Research on Construction of Transportation Facilities

Bibliography With Abstracts
October 1976

U.S. DEPARTMENT OF TRANSPORTATION
OFFICE OF THE SECRETARY
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<th>DOT-TST-77-12</th>
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16. Abstract

Summaries of 158 recent ongoing research projects are listed in Section 1. Abstracts of more than 2800 research reports, technical papers and journal articles from U.S. and non-U.S. sources pertaining to construction of transportation facilities are listed in Section 2 of this publication. Indexes with explanatory notes are included for each section at the end of the respective sections. An analysis of the abstracts and summaries is given in the manuscript section that precedes Section 1. The analysis illustrates a method to program the funding of research projects within three major categories of construction of transportation facilities, namely: (1) system construction, management and quality control; (2) optimization of materials selection and utilization; and (3) construction methods and equipment. The abstracts and summaries (document records) are classified to one of seven research payoff categories and to one of seven transportation facilities within the 3 major categories. The gaps in research payoff/facility type matrices thus indicate areas where little or no research is being funded and suggest areas where research projects may be initiated. Following Section 2 are explanatory notes about the availability of documents cited by the abstracts and explanatory notes on document record content and format.

17. Key Words

| Analysis | Research needs Payoff |
| Construction Research | Abstracts |
| Transportation Facilities | Technical papers |
| Construction Categories | Research reports |
| Research in Progress | Summaries |
| Program planning | Journal articles |

18. Distribution Statement

Release Unlimited. NTIS and TRISNET Document Delivery Centers at Northwestern Univ. Transportation Center and Institute of Transportation Studies, Univ. of California, Berkeley

19. Security Classification (of this report) | UNCLASSIFIED |

20. Security Classification (of this page) | UNCLASSIFIED |

21. No. of Pages | 647 |

22. Price | |
During the last decade, the cost of construction associated with transportation systems—particularly urban systems—has increased at an alarming rate. As a first step in an effort to better understand the cause for this inflation and to assist in developing a means of reducing the rate of increase, the Transportation Research Board was requested to determine the research and development that is being conducted in the United States and the areas of this research.

The purpose of this analysis is to catalog present and past research and development efforts in construction technology without reference to a particular mode of transportation (i.e., highway, railway, transit), to identify possible areas of overlap and oversight, and to provide an additional tool to research managers in establishing priorities for research and development.

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U.S. Department of Transportation
Washington, D.C. 20590
INTRODUCTION

A. B. Mobley, Manager, Highway Research Information Service

The Office of the Assistant Secretary for Systems Development and Technology of the U.S. Department of Transportation requested the Highway Research Information Service (HRIS) of the Transportation Research Board (TRB) to classify and analyze information related to research on the construction of transportation facilities. Information was retrieved from the data bases of three information services operated by TRB: HRIS, the Railroad Research Information Service, and the Maritime Research Information Service. Two types of information were retrieved:

1. Abstracts of published technical papers, journal articles, and research reports acquired from sources throughout the United States and abroad; and

2. Summaries of ongoing research projects reported to TRB during 1974 and 1975.

The search of the data bases identified 2811 published works and 158 ongoing research projects that were relevant to transportation construction. The retrieved information was classified into three areas of construction research. It was then classified with respect to types of payoffs or benefits that might be expected from successful research and implementation. Seven payoff categories were used. And finally, it was classified with respect to transportation facilities that would be primary beneficiaries of the construction research. Seven categories of transportation facilities were used. Table 1 gives the research areas and the payoff and transportation facility categories.

In the analysis, six retrievals were made from the data base, one for each research area both for recent ongoing research and for published research. Results of these retrievals are given in Table 2. The retrieved records are mutually exclusive within each research area. However, there is overlap of records among areas, for some records are relevant to more than one research area.

Table 3 gives the distribution of the 1184 abstracts and summaries by categories and research areas. The sections below further discuss this analysis. Forty percent of all the document records contained in this publication were analyzed. Analysis of the remaining 60 percent probably would not significantly change the results, trends, or conclusions stated.

ABSTRACTS OF PUBLISHED TECHNICAL PAPERS, JOURNAL ARTICLES, AND RESEARCH REPORTS

Approximately a third of the abstracts of published technical papers, journal articles, and research reports were classified (Table 2). The number of abstracts given in the cells of Table 2 provides a measure of the research effort that has been expended on the construction of transportation facilities by facility and payoff categories. Much of the completed research has been concentrated in the area of life expectancy of earthwork and drainage and of pavements. There has also been a significant level of activity in improving construction efficiency for earthwork and drainage and for pavements.

The listing below gives the accession numbers of all the abstracts of papers, articles, and reports according to the categories under which they are classified.

Some abstracts relate to the results obtained by the implementation of research findings, for example, the abstract of the journal article, Computer Speeds Monitoring of Fill and Base Construction (accession no. 215330) listed under the research area of system construction, management, and quality control. The abstract of the workshop proceedings paper by McDonald and Potter, Review of Highway Design and Construction Through Expansive Soils in South Dakota on I-95 Missouri River West—135 Miles (accession no.
Table 3. Number of abstracts and research summaries by transportation facility and payoff categories and by research area.

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Table 4. Funding of recent ongoing research projects in the United States.

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System Construction, Management, and Quality Control

Earthwork and Drainage

- **Life Expectancy**
  - 080644 080730 096986 099611 120025 212057 214488
  - 214625 214874 215203 215449 215456 215716 215872
  - 215936 217019 217823 230583 231048 231453 232497
  - 234447 235271 236379 236643
- **Initial Cost**
  - 090291 214445 215478 213943 232147 232551
- **Construction Time**
  - 123990 214433 214441 214444 214450 214843 214782
  - 215221 215323 215330 215498 230596 230615 230616
  - 230916 231021 231051 231172 231695 232001 232437
  - 232498 232890 235570
- **Multiple or not specified**
  - 214872 216231 216730 231685 231725

Bridges, Piles, Buildings, and Docks

- **Safety**
  - 126294 126128 208177 215643
- **Life Expectancy**
  - 080448 096800 214789
- **Initial Cost**
  - 215586
- **Construction Time**
  - 212426 215079 215373 215418 215581 216592 216726
  - 243059 244061 264084
- **User Amenity**
  - 208799
- **Multiple or not specified**
  - 215687

Tunnels

- **Safety**
  - 091373 236595
- **Life Expectancy**
  - 260465
- **Initial Cost**
  - 090277 091372 097157 097158 094294 127939 129113
  - 216588
- **Construction Time**
  - 243637 236544 236588 264756

Pavements

- **Life Expectancy**
  - 081474 081654 081762 082810 097488 099622 127336
  - 127337 200420 205350 211791 214424 214437 214471
  - 214477 214504 207038 207395 207442 210470 211687
  - 211589 214619 214621 214627 214678 214737 214895
  - 214960 214813 214874 215145 215219 215457 215640
  - 215672 216911 217091 229808 230681 232510 232576
  - 264754
- **Initial Cost**
  - 081396 099711 211356
- **Construction Time**
  - 081395 200734 205661 206464 214427 214442 214447
  - 210330 210776 211400 211445 214525 214812 214840
  - 214975 215120 215234 215235 216747 216931 222976
- **User Amenity**
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- **Multiple or not specified**
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**Multiple**

- **Safety**
  - 219881
- **Environment**
  - 236899

**Energy and Natural Resources**

- **Life Expectancy**
  - 200574 124563 214466 214506 214618 214786 214818
  - 215167 215182 215357
- **Initial Cost**
  - 220444
- **Construction Time**
  - 200302 200456 200661 200866 206454 206468 215129
  - 216264 216909 263105
- **Multiple or not specified**
  - 200399 215125 215156 217849 233820

- **Safety**
  - 216124 263764
- **Environment**
  - 260478 264579
- **Energy and Natural Resources**
  - 265648

**Optimization of Materials and Utilization**

- **Earthwork and Drainage**
  - **Safety**
    - 229924 231306 264642
  - **Environment**
    - 234485
  - **Energy and Natural Resources**
    - 090229 212798

- **Life Expectancy**
  - 084068 096603 128116 203480 213202 214444 215095
  - 217596 228582 228629 229282 229376 230137 230697
  - 230673 230834 230902 230944 231113 231173 231239
  - 231601 231616 231829 232373 232430 232511 233776
  - 234119 263479 264282
- **Initial Cost**
  - 083729 230351 263786

- **Construction Time**
  - 096249 096371 099743 214615 214872 215110 215231
  - 215270 228804 229729 231953 232063 263943 265216
- **Multiple or not specified**
  - 040032 090197 090789 097352 226871 229134 229204
  - 229533 229561 229626 229666 230556 230791 230866
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**Bridges, Piles, Buildings, and Docks**

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SUMMARIES OF RECENT ONGOING RESEARCH PROJECTS

All of the summaries of the recent ongoing research projects were classified by payoff category for each of the transportation facility categories. For example, the project, Design and Construction Guidelines for Shale Embankments (accession no. 109551), being performed by the Joint Highway Research Program of the Indiana State Highway Commission and Purdue University, was placed in the research area of system construction, management, and quality control. It was classified under the transportation facility category of earthwork and drainage and the payoff category of life expectancy.

The listing below gives the accession numbers of all the research summaries according to the categories under which they are classified. Accession numbers followed by an "F" indicate that the research is being performed outside the United States. Seventy-one of the recent ongoing research projects are being performed outside the United States. The greatest number of projects under way in the United States are concerned with increasing the life expectancy of pavements (Table 2), a finding similar to that for completed research. Only five projects indicate research on energy and natural resource conservation; no records indicate research on guideways and trackage or on pipelines. Funding data for 67 U.S. projects are given in Table 4. The largest expenditure is for research to increase the life expectancy of earthwork and drainage. No funding data were available for the other 20 U.S. projects.

System Construction, Management, and Quality Control
Earthwork and Drainage

Life Expectancy
109504 109561 115490F
Construction Time
115111F 020877
Multiple or not specified
020877

Bridges, Piles, Buildings, and Docks

Safety
085787F 086435F
Construction Time
085786F

Tunnels

Multiple or not specified
089653

Pavements

Life Expectancy
101481 102037 103634 115500F
Construction Time
101592F

Multiple

Safety
086475F 115637F
Life Expectancy
021188 082042 082245 085590F 100140 104699F
Construction Time
061123F 086273F 100227

Not specified

Safety
115257F
Environment
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Life Expectancy
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Construction Time
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Optimization of Materials Selection and Use
Earthwork and Drainage

Life Expectancy
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Bridges, Piles, Buildings, and Docks

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PART 1
SUMMARIES OF RECENT ONGOING RESEARCH PROJECTS

IR 020877
DEVELOPMENT OF IMPROVED PERFORMANCE CRITERIA FOR USE IN NUCLEAR GAGE SPECIFICATIONS
This project will develop the criteria for efficient "state of the art" specification for nuclear moisture-density gages for use in highway compaction control. Work is nearing completion on the spectrum analysis at the California density standards, using the radioisotopes Co-60, Ra-226, Cs-137. In a combination of the possible geometric arrangements, the basic factors affecting response to density and chemical sensitivity are being identified. Other topics being studied are primary shielding, detector shielding (filtering), and the characteristics of various deflectors currently available.

PERFORMING AGENCY: California Department of Transportation, Division of Highways, Transportation Laboratory Branch, Study No 19-632108
INVESTIGATOR: Forsyth, RA; Hannon, JB; Chang, J
SPONSORING AGENCY: California Department of Transportation, Division of Highways, Federal Highway Administration, Department of Transportation
RESPONSIBLE INDIVIDUAL: Mitchell
HP&R F-4-24
STATUS: Active
NOTICE DATE: Oct. 1974
START DATE: July 1969
COMPLETION DATE: June 1975
TOTAL FUNDS: $40,700
ACKNOWLEDGMENT: California Department of Transportation, Federal Highway Administration (196089351)

IR 021188
APPLICATION OF STATISTICAL QUALITY CONTROL METHODS
The objective of this study is to develop specifications in combination with sampling and testing procedures which are statistically sound and will provide the construction engineer with reasonable assurance that the decision he makes with regard to accepting or rejecting a material are correct. The use of statistical methods in contract control will be monitored and revised specifications will be evaluated.

PERFORMING AGENCY: California Department of Transportation, Division of Highways, Transportation Laboratory Branch, Study No 19-631146
INVESTIGATOR: Ames, WH; Sundquist, CR; Benson, PE
SPONSORING AGENCY: California Department of Transportation, Division of Highways, Federal Highway Administration, Department of Transportation
RESPONSIBLE INDIVIDUAL: Granley
HP&R F-1-03
STATUS: Active
NOTICE DATE: Oct. 1974
START DATE: July 1967
COMPLETION DATE: June 1975
TOTAL FUNDS: $276,000
ACKNOWLEDGMENT: California Department of Transportation, Federal Highway Administration (196089351)

IR 048653
COMPREHENSIVE STUDY CONTRACTING PRACTICES USED FOR UNDERGROUND CONSTRUCTION IN THE UNITED STATES
This Remountable Agreement transfers funds to the National Science Foundation to support the U.S. National Committee on Tunneling Technology, for a comprehensive study of contracting practices used for underground construction in the United States.

PERFORMING AGENCY: National Science Foundation
SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation
RESPONSIBLE INDIVIDUAL: McFarland, RK
(Tel 202-426-9638)
1A DOT-AS-40032
STATUS: Active
NOTICE DATE: Aug. 1975
START DATE: Feb. 1974
TOTAL FUNDS: $25,000
ACKNOWLEDGMENT: TRAIR

IR 082042
QUALITY CONTROL RESEARCH STUDY
This study aims to: 1) determine the level of quality of ready mix concrete presently being incorporated into construction projects of D.C. Department of Highways & Traffic; and 2) develop realistic requirements for level of quality and procedures for controlling quality of ready mix concrete used on highway projects.

PERFORMING AGENCY: District of Columbia Department of Transportation
INVESTIGATOR: Martin
SPONSORING AGENCY: District of Columbia Department of Transportation, Federal Highway Administration, Department of Transportation
RESPONSIBLE INDIVIDUAL: Granley
HP&R 617
STATUS: Active
NOTICE DATE: Dec. 1974
TOTAL FUNDS: $36,000
ACKNOWLEDGMENT: Federal Highway Administration (167029356)

IR 082245
DETERMINATION OF STATISTICAL PARAMETERS PHASE II: CONCRETE PAVEMENT AND STRUCTURES
The goal of this study is to develop realistic and fully enforceable acceptance specifications for concrete pavement and structures which will ensure that the quality level of currently acceptable construction is maintained in future work.

PERFORMING AGENCY: Materials Research and Development, Woodward-Gardner and Associates, Incorporated
INVESTIGATOR: Hudson
SPONSORING AGENCY: Pennsylvania Department of Transportation, Federal Highway Administration, Department of Transportation
RESPONSIBLE INDIVIDUAL: Granley
HP&R 73-3A
STATUS: Active
NOTICE DATE: Dec. 1975
COMPLETION DATE: Dec. 1975
TOTAL FUNDS: $110,000
ACKNOWLEDGMENT: Federal Highway Administration (033294356)
1R 082638
EVALUATION OF UTAH’S QUALITY CONTROL PROCEDURES RELATED TO CONSTRUCTION
The objective is to establish an overall plan to improve Utah’s quality control system. Also those areas of quality control that can be immediately changed or improved will be implemented through this study; these areas requiring a more extensive change-over will be identified for later implementation. Information will be gathered from various individuals throughout Utah related to construction to help identify problem areas and possible solutions. This information will be compared to excavation and shoring methods will commence during the year. A start will be made on an analysis of the cost of accidents to workers, contractors, and the public purse. An assessment is being made of the hazards which occur at workers. This project involves evaluating non-destructive apparatus and methods used in or available for construction practice. The methods used are based on site testing, backed by laboratory tests and theoretical analysis. Measures have just been made on falsework used on successive spans of a bridge. The methods used are based on site testing, backed by laboratory tests and theoretical analysis. Measures have just been made on falsework used on successive spans of a bridge.

ACKNOWLEDGMENT: Utah State Department of Transportation

STATUS: Active
NOTICE DATE: Oct. 1974
START DATE: July 1974
COMPLETION DATE: June 1975
TOTAL FUNDS: $12,000

1R 083649
CONSTRUCTION MANAGEMENT
A system for the operational management of construction engineering and inspection will be developed and field tested.

ACKNOWLEDGMENT: Federal Highways Administration (214031356)

1R 085475
SAFETY ON CONSTRUCTION SITES
This project is attempting to obtain a better understanding of the factors influencing safety in building construction through investigations into the causes and costs of accidents, and to reduce accidents during construction operations by improving equipment and methods and providing design data that accurately reflect site conditions and methods. Research into scaffolding design and practice is proceeding and similar studies in relation to excavation and shoring methods will commence during the year. A start will also be made on an analysis of the cost of accidents to worker, contractor, and the public purse. An assessment is being made of the hazards which occur at workers. This project involves evaluating non-destructive apparatus and methods used in or available for construction practice. The methods used are based on site testing, backed by laboratory tests and theoretical analysis. Measures have just been made on falsework used on successive spans of a bridge. The methods used are based on site testing, backed by laboratory tests and theoretical analysis. Measures have just been made on falsework used on successive spans of a bridge.

ACKNOWLEDGMENT: International Road Federation (IRF 6(49))

1R 085786
BRIDGE CONSTRUCTION OPERATIONS
The aim is to investigate the characteristics of bridge building operations and the ways in which these can be improved by changes in procedures and processes associated with design, construction and contract matters. The techniques adopted will include: (1) analysis of available data from past contracts; (2) analysis of contractor’s planning, programming, accounting, and performance; and (3) observation and measurement of site activities, including time-lapse photography. Measures have just been made on falsework used on successive spans of a bridge. The methods used are based on site testing, backed by laboratory tests and theoretical analysis. Measures have just been made on falsework used on successive spans of a bridge. The methods used are based on site testing, backed by laboratory tests and theoretical analysis. Measures have just been made on falsework used on successive spans of a bridge.

ACKNOWLEDGMENT: International Road Federation (IRF 6(49))

1R 085979
LOADING AND PERFORMANCE OF FALSEWORK IN BRIDGE CONSTRUCTION
Loads on falsework used for building bridges are being determined to improve safety during construction. The methods used are based on site testing, backed by laboratory tests and theoretical analysis. Measures have just been made on falsework used on successive spans of a motorway viaduct. Results are being analysed.

ACKNOWLEDGMENT: International Road Federation, OECD (IRRD-603061), International Road Federation (IRF 1(449))

1R 086123
NETWORK ANALYSIS APPLIED TO CIVIL ENGINEERING
A set of computer based network/cost/decision models are being developed which will assist project management in the pre-tender, pre-contract and

REFERENCES:
Precision and Reliability of a Nuclear Meter for Soil and Bituminous Mix Density Determination, Rule, B. Internal Report, Feb. 1975
in-contract phases. It is hoped that the research will provide guidance to management on problems which are outside the scope of the existing commercially available programs. /IRRD/IRF/

PERFORMING AGENCY: Aston University, England, Department of Civil Engineering
INVESTIGATOR: Ford, LM

STATUS: Active
NOTICE DATE: Jan. 1975
START DATE: 1977

ACKNOWLEDGMENT: International Road Research Documentation, OECD (IRRD-603262), International Road Federation (IRF 140(21))

1R 086273

COMPUTER ASSISTANCE IN PRODUCTION PLANNING FOR ROAD CONSTRUCTION

This project consists of coordinating existing computer programs and developing new ones that will be helpful in production planning for road construction. The computer programs are meant to include planning of costs, scheduling of time (PERT), planning of needs for resources (machinery) and planning of costs/time. /IRRD/IRF/

PERFORMING AGENCY: Norwegian Institute of Technology, Foundation of Scientific and Industrial Research
INVESTIGATOR: Berger, A

SPONSORING AGENCY: Public Roads Administration, Norway

STATUS: Active
NOTICE DATE: June 1975
START DATE: 1975
TOTAL FUNDS: $21,200

ACKNOWLEDGMENT: International Road Research Documentation, OECD (IRRD-663498), International Road Federation (IRF 566)

1R 086435

STRUCTURAL ENGINEERING STUDIES REGARDING A NEW SAFETY THEORY IN THE FIELD OF STEEL CONSTRUCTION

Many national and international proposals have been made which relate to the development of a generally valid theory of safety; these have mostly resulted from theoretical and probabilistic studies. These proposals have to be checked for their practical applicability, and if necessary modified to meet the requirements of a generally valid concept of safety. The work is to be carried out as follows: 1) inspection and evaluation of the literature; 2) statistical evaluation of the strength properties of structural steels st 37 and st 52; 3) design of a standard concept on a semi-probabilistic basis and checking this on actual building projects by means of comparative calculations; 4) study of steel supports subjected to compressive stress, with particular reference to imperfections; 5) studies of the literature on the statistical significance of test results; 6) tabulation of the results for specifications to support the work on standardization in steel engineering; 7) preparation of final report. /IRRD/IRF/

PERFORMING AGENCY: Technical University of Munich, West Germany, Department of Steel Structures
INVESTIGATOR: Petersen

SPONSORING AGENCY: Construction Techniques Institute

STATUS: Active
NOTICE DATE: Mar. 1974
START DATE: Nov. 1975

ACKNOWLEDGMENT International Road Research Documentation, OECD (IR-F-700913), International Road Federation (IRF 28p(1))

1R 100140

DEVELOPMENT OF A LABORATORY DATA SYSTEM

THE OBJECTIVES ARE (1) TO UTILIZE ELECTRONIC DATA PROCESSING TO FACILITATE LABORATORY DATA HANDLING; (2) TO INCORPORATE STATISTICAL METHODS TO REDUCE TESTING FREQUENCY; (3) TO PROVIDE MANAGEMENT WITH RAPID AND ORGANIZED MATERIALS INFORMATION, AND; (4) TO EXPEDITE PROCESSING OF MATERIAL TESTING RESULTS FOR PROJECT PERSONNEL TO ENHANCE JOB QUALITY CONTROL DURING CONSTRUCTION, A COMPUTER SYSTEM (USING UNIVAC 1106 HARDWARE) WILL BE DESIGNED FOR THE MATERIALS TESTING LABORATORY, INCORPORATING ALL PHASES OF MATERIAL TESTING.

REFERENCES:
A Development of a Laboratory Data System--Report 1 Christman, R. Mar. 1973
Development of A Laboratory Data System--Report 2 Christman, R. Nov. 1973

PERFORMING AGENCY: Connecticut Department of Transportation, Bureau of Highways, Study No. HPR-360
INVESTIGATOR: Christman, R. Attardi, SC
SPONSORING AGENCY: Connecticut Department of Transportation, Bureau of Highways; Federal Highway Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: Runt

HPR & HPR 360

STATUS: Active
NOTICE DATE: Sept. 1974
START DATE: Nov. 1972
COMPLETION DATE: May 1975
TOTAL FUNDS: $55,500

ACKNOWLEDGMENT: Connecticut Department of Transportation, Federal Highway Administration (314012357)

1R 100227

OPTIMAL HIGHWAY INVESTMENTS BY DYNAMIC PROGRAMMING

THE OBJECTIVES ARE TO DEVELOP OR ADOPT APPROPRIATE DYNAMIC PROGRAMMING METHODS THAT WILL ASSIST IN THE ESTABLISHMENT OF OPTIMAL ANNUAL PRIORITIES FOR HIGHWAY CONSTRUCTION, MAINTENANCE, AND SAFETY IMPROVEMENT PROJECTS. THE TASK OF DECIDING WHICH PROJECTS TO IMPLEMENT UNDER A GIVEN BUDGET AND WHICH TO DEFER UNTIL LATER IS CENTRAL TO THE MANAGEMENT AND PLANNING OF HIGHWAY SYSTEMS. DYNAMIC PROGRAMMING TRANSFORMS A MULTISTAGE DECISION PROBLEM INTO A SERIES OF ONE-STAGE DECISIONS.

REFERENCES:
Optimal Highway Safety Improvement Investments by Dynamic Programming, Pigman, JG; Agent. KR; Mayes, JG; Zegrez, CV. Research Division, Kentucky DOT, Bureau of Highways, TRB Record. Aug. 1974

PERFORMING AGENCY: Kentucky Department of Transportation, Bureau of Highways. KYP-73-47
INVESTIGATOR: Pigman, JG
SPONSORING AGENCY: Kentucky Department of Transportation, Bureau of Highways

STATUS: Active
NOTICE DATE: Feb. 1975
START DATE: Mar. 1973
COMPLETION DATE: June 1976
TOTAL FUNDS: $21,700

ACKNOWLEDGMENT: Kentucky Department of Transportation

1R 101481

SURFACE TREATMENT STUDY

THE OBJECTIVES OF THIS RESEARCH STUDY ARE TO INVESTIGATE IN DEPTH ALL PHASES OF SURFACE TREATMENT WORK AND FROM THIS STUDY TO DEVELOP SPECIFICATIONS, QUALITY CONTROL PROCEDURES, CONSTRUCTION GUIDES, AND TRAINING AIDS. THIS WILL PROVIDE ENGINEERS WITH BACKGROUND INFORMATION AND SPECIFIC DETAILS OF REQUIREMENTS AND PROCEDURES NEEDED TO ACHIEVE HIGH QUALITY RESULTS IN SURFACE TREATMENT WORK.

PERFORMING AGENCY: Georgia Department of Transportation, Study No 7301; Mills (William H) and Associates
INVESTIGATOR: Mills, WH; Stapler, T; Fowler, G; Thornton, JB
SPONSORING AGENCY: Georgia Department of Transportation; Federal Highway Administration, Bureau of Transportation

RESPONSIBLE INDIVIDUAL: Lentz

HP 7301

STATUS: Active
NOTICE DATE: Oct. 1974
START DATE: Mar. 1974
COMPLETION DATE: Nov. 1975
TOTAL FUNDS: $38,000

ACKNOWLEDGMENT: Georgia Department of Transportation

1R 101592

PAVEMENT MANAGEMENT STUDY

THE INTERRELATIONSHIPS BETWEEN THE PLANNING, DESIGN, CONSTRUCTION AND MAINTENANCE ASPECTS OF PAVEMENTS HAVE NOT BEEN WELL DEFINED IN THE PAST. IT IS HOPED THAT A GUIDE WILL BE PRODUCED WHICH RECOG
1R SYSTEM CONSTRUCTION, MANAGEMENT & QUALITY CONTROL

NIZES AND IDENTIFIES THESE INTERRELATIONSHIPS SO THAT THE MOST EFFECTIVE USE CAN BE MADE OF FUNDS ALLOCATED TO PAVEMENTS. /RTAC/

PERFORMING AGENCY: Roads and Transportation Association of Canada
INVESTIGATOR: Tessier, OR Mass, RC
SPONSORING AGENCY: Roads and Transportation Association of Canada
STATUS: Active NOTICE DATE Oct. 1975 COMPLETION DATE 1976
ACKNOWLEDGMENT: Roads and Transportation Association of Canada

1R 102977
EVALUATION OF BITUMINOUS MIXES IN PAVEMENT STRUCTURES
THE PRIMARY OBJECTIVE IS THE EVALUATION OF ASPHALT CONCRETE SURFACE MOISTURE AND CORRELATION WITH SPECIFIC DISTRESS CONDITION. SECONDARY OBJECTIVES INCLUDE (1) THE REVIEW OF PRESENT ASPHALT MIX DESIGN METHODS, MATERIAL SPECIFICATION, CONSTRUCTION SPECIFICATION AND TECHNIQUES AND MAINTENANCE METHODS FOR POSSIBLE REVISION TO ALLEVIATE THESE PAVEMENT DISTRESS PROBLEMS; AND (2) RELATION OF SUCH DISTRESS CONDITION FACTORS TO STRUCTURE DESIGN, I. E., LAYER QUALITY AND THICKNESS, CONDITION OF LOADING, ETC. FOR ADDITIONAL OR SUBSEQUENT INVESTIGATION.

PERFORMING AGENCY: Oklahoma State University, /School of Civil Eng, 72-03-3
INVESTIGATOR: Manke, P
SPONSORING AGENCY: Oklahoma Department of Highways, 72-03-3
ACKNOWLEDGMENT: Oklahoma State University

1R 103534
IMPLEMENTATION OF STATISTICAL SPECIFICATIONS FOR BITUMINOUS CONCRETE
THE OVERALL PERFORMANCE OF THE STATISTICAL SPECIFICATION, IN PARTICULAR THE QUANTITATIVE VALUES OF THE VARIOUS PARAMETERS AND SUBLOTS USED IN SETTING UP THE SPECIFICATIONS, IS BEING ASSESSED. TRIAL SPECIFICATIONS HAVE BEEN DEVELOPED AND ARE BEING IMPLEMENTED ON A TRIAL BASIS ON FOUR CONSTRUCTION PROJECTS: TWO OVERLAYS AND TWO NEW CONSTRUCTION PROJECTS.


PERFORMING AGENCY: Connecticut Department of Transportation, Bureau of Highways, Study No. 376
INVESTIGATOR: Sternberg, FE
SPONSORING AGENCY: Connecticut Department of Transportation, Bureau of Highways; Federal Highway Administration, Department of Transportation
RESPONSIBLE INDIVIDUAL: Granley, E
HP&R HPR-376
STATUS: Active NOTICE DATE Sept. 1974 START DATE July 1973 COMPLETION DATE June 1975 TOTAL FUNDS $40,000
ACKNOWLEDGMENT: Connecticut Department of Transportation, Federal Highway Administration (212073356)

1R 104659
METHODS FOR SAMPLING AND CONTROL OF ROAD CONSTRUCTION
THE NIRR IS AIMING AT INTRODUCING ITS SCHEME FOR QUALITY CONTROL INTO GENERAL ROAD PRACTICE IN SOUTH AFRICA. THE FEASIBILITY OF USING THE SCHEME IN PRACTICAL ROAD CONSTRUCTION WILL BE TESTED. ASSISTANCE IS BEING OFFERED TO ROAD AUTHORITIES IN THE DRAFTING OF SPECIFICATIONS IN ACCORDANCE WITH THE SCHEME. DATA WILL BE COLLECTED ON COSTS AND ON THE VARIABILITY OF PARAMETER, WHICH CAN BE USED TO IMPROVE THE EFFECTIVENESS OF THE PRACTICAL USE OF THIS QUALITY CONTROL SCHEME. /IRF/

PERFORMING AGENCY: Nat Inst Road Research /S Africa/, 9431/4541; Cecil Scient & Indus Res /S Africa/
INVESTIGATOR: Kuhn, SH Walker, RN
SPONSORING AGENCY: Nat Inst Road Research /S Africa/, 9431/4541
ACKNOWLEDGMENT: International Road FederationIRF 1A(66), 2R3500799

1R 105748
DETERMINE FEASIBLE NOISE LIMITS FOR CONSTRUCTION AND MAINTENANCE EQUIPMENT AND STUDY NOISE REDUCTION METHODS
THE OBJECTIVES OF THIS RESEARCH ARE TO DEVELOP TEST METHODS AND SYSTEMS FOR REDUCING THE NOISE EMANATIONS FROM EXISTING TYPES OF CONSTRUCTION EQUIPMENT AND ROADWAY EQUIPMENT. THE PROGRAM WILL STUDY ALL TYPES OF EQUIPMENT POWERED BY INTERNAL COMBUSTION ENGINES. DYNAMOMETER TESTS WILL BE FACED TO EQUIPMENT COMPATIBLE WITH DRIVE WHEELS AND FIELD TESTS WILL BE EMPLOYED FOR NON-COMPATIBLE EQUIPMENT.

PERFORMING AGENCY: California Department of Transportation, Division of Highways, Transportation Laboratory Branch, Study No. 19-56410 19-657083
INVESTIGATOR: Shirley, EC Bourget, L
SPONSORING AGENCY: California Department of Transportation, Division of Highways; Federal Highway Administration, Department of Transportation
RESPONSIBLE INDIVIDUAL: Jongedyk
HP&R A-8-08
ACKNOWLEDGMENT: California Department of Transportation, Federal Highway Administration (312211352)

1R 109504
DYNAMIC APPROACH TO EMBANKMENT CONSTRUCTION CONTROL
THIS PROJECT WILL DEVELOP A PROCEDURE TO EVALUATE AND DIRECTLY CONTROL THE QUALITY OF COMPACTED FILL IN TERMS OF ITS ELASTIC PROPERTIES THIS WILL MAKE IT POSSIBLE TO USE THE FINITE ELEMENT METHOD FOR DESIGN AND ANALYSIS OF HIGHWAY EMBANKMENTS UNDER EITHER STATIC OR DYNAMIC LOADINGS. RESONANT-COLUMN TESTS, CYCLIC STRESS OR STRAIN CONTROL TRIAXIAL TESTS WILL BE EMPLOYED TO DETERMINE THE ELASTIC PROPERTIES OF SOIL IN THE LABORATORY. IMPACT-TYPE VIBRATION AND STEADY-STATE VIBRATION TESTS WILL BE CONDUCTED IN THE FIELD TO DETERMINE THE IN-SITU ELASTIC PROPERTIES OF EMBANKMENT MATERIALS.

PERFORMING AGENCY: California Department of Transportation, Division of Highways, Transportation Laboratory Branch, Study No. 19-632304
INVESTIGATOR: Forsyth, RA Hannon, JB Chang, JC
SPONSORING AGENCY: California Department of Transportation, Division of Highways; Federal Highway Administration, Department of Transportation
RESPONSIBLE INDIVIDUAL: Sallberg
HP&R F-4-27
ACKNOWLEDGMENT: California Department of Transportation, Federal Highway Administration (224032353)
THE OBJECTIVES OF THE SHALE STUDY INCLUDE:

1. A survey of current experience to evaluate existing provisional embankment construction guidelines.
2. A development of laboratory testing techniques required to define design and construction parameters.
3. A set of procedures for subsurface exploration of shale such that it will be possible to anticipate possible problems at the time of the evaluation of the subsurface exploration data. The findings of this study should have immediate application in the form of improved design and construction guidelines for embankments built of shales. Specifically, there will be recommendations for conducting the subsurface exploration in shales which are potentially embankment materials. Simple index tests conducted on extracted shale samples so obtained will permit classification of the shale and reasonable prediction of its compacted behavior. To accomplish the latter goal, it will be necessary to develop compaction and degradability measures, as well as strengths or strength parameters, for the compacted shales.

PERFORMING AGENCY: Purdue and Indiana State Highway Commission
JHRP, Joint Highway Research Project, Study No. C-36-SL
INVESTIGATOR: Wood, LE
Sponsoring Agency: Indiana State Highway Commission, Purdue University Federal Highway Administration, Department of Transportation

ACKNOWLEDGMENT: Purdue and Indiana State Highway Commission
JHRP, Federal Highway Administration (240013351)

ACR 115540
QUALITY CONTROL OF DENSITY AND MOISTURE CONTENT USING NUCLEAR Meters
Investigations are conducted into the use of Nuclear Density/Moisture Gauges as a means of quality control for roadways. /IRF/

REFERENCES:
SIX MONTH'S USE OF A NUCLEAR MOISTURE/DENSITY GAUGE Hamory, G. Main Roads Department, Western Australia, 73/21, Materials Engnr Sect RP, 1973

PERFORMING AGENCY: Western Australia Main Roads Department, Australia
INVESTIGATOR: Goundram, LW
Sponsoring Agency: Western Australia Main Roads Department, Australia

ACKNOWLEDGMENT: International Road Federation (IRF 9(20))
FACTORS THAT INFLUENCE SUCCESSFUL CONSTRUCTION PROJECT MANAGEMENT

Description: One reason that a construction organization is unique and different from other industries is that project management is based upon solving a continuous stream of crisis situations. Therefore, little effort is directed toward repetitious management decisions which become standard operating procedures in most businesses. This research will examine construction project management by interviewing successful project managers, superintendents, general contractor and subcontractor foremen, and to a lesser degree, upper level management in the home office. Then a comparison will be made between interview data and research findings of management techniques employed in other organizations to improve the effectiveness of construction project managers.

PERFORMING AGENCY: Texas University, Austin, School of Engineering, Dept of Architectural Engineering
INVESTIGATOR: Borcherding, JD Lott, W
SPONSORING AGENCY: Texas University, Austin
STATUS Active NOTICE DATE Dec. 1974 START DATE July 1973
ACKNOWLEDGEMENT: Science Information Exchange (NTX 264)
CONSTRUCTION MATERIALS

2R 000061
TEST FIELD MEASUREMENT SYSTEM FOR TUNNEL CONSTRUCTION
THE PURPOSE IS TO: (1) RESEARCH AND DEMONSTRATE THE CAPABILITIES OF FIELD-INSTRUMENTATION SYSTEMS IN DEEP, BRACED CUTS AND TUNNEL STRUCTURES OF THE TYPE COMMONLY USED IN SUBWAY CONSTRUCTION, AND (2) DEVELOP DESIGN APPROACHES AND PRINCIPLES WHICH WILL ENABLE ENGINEERS ON LATER PROJECTS TO DESIGN MORE ECONOMICAL AND SAFE TUNNEL STRUCTURES AND SYSTEMS OF ENACTING AND BRACING FOR DEEP CUTS. THE PROJECT INVOLVES THE INSTALLATION OF FIELD INSTRUMENTATION SYSTEMS ON SHEETING AND BRACING SYSTEMS IN CUT-AND-COVER EXCAVATION AND TUNNEL CONSTRUCTION FOR AN NBA SUBWAY EXTENSION. THE INSTRUMENTS MEASURE PORE-WATER PRESSURE, EARTH PRESSURE, AND SOIL DEFORMATION, PROVIDING DATA ON THE BEHAVIOR OF ORGANIC SILTS AND SHEETING, AND THE BRACING SYSTEM USED DURING SUBWAY CONSTRUCTION.

PERFORMING AGENCY Massachusetts Bay Transportation Authority.
INVESTIGATOR Silven
SPONSORING AGENCY Urban Mass Transportation Administration, Department of Transportation

2R 020892
PROCEDURAL RESEARCH FOR REPORTING OF MATERIALS TEST DATA USING COMPUTER SYSTEMS
AN ATTEMPT IS MADE TO REMEDY THE PRESENT BURDEN-SOME METHOD OF MANUALLY REPORTING AND FILING CONSTRUCTION MATERIALS TEST DATA BY USING COMPUTERIZED STORAGE RETRIEVAL TECHNIQUES. A NUMBER OF METHODS OF COLLECTING THE DATA FOR EASY REPORTING AND STORAGE WILL BE TRIED INCLUDING: PREPARED CODED FORMS AND REMOTE TERMINALS. THE NEW SYSTEM WILL PROVIDE A MORE MEANINGFUL LIBRARY OF INFORMATION ON VARIOUS FACETS OF CONSTRUCTION DATA FOR SUBSEQUENT STATISTICAL QUALITY CONTROL EVALUATION.

REFERENCES
Computerization of Material Test Data Reporting System Shah, SC; Smith, JT; Hirschmann, JJ, Louisiana Department of Highways, Interim Report, Sept. 1973

PERFORMING AGENCY Louisiana Department of Highways, Study No. 70-61G
INVESTIGATOR Shah, SC; Hirschmann, JJ
SPONSORING AGENCY Louisiana Department of Highways, Federal Highway Administration, Department of Transportation

H&P&R 70-71G
STATUS Active Notice Date: Nov 1974 Start Date: July 1970 Completion Date: June 1975 Total Funds: $187,332
ACKNOWLEDGMENT Louisiana Department of Highways

2R 048913
INNOVATIVE MATERIALS AND TECHNIQUES FOR CONSTRUCTION AND MAINTENANCE TO INSURE RESISTANT SURFACES
The project is designed to locate, classify, and field test evaluate the various innovative skid resistant treatments currently in use in the State of California and adjacent states for their potential to provide and reasonable retain adequate levels of friction and texture and also to field-test evaluate selected recommended innovative materials systems developed under NCHRP project 1-12(3).

PERFORMING AGENCY California Department of Transportation, Division of Highways
INVESTIGATOR Bozouska, TJ; Mancardi, GD; Nelson, BN, California Department of Transportation, Division of Highways, Office of Structures, Study No. 70-624122
SPONSORING AGENCY California Department of Transportation, Division of Highways, Federal Highway Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL Ballinger

H&P&R D-4-043
STATUS Active Notice Date: Oct. 1974 Start Date: 1970 Completion Date: June 1978 Total Funds: $70,000
ACKNOWLEDGMENT California Department of Transportation, Federal Highway Administration (324520353)

2R 055848
PRIMARY REFERENCE SURFACES FOR THE FHWA FIELD TEST AND EVALUATION CENTERS
The contractor shall construct 10 experimental test surfaces at a site selected by the contracting officer at the Research Center of the Texas Transportation Institute near College Station, Texas. Each test surface shall be 100 feet long and 7 and one half feet wide. The cover aggregates shall be selected and furnished by the contracting officer. The purpose of these experimental surfaces is to evaluate the construction process, the levels of skid resistance and skid number-speed gradient achieved.

PERFORMING AGENCY Adhesive Engineering Company
SPONSORING AGENCY Federal Highway Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL Gale, HG (Tel 202-426-0743)

Contract DOT-FH-11-8480 (CPFF)
STATUS Active Notice Date: Oct. 1975 Start Date: June 1974 Total Funds: $200,000
ACKNOWLEDGMENT Federal Highway Administration (170024351)

2R 000061
STRENGTH COEFFICIENT OF MATERIALS
THE COEFFICIENTS ESTABLISHED AT THE AASHO TEST ROAD WERE DETERMINED SPECIFICALLY FOR THE VARIOUS COMPONENT MATERIALS USED IN THE CONSTRUCTION OF THE TEST ROAD. THIS RESEARCH IS INTENDED TO DETERMINE THE APPLICABILITY OF THESE COEFFICIENTS TO SEVERAL TYPICAL HIGHWAY MATERIALS USED IN THE CONSTRUCTION OF THE HIGHWAYS IN SOUTH DAKOTA AND TO DETERMINE COEFFICIENTS WHICH ARE REALISTIC FOR THE VARIOUS MATERIALS.

PERFORMING AGENCY South Dakota Department of Transportation, Study No. 63(70)
INVESTIGATOR Crawford, RA
SPONSORING AGENCY South Dakota Department of Transportation, Federal Highway Administration, Department of Transportation

H&P&R 613(30)
STATUS Completed Notice Date: Apr. 1975 Start Date: July 1970 Completion Date Sept. 1974 Total Funds: $41,075
ACKNOWLEDGMENT South Dakota Department of Transportation (HIRS 31 022757, 2R22214088)

2R 021369
LONG SPAN BRIDGE DEFLECTION STUDY
FIELD DEFLECTION DATA ARE BEING ACCUMULATED ON SEVERAL SELECTED LONG SPAN BRIDGES. REDUCTION OF DATA AND STATISTICAL ANALYSIS WILL BE MADE AND CHARTS OR GRAPHS WILL BE PREPARED WHICH WILL AID BRIDGE DESIGNERS IN PREDICTING SHORT AND LONG TERM DEFORMATIONS AS INFLUENCED BY CONSTRUCTION METHODS, SEQUENCE OF CONSTRUCTION, AND CONSTRUCTION MATERIALS.

PERFORMING AGENCY California Department of Transportation, Division of Highways, Office of Structures, Study No. 14-624122
INVESTIGATOR Bezosu, TJ, California Department of Transportation, Division of Highways, Federal Highway Administration, Department of Transportation
SPONSORING AGENCY California Department of Transportation, Division of Highways, Federal Highway Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL Belanger

H&P&R 64-043
STATUS Active Notice Date: Oct. 1974 Start Date: 1970 Completion Date: June 1978 Total Funds: $70,000
ACKNOWLEDGMENT California Department of Transportation, Federal Highway Administration (324520353)
2R CONSTRUCTION MATERIALS

2R 082119
UTILIZATION OF WASTE BOILER ASH IN HIGHWAY CONSTRUCTION IN ARIZONA
The project will establish effective design criteria for the utilization of fly ash from the Colla, Navajo, and Four Corners Power Plants as highway construction materials.

PERFORMING AGENCY: Engineers Testing Laboratories
INVESTIGATOR: Roper
SPONSORING AGENCY: Arizona Department of Transportation, Highway Division; Federal Highway Administration, Department of Transportation
RESPONSIBLE INDIVIDUAL: Dikeou
HP&R PR-94
STATUS: Active
NOTICE DATE: Dec. 1974
COMPLETION DATE: June 1976
TOTAL FUNDS: $123,000
ACKNOWLEDGMENT: Federal Highway Administration (22504351)

2R 082196
ANALYSIS OF FRESH CONCRETE
The objective of the research is to develop practical methods of measuring with sufficient accuracy the critical parameters of fresh concrete—cement content, water content, and entrained air content. These methods will be sufficiently simple and rapid to permit batch by batch testing of concrete on a construction site before it is placed and has set. It is anticipated that these methods would be put in standard form and incorporated in the procedures and specifications of organizations undertaking concrete construction.

PERFORMING AGENCY: Purdue and Indiana State Highway Commission
JHRP, Joint Highway Research Project, C-36-10E
INVESTIGATOR: Winslow, DN; Dolch, WL
SPONSORING AGENCY: Indiana State Highway Commission; Federal Highway Administration, Department of Transportation
HP&R
STATUS: Active
NOTICE DATE: Dec. 1974
COMPLETION DATE: 1978
TOTAL FUNDS: $79,500
ACKNOWLEDGMENT: Purdue and Indiana State Highway Commission JHRP

2R 082296
ASPHALT RECLAIMER EVALUATION
A new construction method whereby old, abandoned, or worn asphaltic concrete pavements can be removed, recycled, and relaid as new asphaltic composition will be developed. The objective of the project is to determine, evaluate, and demonstrate the merits of an alternate method of highway construction or reconstruction using recycled asphaltic materials and to establish their behavior under actual highway service conditions. The recycling process and equipment were developed by private enterprise.

PERFORMING AGENCY: Nevada Department of Highways
INVESTIGATOR: Gregory, G
SPONSORING AGENCY: Federal Highway Administration, Department of Transportation
Contract DOT-FH-11-8173
STATUS: Active
NOTICE DATE: Nov. 1974
START DATE: Aug. 1974
COMPLETION DATE: Sept. 1975
TOTAL FUNDS: $30,000
ACKNOWLEDGMENT: Nevada Department of Highways

2R 082318
PERMEABILITY OF NEW JERSEY SOIL AGGREGATE BASES
Determination will be made of the permeability of load-bearing values for soil aggregate base and subbase materials that are used in New Jersey highways. The information gathered will be used to review the adequacy of New Jersey's gradation based acceptance criteria for base and subbase materials. If deficiencies are identified modifications to these criteria will be formulated and new base and subbase usage practices will be proposed.

PERFORMING AGENCY: New Jersey Department of Transportation, Study No. 7775
INVESTIGATOR: Cosaboom, B; Kozdy, G
SPONSORING AGENCY: New Jersey Department of Transportation; Federal Highway Administration, Department of Transportation
RESPONSIBLE INDIVIDUAL: Ring
HP&R 7775
STATUS: Active
NOTICE DATE: Dec. 1974
START DATE: Sept. 1974
COMPLETION DATE: Sept. 1977
TOTAL FUNDS: $85,866
ACKNOWLEDGMENT: New Jersey Department of Transportation, Federal Highway Administration (268404353)

2R 082554
ENGINEERING-ECONOMY AND ENERGY CONSIDERATIONS IN DESIGN, CONSTRUCTION AND MATERIALS
The objective is to evaluate the trade-offs or consequences (including as appropriate: cost effectiveness, cost benefits, effectiveness of material utilization, energy-effectiveness and other factors) of alternative practices, specifications, criteria, and procedures used in highway design and construction.

PERFORMING AGENCY: Texas Transportation Institute, Texas A&M University, 2-9-74-214
INVESTIGATOR: McFarland, WF
SPONSORING AGENCY: Texas State Department of Highways & Public Transp
STATUS: Active
NOTICE DATE: Jan. 1975
START DATE: June 1974
COMPLETION DATE: Aug. 1975
TOTAL FUNDS: $80,000
ACKNOWLEDGMENT: Texas Transportation Institute

2R 082601
TECHNOLOGY FOR USING SULFATE WASTE IN ROAD CONSTRUCTION
The Gillette Research Institute and the University of Virginia (as a subcontractor) are cooperating in a study of the chemical and engineering properties of 1) lime fly ash-waste sulfate mixtures and 2) lime-fly ash-waste sulfate-soil and sewage sludge mixtures for use in highways as fill, subgrade, base course and aggregates for asphalt and Portland Cement Concrete.

REFERENCES:
PERFORMING AGENCY: Virginia University, Department of Civil Engineering
INVESTIGATOR: Rawe, HG; McCormick, FC
SPONSORING AGENCY: Gillette Research Institute; Federal Highway Administration, Department of Transportation
Contract DOT-FH-11-8122
STATUS: Active
NOTICE DATE: Oct. 1974
START DATE: Aug. 1973
COMPLETION DATE: July 1975
TOTAL FUNDS: $74,307
ACKNOWLEDGMENT: Virginia University

2R 083093
INVESTIGATION OF NEW MATERIALS, TESTING METHODS, AND APPARATUS
The objective of this is to determine the characteristics and behavior of new materials for use in concrete including expansive cements, regulated-set cements, sub-bituminous fly ash, and various other new and modified admixtures, to evaluate their usefulness in Corps of Engineers Civil Works Construction and to investigate new methods of testing and apparatus for testing to determine whether such methods or modifications should be standardized for use by the Corps of Engineers. Samples of expansive cements, regulated-set cements, new and improved admixtures, and sub-bituminous fly ash will be obtained from as many sources as necessary to be representative. The chemical and physical properties of these materials will be determined. The concrete-making properties of the cements and cement-admixture systems will be studied. The parameters to be considered will include expansive potential, proportioning, durability, placing, and curing. Acceptance criteria will be established. The sub-bituminous fly ash will be evaluated as a cement-replacement material. Heat of hydration of fly ash-cement blends will be determined. The effects of sub-bituminous fly ash on alkali-silica reaction and alkali-carbonate reaction will be determined. Acceptance criteria will be established and published. Improved admixtures for use in concrete will continue to be evaluated for use in Corps of Engineers Civil Works construction as they become available. The investigation and evaluation of the wide variety of testing methods, apparatus, and techniques applicable to concrete or related construction that are constantly being developed in both the United States and abroad will continue. Each year some of the tasks conducted under this item are completed, specifications
CONSTRUCTION MATERIALS

and test methods are published, and other studies are initiated as new methods and new apparatus become available.

PERFORMING AGENCY: Department of the Army, Concrete Laboratory
INVESTIGATOR: Mathes, B. Hoff, G
SPONSORING AGENCY: Army Corps of Engineers, Department of the Army

STATUS Active NOTICE DATE Dec. 1974 START DATE July 1973

ACKNOWLEDGMENT: Science Information Exchange (ZTK 174-1)

2R 083104 EXPLORATION FOR CONSTRUCTION MATERIALS BY REMOTE SENSING

The objective is to develop techniques that can be applied at Corps Division and District levels for the utilization of remote imagery to identify, delineate, and evaluate sources of engineering construction materials in areas of current or proposed CE project activity. Initial step will involve the selection of study areas. A remote sensing package of optimum configuration for the recognition and delineation of pertinent, potentially exploitable landforms will be generated. Such a package should include radar, thermal infrared, and multispectral imageries and panchromatic, color, and color infrared photographs. Governmental agencies such as NASA, USAF, and Army units with remote sensing capabilities will be contacted to fly these coverage at no cost to the project.

PERFORMING AGENCY: Waterways Experiment Station, Army Corps of Engineers
INVESTIGATOR: Dornbusch, WK
SPONSORING AGENCY: Army Corps of Engineers, Department of the Army 31215

STATUS Active NOTICE DATE Dec. 1974 START DATE July 1973

ACKNOWLEDGMENT: Science Information Exchange (ZTK 294)

2R 085341 APPLICATION OF NEW MATERIALS TO CONCRETE STRUCTURES

New materials such as expansive concrete and plastic concrete were investigated in application to concrete structures. (IRRD/IRF;

PERFORMING AGENCY: Tokyo University, Japan
INVESTIGATOR: Higuchi, Y Kobayashi, K Okamura, H
SPONSORING AGENCY: Ministry of Education, Japan

STATUS Active NOTICE DATE Dec. 1974 START DATE July 1973

ACKNOWLEDGMENT: International Road Research Documentation, OECD, International Road Federation (IRF 23a(15))

2R 085782 ARID AREA CONSTRUCTION TECHNIQUES

Techniques are to be developed for compacting materials in their dry state and the properties of materials which have been compacted in this condition are to be studied. The work is in the planning phase. (IRRD/IRF;

PERFORMING AGENCY: Transport and Road Research Laboratory, Department of the Environment
INVESTIGATOR: Biediger, HE Russell, RB Buchan, EB
SPONSORING AGENCY: Transport and Road Research Laboratory, Department of the Environment

STATUS Programmed NOTICE DATE Apr. 1975 START DATE 1975 COMPLETION DATE 1978

ACKNOWLEDGMENT: International Road Research Documentation, OECD (IRRD-607085), International Road Federation (IRF 1a(45))

2R 086386 LONG-TERM BEHAVIOR OF EPOXY RESINS IN CONCRETE CONSTRUCTION

Systematic studies of the long-term behavior of epoxy resins, in particular their strength, weather resistance and deformation behavior (creep), are to be carried out. The shear strength of glued connections subjected to fatigue loading under various environmental conditions is to be determined, as is the strength of glued connections under combined compression and shear stress under various conditions and with varying types of load. Preliminary tests will be done on the long-term behavior of epoxy resins as epoxy resin concrete and structural epoxy resin mortar, surfacing mortar and grouting resins, and short-term testing procedures which permit a qualitative statement of the long-term behavior of epoxy resins will be developed. (IRRD/IRF;

PERFORMING AGENCY: Technical University of Aachen, West Germany, Building Research Institute
INVESTIGATOR: Wesche, K
SPONSORING AGENCY: Federal Ministry of Planning and Housing, W Ger

STATUS Active NOTE DATE July 1974 START DATE Dec. 1973

ACKNOWLEDGMENT: International Road Research Documentation, OECD (IRRD-700919), International Road Federation (IRF 1a(13))

2R 086435 STRUCTURAL ENGINEERING STUDIES REGARDING A NEW SAFETY THEORY IN THE FIELD OF STEEL CONSTRUCTION

Many national and international proposals have been made which relate to the development of a generally valid theory of safety; these have mostly resulted from theoretical and probabilistic studies. These proposals have to be checked for their practical applicability, and if necessary modified to meet the requirements of a generally valid concept of safety. The work is to be carried out as follows: 1) inspection and evaluation of the literature; 2) statistical evaluation of the strength properties of structural steels st 37 and st 52; 3) design of a standard concept on a semi-probabilistic basis and checking this on actual building projects by means of comparative calculations; 4) study of steel supports subjected to compressive stress, with particular reference to imperfections; 5) studies of the literature on the statistical significance of test results; 6) tabulation of the results for specifications to support the work on standardization in steel engineering; 7) preparation of final report. (IRRD/IRF;

PERFORMING AGENCY: Technical University of Munich, West Germany, Department of Steel Structures
INVESTIGATOR: Petersen
SPONSORING AGENCY: Construction Techniques Institute

STATUS Active NOTICE DATE Apr. 1974 START DATE Nov. 1973

ACKNOWLEDGMENT: International Road Research Documentation, OECD (IRF-700913), International Road Federation (IRF 28p(1))

2R 086440 LONG-TERM BEHAVIOUR OF EPOXY-RESINS IN CONCRETE CONSTRUCTION

The research project is being carried out jointly with the Institute of Construction Research in Aachen, and is concerned with the continuance of systematic studies of the long-term behavior of epoxy resin adhesive mortars for concrete and structural synthetic epoxy resin mortars and concrete. Preliminary tests are being financed by the German Concrete Association. The studies are being undertaken with a resin of known mix design which can be supplied by various manufacturers. This means that the applicability of the results of the tests is independent of special manufacturing methods. Long-term fatigue tests lasting up to 16 years are being carried out with cement mortar prisms which are being exposed to four different environmental conditions (normal climate, heat, water, and open-air weathering). Other long-term studies on synthetic resin mortars are anticipated; these should provide data on bearing capacity and deformation behavior in relation to temperature and the duration of temperature effects. Further studies are to be made with methods by means of which the critical temperature of the synthetic resin aggregate system can be determined. (IRRD/IRF;

PERFORMING AGENCY: Stuttgart University, West Germany, Official Research and Materials Testing Inst. for Constr
SPONSORING AGENCY: Federal Ministry of Planning and Housing, W Ger


ACKNOWLEDGMENT: International Road Research Documentation, OECD (IRRD-700917), International Road Federation (IRF 33e(21))
CONSTRUCTION MATERIALS

2R 086637
THE USE OF WASTE PRODUCTS AND BY-PRODUCTS IN ROAD CONSTRUCTION
The aim of the project is to study the possibility of using by-products and waste products in road construction. The 1975 program will comprise: 1) an inventory of existing waste and by-products (nature, composition, form, tonnage, geographical location, etc.); 2) research on their use in road construction as binders, admixtures, aggregates, taking into account the above parameters; 3) follow up studies of investigations started in 1974 in the use of pvc and sludge oil waste products; 4) a study of a hardened bituminous mixture (evolution in mix design and binder) with a view to using the mixture at a later date for regenerating bituminous mixtures. /IRR-D/1RF/

PERFORMING AGENCY: Central and Regional Labs of Bridges & Highways, Ministry of Equipment and Housing
INVESTIGATOR: Griggan, A
SPONSORING AGENCY: Ministry of Equipment and Housing, France

STATUS: Active
NOTICE DATE: Mar. 1975
START DATE: 1975
TOTAL FUNDS: $64,500

ACKNOWLEDGMENT: International Road Research Documentation, OECD (IRR-300477), International Road Federation (IRF. 1et 686)

2R 101221
EFFICIENCY OF SHREDDED HARDWOOD BARK FOR ROADSIDE MULCHING AND EROSION CONTROL
This study was initiated for the purpose of establishing more precisely erosion control capabilities of shredded hardwood bark when used as a seeding mulch on freshly disturbed slopes similar to those encountered on highway construction projects, and to determine to what extent these erosion control capabilities are affected by changes in the rates of application, and changes in the textural composition of the shredded bark mulches. The erosion control efficiencies of the various types of mulching media are to be determined under simulated conditions in a rainfall drop tower where slope gradient and the intensity and length of exposure to which the slope models are exposed to rainfall can be controlled. The quantities of surface water runoff, soils and the quantities of mulching media eroded from the model surfaces, and the amount of water percolating down through the soil profile of the model are to be measured and are the variables that will be used to determine which media applied at what rates is the most effective mulching media. Measurements of these same variables, when the model is mulched with straw and emulsified asphalt are applied at the rate of two tons of straw and 290 gallons (760 dm^3) of asphalt per acre will be used as a standard for comparing the effectiveness of the bark materials. Three replicates of test runs using shredded bark applied at 20, 30, 40, and 50 cubic yards (15,30, 22.95, 30.00, 28.25 h to 3rd power) per acre on two slopes (1.1 and 2.1) at two different rainfall rates (6" and 9", 0.1524 m and 0.2286 m, per hour for 30 minutes) have been completed. Also sawdust applied at 30 and 40 cubic yards (22.95 and 30.00 m to the 3rd power) per acre and coarse and fine shredded hardwood bark mulching media have also been tested. Work with the straw and emulsified asphalt treatments are in progress and should be completed in December 1974. Preliminary examinations show that significant differences between the various types of mulches applied at different rates are being observed. It is hoped that a final report for this project can be completed by mid June 1975.

PERFORMING AGENCY: Illinois University, Urbana, ILLU-55-0312
INVESTIGATOR: Yocum, TR
SPONSORING AGENCY: Illinois University, Urbana, Agricultural Experiment Station

STATUS: Active
NOTICE DATE: Mar. 1975
START DATE: July 1972
COMPLETION DATE: June 1975
ACKNOWLEDGMENT: Illinois University, Urbana

2R 101274
THE DESIGN AND CONSTRUCTION OF ROADS FOR LIGHT DENSITY TRAFFIC
A report was prepared by L.F. Loder outlining principles for the design and construction of roads for light density traffic during 1967 Experimental sections of rural road were constructed at two sites in Western Australia, having significantly different climatic conditions with average rainfall of 14 and 15 inches. The sections incorporated compaction of the clayey soil subgrade close to its driest natural moisture. Reports have been prepared. But not yet published, describing construction of the sections and their performance during winter 1967 when there was considerable deterioration under traffic. At the wetter of the two sites observations of performance of the experimental sections are being continued. /IRF/ Reports issued. The design and construction of roads for very light density traffic. L.F. Loder. 1966. Observations on sections of rural road near Merredin and Bunbury West Australia. 1967-1970. H.M. Beavis. Australian Road Research Board, 1971.

PERFORMING AGENCY: Australian Road Research Board, Main Roads Dept., Western Australia
INVESTIGATOR: Beavis, HM
SPONSORING AGENCY: Australian Road Research Board, Main Roads Dept., Western Australia

STATUS: Active
NOTICE DATE: Dec. 1971
START DATE: 1964
TOTAL FUNDS: $46,000

ACKNOWLEDGMENT: International Road Federation/RRD R29329. 2R5060065

2R 101279
THE ELASTIC PROPERTIES OF VARIOUS ROAD MATERIALS AND THEIR EFFECT ON STRESS DISTRIBUTION
The elastic constants at different stress intensities and rates of change of stress for various road materials are being evaluated. The variation in stress distribution in a layered road pavement resulting from the variation of the rate of application of the load was examined. For a given load the stress distribution within a layered system such as a road pavement is dependent upon the elastic constants of the constituent layers. If the elastic constants vary with intensity and rate of change of stress, then the stress distribution in such a layered structure is not constant for a given wheel load but is dependent on the rate of travel of the wheel.

PERFORMING AGENCY: New South Wales University, Australia
INVESTIGATOR: Dunlop, J
SPONSORING AGENCY: New South Wales University, Australia

STATUS: Active
NOTICE DATE: 1966

ACKNOWLEDGMENT: International Road Federation

2R 010317
TRAIL PAVEMENT SECTIONS: WAIKATOE COUNTY
Eight alternative pavement types each of 300 feet are being constructed as part of an experimental construction contract on a country road which will carry recreational traffic of up to 10,000 vehicles per day. Performance of local materials is to be determined. The alternatives include untreated high quality base course, cement treated and bitumen treated local aggregate. Use of medium quality local aggregate as subbase and lime stabilization of the subgrade clays. /IRF/ reports issued. Pavement experimental strips on East Coast road, Waikatoe County. A.H. Malcolm. R.G. Hawkes. Annual Conf of NZ Inst of County Engineers, 1969. Progress report on the eight pavement experimental strips on East Coast roads in the Waikatoe County. A.H. Malcolm. Annual Conf NZ Inst of County Engineers, 1971.
CONSTRUCTION MATERIALS

PERFORMING AGENCY: Waitemata County Council /New Zealand/
INVESTIGATOR: Jones, FG
SPONSORING AGENCY: National Roads Board /New Zealand/; Waitakamata County Council /New Zealand/
STATUS: Active NOTICE DATE: May 1973 COMPLETION DATE: 1974 TOTAL FUNDS: $30,300
ACKNOWLEDGMENT: International Road Federation (Irrd-r36539)IRF 6(f), 2R25063571

2R 101371
THE SKID RESISTANCE OF ROAD SURFACE
A STANDARD SPECIFICATION OF SKID RESISTANCE ON ROAD SURFACE IS DETERMINED. THIS SPECIFICATION WILL BE APPLIED TO THE FIELD CONTROL OF HIGHWAY CONSTRUCTION OR THE MAINTENANCE OPERATION OF HIGHWAYS. FOR THIS PURPOSE, THE RELATIONSHIP BETWEEN SKID RESISTANCE AND THE TYPE OF BITUMINOUS MIXTURES OR AGGREGATES USED IS BEING STUDIED. IN ADDITION TO THIS, THE SKID RESISTANCE OF A SPECIFIC SURFACE COURSE OR AT DANGEROUS SITES IS BEING MEASURED AND THESE RESULTS WILL BE THE BASIC DATA FOR DETERMINING THE LOWER LIMITS OF SKID RESISTANCE OF EXPRESSWAYS. DEVICES OR MECHANISMS FOR MEASURING SKID RESISTANCE ARE BEING CHECKED TO GET MORE PECIFIC SKID VALUES.

SPEAKERS, National Roads Board /New Zealand/
SPONSORING AGENCY: Waitemata County Council /New Zealand/

PERFORMING AGENCY: Japanese Highway Public Corporation, Expressway Laboratory
SPONSORING AGENCY: Japanese Highway Public Corporation
ACKNOWLEDGMENT: International Road Research Documentation, OECD (IRR-D-R51202), International Road Federation (IRF 2a(34))

2R 101520
EXPERIMENTAL PAVEMENTS STUDY IN ARID AREAS
VARIABLE CONFIGURATIONS OF PAVEMENT THICKNESSES AND MATERIALS USED ARE BEING INVESTIGATED UNDER SERVICE CONDITIONS IN AN ARID ENVIRONMENT, UTILIZING NON-DESTRUCTIVE MONITORING METHODS OF OBSERVATION. THE DATA ARE TO BE UTILIZED IN THE OPTIMIZATION OF PAVEMENT DESIGN. IRF/

SPEAKERS: Yoder, EJ Scholer, CF Dolch, WL Walsh
SPONSORING AGENCY: Indiana State Highway Commission

PERFORMING AGENCY: Queensland Main Roads Department, Australia
INVESTIGATOR: Vlastic, Z. Gordon, R. Gray
SPONSORING AGENCY: Queensland Main Roads Department, Australia
ID: R522&R524
ACKNOWLEDGMENT: International Road Federation (IRF 6(28))

2R 102032
EVALUATION OF CONTINUOUSLY REINFORCED CONCRETE PAVEMENTS

SPEAKERS: Yoder, EJ Scholer, CF Dolch, WL Walsh
SPONSORING AGENCY: Indiana State Highway Commission

PERFORMING AGENCY: Purdue and Indiana State Highway Commission JHRP, Joint Highway Research Project C-36-52J
INVESTIGATOR: Yoder, EJ Scholer, CF Dolch, WL Walsh
SPONSORING AGENCY: Indiana State Highway Commission

STATUS: Active NOTICE DATE: Dec. 1974 START DATE: June 1972 COMPLETION DATE: June 1975 TOTAL FUNDS: $30,000
ACKNOWLEDGMENT: Purdue and Indiana State Highway Commission JHRP

2R 102043
CONSTRUCTION AND UTILIZATION OF A RAPID WEAR APPARATUS FOR THE EVALUATION OF ARKANSAS' AGGREGATES
A rapid wear machine has been designed with the capacity of random variation of the wheel path. Limited testing of the machine operation has been accomplished. Actual operation will begin upon final assembly in its permanent location.

PERFORMING AGENCY: Arkansas State Highway Department, G-456
INVESTIGATOR: Kessinger, BG
SPONSORING AGENCY: Arkansas State Highway Department, G-456

STATUS: Active NOTICE DATE: Mar. 1975 START DATE: July 1973
ACKNOWLEDGMENT: Arkansas State Highway Department

2R 102064
SURFACE WEAR AND SKID RESISTANCE PROPERTIES OF PORTLAND CEMENT CONCRETE PAVEMENTS
OVERALL OBJECTIVES ARE TO EVALUATE, IN THE LABORATORY, AN IMPROVED SMALL WHEEL CIRCULAR TRACK, THE WEAR AND SKID RESISTANCE PROPERTIES OF PORTLAND CEMENT CONCRETE PAVEMENT SURFACES SINCE THESE PROPERTIES ARE AFFECTED BY AGGREGATES, MIXTURE DESIGN, SURFACE TEXTURE, CONSTRUCTION METHODS, CURING METHODS, AND TEST SPEED. FURTHER OBJECTIVES, FOLLOWING SUCCESSFUL LABORATORY TESTS, WOULD CORRELATE WITH LABORATORY AND FIELD MEASUREMENT TECHNIQUES AND THE PREDICTION OF FIELD PERFORMANCE.

SPEAKERS: Yoder, EJ Scholer, CF Dolch, WL Walsh
SPONSORING AGENCY: Arkansas State Highway Department, G-456

PERFORMING AGENCY: Arkansas State Highway Department, G-456
INVESTIGATOR: Kessinger, BG
SPONSORING AGENCY: Arkansas State Highway Department, G-456

STATUS: Active NOTICE DATE: Dec. 1974 START DATE: June 1972 COMPLETION DATE: June 1975 TOTAL FUNDS: $30,000
ACKNOWLEDGMENT: Purdue and Indiana State Highway Commission JHRP
CONSTRUCTION MATERIALS

2R 103577
USE OF SYNTHETIC RUBBER-IN-ASPHALT PAVEMENT TO DETERMINE MIXTURE BEHAVIOR AND PAVEMENT PERFORMANCE


PERFORMING AGENCY: Utah State Department of Transportation. Materials and Tests Division, Study No. 500-903; Utah University INVESTIGATOR: Sorbe, VK; Lai, JS
SPONSORING AGENCY: Utah State Department of Transportation; Federal Highway Administration, Department of Transportation RESPONSIBLE INDIVIDUAL: Kenis

H&P&R 903
STATUS: Active Notice Date: Dec. 1974 Start Date: June 1968 Completion Date: Jan. 1975 Total Funds: $146,000
ACKNOWLEDGMENT: Utah State Department of Transportation, Federal Highway Administration (273800353). Utah UniversityHRIS 3102035, HRIS 31202018, 2R 31086644

2R 103581
EXPERIMENTAL TAR BASE COURSE
THE EFFECTIVENESS OF TARI CEMENTS IN BASE COURSE CONSTRUCTION IS BEING EVALUATED. RESISTANCE TO WATER, STRIPPING AND CHEMICALS, COATING ABILITY, BINDING STRENGTH, AND PHYSICAL STABILITY WILL BE EVALUATED.

PERFORMING AGENCY: Pennsylvania Department of Transportation. 65-7
INVESTIGATOR: Stewart, PD; Nichols, TH
SPONSORING AGENCY: Pennsylvania Department of Transportation

STATUS: Active Notice Date: Oct. 1974 Start Date: June 1965 Completion Date: June 1975
ACKNOWLEDGMENT: Pennsylvania Department of Transportation

2R 103895
POZZOLAN CEMENT CONCRETE, LIME-POZZOLAN CONCRETE AND LIME-POZZOLAN MIXTURE-BOUND MACADAM IN PAVEMENTS
THE RHEOLOGY, CONSTRUCTION TECHNIQUES, ECONOMICS, LOAD-CARRYING CAPACITY AND PERFORMANCE OF POZZOLAN CEMENT CONCRETE, LIME-POZZOLAN CONCRETE AND LIME-POZZOLAN MIXTURE: MACADAM ARE BEING STUDIED AS PAVEMENT MATERIAL IN SURFACINGS. COMPOSITE CON-
CONSTRUCTION MATERIALS

2R 104328
DETERMINATION OF STATISTICAL PARAMETERS-PHASE II; CONCRETE PAVEMENTS AND STRUCTURES
THE OBJECTIVES OF THIS PROJECT ARE TO DESIGN REALISTIC AND FULLY ENFORCEABLE ACCEPTANCE SPECIFICATIONS FOR PAVEMENT AND STRUCTURE CONCRETE THAT WILL ENSURE THAT THE QUALITY LEVEL OF CONCRETE CURRENTLY UTILIZED IN ACCEPTABLE CONSTRUCTION IS MAINTAINED IN FUTURE WORK. TO COMPLETELY DEFINE ACCEPTABLE PROCEDURE INCLUDING RANDOM SAMPLING, TESTING METHODS, LOT BY LOT ACCEPTANCE; TO DEFINE CONTRACTOR'S RESPONSIBILITIES WITH RESPECT TO QUALITY CONTROL; AND TO DEMONSTRATE THE EFFICACY OF THE PROPOSED SPECIFICATIONS AND SAMPLING PROCEDURES BY A PROGRAM OF SIMULATED APPLICATION TO CURRENT PROJECTS.

PERFORMING AGENCY: Materials Research & Development, 73-3
INVESTIGATOR: Hudson, SB
SPONSORING AGENCY: Pennsylvania Department Transp. Federal Highway Administration
STATUS: Active Notice Date Jan. 1974 Start Date: Sept. 1973 Completion Date: Dec. 1974 Total Funds: $59,000
ACKNOWLEDGMENT: Materials Research & Development

INVESTIGATOR: Nelson, CA

2R 104331
CONCRETE-POLYMER MATERIALS DATA BANK
THIS DATA SYSTEM WILL PROVIDE A FAST, ECONOMICAL WAY TO SELECT AND OBTAIN DESIRED INFORMATION FORM A LARGE VOLUME OF DATA ON CONCRETE-POLYMER MATERIALS. THE PRESENT EFFORT IS CORRECTING AND UPDATING DATA IN THE BANK WHICH INCLUDES INFORMATION ON MATERIALS USED IN SPECIMENS AND RESULTS OF VARIOUS PHYSICAL PROPERTIES TESTS. THE INFORMATION IS IN A COMPUTER PROGRAM CALLED CONCRETE-POLYMER DATA SYSTEM (CPDOS) WHICH WILL BE USEFUL IN STRUCTURAL DESIGN AND TESTING PROJECTS.

PERFORMING AGENCY: Bureau of Reclamation, DR-374
INVESTIGATOR: Nelson, CA
SPONSORING AGENCY: Bureau of Reclamation
STATUS: Active Notice Date: Feb. 1974 Start Date: Jan. 1972 Completion Date: Jan. 1975
ACKNOWLEDGMENT: Bureau of Reclamation

2R 104373
STUDY OF POLYMER MATERIALS FOR CONCRETE
THE AIM OF THE STUDY IS TO DEVELOP A POLYMER IMPREGNATED CONCRETE COMPOSITOR FOR USE AS IMPROVED MATERIAL IN CONSTRUCTION. IN THE STUDY IT IS PROPOSED TO INVESTIGATE THE PROPERTIES AND USEFULNESS OF SOME OF THE POLYMER RESINS AVAILABLE IN INDIA. /IRF/

PERFORMING AGENCY: Tamil Nadu Highways & Rural Works Dept. India, Highway Research Station
SPONSORING AGENCY: Tamil Nadu State of India
STATUS: Active Notice Date: May 1974 Start Date: 1973
ACKNOWLEDGMENT: International Road Federation (IRF 5a(82))
CONSTRUCTION MATERIALS

PROCEDURE IS DEVELOPED FOR EACH APPLICATION BASED ON FUNCTIONAL REQUIREMENTS, LIFE CYCLE COSTS, QUALITY CONTROL AND SAFETY ASPECTS OF THE CONSTRUCTION PHASE; ETC. THE PROCEDURE IS THEN USED TO EVALUATE SPECIFIC MATERIALS PROPOSED FOR THE APPLICATION BASED ON MATERIAL PROPERTIES; FIELD CONSTRUCTION PROCEDURES AND PERFORMANCE OF EXISTING INSTALLATIONS. PROMISING MATERIALS WILL BE RECOMMENDED AS POTENTIAL ALTERNATES TO EXISTING MATERIALS GUIDANCE FOR SPECIFICATIONS AND MANUAL PREPARATION OR REVISION WILL BE FURNISHED AFTER OCE REVIEW AND IF REQUESTED.

PERFORMING AGENCY: Army Construction Engineering Research Laboratory
INVESTIGATOR: Aufrecht, R. E. Kanarowski, SM
SPONSORING AGENCY: Department of Defense, Department of the Army, Department of Defense

STATUS: Active Notice Date: Oct. 1974 Start Date: July 1973 Completion Date: June 1975

ACKNOWLEDGMENT: Army Construction Engineering Research Laboratory

2R 105106
EPOXY RESINS FOR USE ON CIVIL WORKS PROJECTS (ES 628)
THE PURPOSE OF THE STUDY IS TO DEVELOP INFORMATION ON THE APPLICATIONS THAT CAN BE MADE OF EPOXY RESIN SYSTEMS IN CONNECTION WITH CONCRETE CONSTRUCTION AND MAINTENANCE SO THAT THE MOST ADVANTAGEOUS SYSTEMS MAY BE SELECTED FOR THE ACCOMPLISHMENT OF SPECIFIC RESULTS THE PLAN IS TO OBTAIN, CORRELATE, SUMMARIZE, AND EVALUATE AVAILABLE DATA ON POTENTIAL APPLICATIONS OF EPOXY RESINS IN CIVIL WORKS CONSTRUCTION EPOXY RESIN SYSTEMS WILL BE TESTED FOR SPECIFIC NEEDS SUCH AS DURABILITY UNDER VARIOUS CONDITIONS, BONDING CHARACTERISTICS, PROTECTION, ETC. THE PROGRESS TO DATE INCLUDES: (1) SURVEY OF THE USE OF EPOXY-RESIN SYSTEMS IN CIVIL WORKS PROJECTS; (2) STUDY OF THE EFFECTS OF WATER ON CURED EPOXY-RESIN SYSTEMS; (3) COOPERATION IN TESTING WITH ASTM; (4) IDENTIFICATION OF NEW MATERIALS; (5) CAVITATION TESTS; (6) RATE OF CURING AND AGING FACTORS OF EPOXY RESIN SYSTEMS; AND (7) PULL-OUT TESTS.

PERFORMING AGENCY: Department of the Army, Concrete Div
INVESTIGATOR: Mather, B
SPONSORING AGENCY: Department of Defense, Corp Eng

STATUS: Active Notice Date: Apr. 1974 Start Date: July 1972

ACKNOWLEDGMENT: Science Information Exchange

2R 105113
TECHNOLOGY FOR USE OF SULPHATE WASTE IN ROAD CONSTRUCTION
This study is developing the technology required for using waste sulfate and fly ash as binder and aggregate in road construction. The effect of the following variables on strength development are being evaluated: type of hydrated lime, form of pure calcium sulfate or sulfate, source and composition of fly ash, consistency of mixtures, curing temperature, replacement of lime by portland cement, admixtures and impurities expected in waste sulfates. Chemical and microstructural changes that take place within selected mixtures will be investigated to relate them to mechanical properties. Actual waste sulfates will be incorporated. Strength-constitutive relationships will be evaluated, based on previous experimental results. Mixtures which show particular promise in highway applications will be evaluated for durability, permeability and leachability. Aggregate will be prepared and its suitability for portland cement concrete and asphaltic concrete will be determined. Finally, based on the knowledge and performance characteristics gained during this work, use criteria will be recommended.

PERFORMING AGENCY: Gillette Research Institute
INVESTIGATOR: Kayam, A, Smith, L
SPONSORING AGENCY: Federal Highway Administration, Department of Transportation
RESPONSIBLE INDIVIDUAL: Ormsby

Contract DOT-FH-11-8122 (CPFF)
STATUS: Active Notice Date: Dec. 1974 Completion Date: June 1975 Total Funds $193,000

ACKNOWLEDGMENT: Federal Highway Administration (204521331), Gillette Research Institute

2R 105116
TIME TREATMENT OF INCINERATOR RESIDUES FOR BASE COURSE CONSTRUCTION
TREATED INCINERATOR RESIDUE AS THE BASE COURSE OF A PARKING LOT TO BE CONSTRUCTED BY THE CITY OF CHICAGO AT ITS SOUTHWEST INCINERATOR AT 39TH AND IRON STREETS

PERFORMING AGENCY: Soil Testing Services, Incorporated
INVESTIGATOR: Grahenger, J. P., Zimmerman, RE
SPONSORING AGENCY: Federal Highway Administration, Department of Transportation
RESPONSIBLE INDIVIDUAL: Ormsby

Contract DOT-FH-11-8128 (CPFF)
STATUS: Active Notice Date: Mar. 1975 Start Date: Aug. 1973 Completion Date: Aug. 1975 Total Funds $19,000

ACKNOWLEDGMENT: Federal Highway Administration (20410351)

2R 105226
BENEFICIATION OF UNSUITABLE MATERIALS FOR BASE AND SUB BASES
DYNAMIC LABORATORY TESTING IS BEING CARRIED OUT IN A CIRCULAR TEST TRACK AND IN A SPECIALLY CONSTRUCTED FACILITY WHICH APPLIES CYCLING COMPRESSION TO SOIL CUBES (6X6X6) THROUGH CONVENTIONAL 10.00-20 DUAL TIRES THE PERFORMANCE OF VARIOUS MULTI-LAYER STRUCTURES CONSTRUCTED WITH BENEFICIATED MATERIALS IS TO BE EVALUATED IN ORDER TO FIND SUPPLIANTS OR REPLACEMENTS FOR TRADITIONAL GRANULAR BASES AND SUB BASES

PERFORMING AGENCY: Autonomous National University of Mexico, Engineering Faculty, Engineering Institute, 869
INVESTIGATOR: Cortes-Caballero, S., Prado, G., Rangel, F
SPONSORING AGENCY: Ministry of Public Works, Mexico

STATUS: Active Notice Date: May 1974 Start Date: Aug. 1973

ACKNOWLEDGMENT: International Road Federation (IRF 14099)

2R 105317
DEVELOPMENT AND VALIDATION OF TEST METHODS FOR ASSESSING THE QUALITY OF SANDS FOR BITUMINOUS ROAD CONSTRUCTION
WHILE TEST METHODS HAVE BEEN DEVELOPED FOR CERTAIN CRITERIA FOR CHIPPINGS, NO SPECIFIC QUALITY REQUIREMENTS HAVE BEEN LAID DOWN FOR CRUSHED AND NATURAL SANDS. IN TVB BIT THERE ARE NO DATA CONCERNING THE PERMISSIBLE PROPORTION OF WEATHERING PRODUCTS IN SANDS OR TEST METHODS FOR THEIR DETERMINATION IN THE PRESENT WORK, A TEST METHOD WILL BE DEVELOPED. EARLIER INVESTIGATIONS INTO THE CAUSES OF PREMATURE WEARING OF ROAD PAVINGS BROUGHT TO LIGHT AMONG OTHER THINGS INADEQUATE COHESION OF ONLY A HIGH PROPORTION PRODUCTS, CAPABLE OF SWELLING, IN THE SANDS USED THE INSTITUTE HAS AVAILABLE A VIBRATORY ABRASION TESTING MACHINE AND AN IMPACT ABRASION TESTING MACHINE IN THESE SAND ASPHALT SPECIMENS WILL BE TESTED UNDER STRESSES WHICH SIMULATE THOSE ENCOUNTERED IN THE PAVING. FIRST, THESE MACHINES WILL BE SYSTEMATICALLY
CONSTRUCTION MATERIALS

2R 105319
THE FIRST-RESISTING PROPERTIES OF MIXTURES OF SAND, CHIPPINGS AND BALLAST (MINERAL CONCRETE)

Many studies have been carried out into frost heaving of naturally occurring soils. There is however no adequate information available on the susceptibility to frost of prepared road materials. Road construction materials are made up on the principle of minimum pore content, so that it is possible for quite small amounts of plastic components contained in the pores to cause frost heaving of the whole mass as a result of the formation of oval inclusions. To clear up this problem, it is intended to carry out a program of frost heaving and triaxial compression tests. Using a material which is susceptible to frost heaving, a preliminary series of tests will be used to establish a temperature-time program, which will as clearly as possible indicate the degree of frost risk. In the main program, tests will be carried out to determine the influence of particle size distribution of crushed shelly limestone with added sand on the frost risk. Tests will also be carried out to determine the deformation moduli and friction angles which occur. In these tests the compactness will be varied. For the measurement of frost risk, cylindrical test specimens 25 cm. long and 25.2 cm. in diameter will be prepared. The specimens will be placed in freezing cells. The upper part of which consists of rings which separate when frost heaving occurs. The frost heaving will be measured by means of dial gauges. By suitable design of the freezing cells it is possible to measure the frost heaving on the frost heaving and the water absorption or partial vacuum due to inclusions in the pores of the unbound material.

PERFORMING AGENCY: Technical University of Munich, West Germany. Institute of Bituminous Materials, VIII.27
SPONSORING AGENCY: Federal Ministry of Transport, West Germany

2R 109353
THE POSSIBILITY OF USING HEAT INSULATING COURSES IN ROAD CONSTRUCTION

Substantial measures have to be taken in construction, e.g. excavation of soil which is sensitive to frost, the inclusion of a frost-protecting layer of gravel 40 to 60 cm thick, to prevent frost damage to roads. In many parts of Germany, the gravel used for this purpose is very scarce and has to be transported by rail or road, sometimes for a distance of more than 100 km., involving a considerable increase in cost. The goal is to ascertain whether the insulating course will enable the anti-frost course to be reduced or omitted entirely. Very little knowledge is available on the use of heat insulating courses in road construction. In view of the advantages and the cost saving offered by the use of these courses, a detailed study and verification of the advantages and disadvantages should be carried out by an official body. Continuous frost and loading tests will be carried out in the large experimental site to determine the dimensioning of the heat insulating courses according to the type of material. Duration of frost and the depth of installation in parallel with these tests temperature measurements and mechanical tests are carried out on experimental sections. These should provide information on the behavior of heat insulating courses after a long period in damp soils. The tests will cover: (1) the testing of heat insulating materials, in respect of their technical and thermodynamic properties for road construction purposes. (2) the influence of the courses on the heat balance and the bearing properties of roads. (3) the determination of the thicknesses of the courses, and (4) observation of experimental road sections and heat insulating courses under traffic loading.

PERFORMING AGENCY: Federal Institute of Road Research, West Germany, 6.204 (242)
INVESTIGATOR: Behr, H.
SPONSORING AGENCY: Federal Ministry of Transport, West Germany

ACKNOWLEDGMENT: International Road Research Documentation, OECD (IRRD-R700422). International Road Federation (IRF 28a148)

2R 109373
ACCELERATED METHODS OF TESTING FOR LIME STABILIZED PAVEMENT MATERIALS

The use of elevated temperature is investigated for curing lime stabilized soil. And testing for unconformed compressive strength and C.B.R. In order to determine the accelerated curing conditions, that would be equivalent to the seven days curing duration normal temperature plus a further four days immersion in water according to standard practice.

PERFORMING AGENCY: Ceylon Dept. of Highways
INVESTIGATOR: Gomnawadene, A.K.
SPONSORING AGENCY: Road Research Lab/Ceylon/ , /Research & Development Div

ACKNOWLEDGMENT: International Road Research Documentation, OECD (IRRD-R700423). International Road Federation (IRF 1(52))
CONSTRUCTION MATERIALS

2R 115509
LABORATORY TEST TRACK
This project will predict the stress and displacement behavior of pavement materials into the plastic range and assess the value of non-standard pavement materials. /IRF/

PERFORMING AGENCY: Sydney University, Australia, School of Civil Engineering
INVESTIGATOR: Davis, EH
SPONSORING AGENCY: Australian Road Research Board
STATUS: Active Notice Date: Oct. 1974

2R 115668
OPERATIONAL RESEARCH IN PRODUCTION AND TRANSPORT OF ASPHALT
The purpose of this project is to improve the organization of the highway construction plant. /IRF/

PERFORMING AGENCY: Croatian Civil Engineering Institute, Yugoslavia
INVESTIGATOR: Milkic, N, Eres, M, Galjania, S
SPONSORING AGENCY: Croatian Civil Engineering Institute, Yugoslavia
STATUS: Active Notice Date: Oct. 1974 Start Date: 1974 Completion Date: 1976 Total Funds: $9,700

ACKNOWLEDGMENT: International Road Federation (IRF 11A(26))

2R 115693
STUDY OF ASPHALT MIXTURES FOR ROAD BASE
Bituminous mixtures used in construction of road bases are studied, especially those containing coarse aggregates as well as those made using calcareous aggregates—"tosca". abundant material found at the southern part of Buenos Aires Province and at La Pampa, for which characteristics and behavior are not yet determined. /IRF/

PERFORMING AGENCY: National University of the South, Argentina
INVESTIGATOR: Zahazar, LM Gonzalez, GA Sceivi, AH Heindl, JJ
SPONSORING AGENCY: National University of the South, Argentina
STATUS: Active Notice Date: Oct. 1974 Start Date: 1974 Completion Date: 1976 Total Funds: $52,400,000

ACKNOWLEDGMENT: International Road Federation (IRF 9(5))

2R 115733
STABILIZATION BY MEANS OF GRADING, AND LIME STABILIZATION [Stabilizzazione Granulometrica Stabilizzazione con Calce]
The purpose of this project is to investigate for the purpose of road construction new applications of soil stabilization methods, namely by grading correction (without the admixture of other materials). the addition of lime. /IRF/

PERFORMING AGENCY: Palermo University, Italy, Institute of Road Construction, Department of Engr
INVESTIGATOR: Terenere, G Barresi, G Boscaino, G
STATUS: Active Notice Date: Oct. 1974

ACKNOWLEDGMENT: International Road Federation (IRF 13B(9))

2R 115813
STEEL BRIDGE CONSTRUCTION
The object of this research is the improvement of steel bridge constructions and their planning methods. /IRF/

2R 109545
STABILIZED LAYERS FOR PAVEMENTS
THE OBJECTIVE IS TO DETERMINE THE STRUCTURAL BENEFITS PROVIDED TO PAVEMENT SYSTEMS BY USE OF STABILIZED SOIL LAYERS AND TO DEVELOP THEREFROM SUITABLE CRITERIA FOR THE DESIGN AND CONSTRUCTION OF SUCH PAVEMENT SYSTEMS. THIS INVESTIGATION PROVIDED SUPPORT TO A LARGE-SCALE FIELD TEST INVOLVING BOTH RIGID AND PAVEMENTS INCORPORATING A RANGE OF SOIL TYPES AND STABILIZING AGENTS. THE TEST PAVEMENTS WERE SUBJECTED TO TRAFFIC WITH HEAVY AIRCRAFT GEAR LOADS. /AUTHOR/

PERFORMING AGENCY: Waterways Experiment Station
INVESTIGATOR: Burns, CD Roney, CL
SPONSORING AGENCY: Waterways Experiment Station, Office, Chief of Engineers
STATUS: Active Notice Date: Feb. 1974 Start Date: Mar. 1972 Completion Date: June 1974 Total Funds: $200,000

ACKNOWLEDGMENT: Waterways Experiment Station

2R 115262
STABILITY OF SHIRASU (A VOLCANIC ASH SOIL) SLOPE
"Shirasu" is a kind of volcanic ash soil very susceptible to erosion. It is so widely distributed in Southern Kyushu that it is an indispensable material for road construction in that region. This research aims at clarifying the distribution and the physical characteristics of Shirasu, finding the factors causing failures of Shirasu slope, and studying the method of stabilizing Shirasu slope. /IRRD-IRF/

REFERENCES
TECHNICAL INSTRUCTIONS IN PLANNING AND CONSTRUCTION OF ROAD EARTHWORK. Shima, T. Business Memo of Kyushu Technical Office, 1973

PERFORMING AGENCY: Kyushu Regional Construction Office, Japan, Ministry of Construction
INVESTIGATOR: Shima, T. Horita, T Tanimoto, S
SPONSORING AGENCY: Ministry of Construction, Japan

IN-HOUSE
STATUS: Active Notice Date: Sept. 1974 Start Date: 1965 Completion Date: 1975 Total Funds: $130,000

ACKNOWLEDGMENT: International Road Federation (IRF 11D(1)), International Road Research Documentation, OECD

2R 115323
UNDERWATER CONCRETING METHODS [Suichu Konkerito Sekoho]
The authors studies preplaced aggregate concrete and tremie concrete methods for the past ten years and have executed many concrete structures under water using these methods. But in these procedures, it was apparent that these methods have substantial, unavoidable defects. So, a new type tremie method called the KDT tremie method was developed and studied. This new tremie method was found to have many advantages in comparison with the conventional tremie method. The study has been continued to obtain detailed data at the job site. An experimental application of the method to an underwater reinforced concrete slab is now under study. /IRRD-IRF/

PERFORMING AGENCY: Kajima Institute of Construction Technology, Japan
INVESTIGATOR: Nakahara, Y Ohtomo, T Yokota, S
SPONSORING AGENCY: Kajima Corporation
STATUS: Active Notice Date: Sept. 1974 Start Date: Nov. 1970 Completion Date: May 1975

ACKNOWLEDGMENT: International Road Federation (IRF 37(29)), International Road Research Documentation, OECD
CONSTRUCTION MATERIALS

PERFORMING AGENCY: Highway Transportation Research Institute, Hungary, Department of Bridges, Road Construction and Materials
INVESTIGATOR: Gellik, I

STATUS: Active  NOTICE DATE: Nov. 1974

ACKNOWLEDGMENT: International Road Federation (IRF 1E(35));
2R 125933
GROUTS AND ANCHORING SYSTEMS
Special grouts for tunnel applications, for machinery support, and for crane rails are being developed. Work includes ground consolidation material, development of rein anchoring systems for stricter central rock bolting, and fixings in concrete. (IRRD/IRF)

PERFORMING AGENCY: Chemical Building Products, Limited
INVESTIGATOR: McCURRICK, L H

STATUS: Active  NOTICE DATE: May 1974

ACKNOWLEDGMENT: International Road Research Documentation, OECD (IRRD-R602373), International Road Federation (IRF 78(3))
CONSTRUCTION EQUIPMENT AND METHODS

3R 020022
SETTLEMENT OF BRIDGE APPROACHES AND EMBANKMENTS
THE CAUSES OF SETTLEMENT OF BRIDGE APPROACHES ARE BEING DETERMINED AND METHODS OF DESIGN AND CONSTRUCTION ARE BEING DEVELOPED WHEREBY SETTLEMENT MAY BE PREVENTED. LONG-TERM DATA ARE BEING COLLECTED FROM SETTLEMENT PLATFORMS. MERCURY-FILLED SETTLEMENT GAGES, PROFILE MEASUREMENTS AND SLOPE INDICATORS AT SOME TEN BRIDGE SITES BASED ON A PRELIMINARY ANALYSIS OF DATA OBTAINED TO DATA ALONG WITH DATA OBTAINED FROM TWO GENERAL SURVEYS MANY BEING DEVELOPED WHEREBY SETTLEMENT AS POST-CONSTRUCTION SETTLEMENT OF MANY BRIDGE APPROACHES APPEARS TO BE (1) SLOPE INSTABILITY DUE TO PROGRESSIVE FAILURE AND (2) SECONDARY COMPRESSION OF APPROACH EMBANKMENT FOUNDATIONS. CONFIRMATION OF THESE OBSERVATIONS IS IN PROGRESS.

REFERENCES
- Mercury-Filled Settlement Gauge Hopkins, TC; Deen, RC, Kentucky Bureau of Highways, Research Division, HRP Record, Dec. 1972
- Bluegrass Parkway Bridges over Chaplin River Hopkins, TC, Kentucky Bureau of Highways, Research Division, Feb. 1973
- Slope Stability Analysis: Computerized Solution of Bishop's Simplified Method of Slices, Yoder, SM; Hopkins, TC, Kentucky Bureau of Highways, Research Division, Feb. 1973

PERFORMING AGENCY: Kentucky Department of Transportation, Bureau of Highways, Research Division, Study No KYHPR-64-17
INVESTIGATOR: Havens, JH; Deen, RC, Hopkins, TC
SPONSORING AGENCY: Kentucky Department of Transportation, Bureau of Highways, Federal Highway Administration, Department of Transportation
RESPONSIBLE INDIVIDUAL: Salberg

HP&R 64-17
STATUS: Active Notice Date: Feb. 1975 Start Date: Jan. 1964 Completion Date: Jan. 1978 Total Funds: $336,000
ACKNOWLEDGMENT: Kentucky Department of Transportation, Federal Highway Administration (003168353)

3R 020415
DESIGN AND PERFORMANCE OF EMBANKMENTS IN ORGANIC SOIL

PERFORMING AGENCY: Florida Department of Transportation, Office of Materials and Research
INVESTIGATOR: Smith, LL, Ho, KH
SPONSORING AGENCY: Florida Department of Transportation, Office of Materials and Research: Federal Highway Administration, Department of Transportation
RESPONSIBLE INDIVIDUAL: Salberg

HP&R S-5-71
STATUS: Active Notice Date: Dec. 1974 Start Date: July 1971 Completion Date: June 1975 Total Funds: $45,600
ACKNOWLEDGMENT: Florida Department of Transportation, Federal Highway Administration (162343353)

3R 020584
EARTHQUAKE INDUCED EMBANKMENT DISTRESS
THE OBJECTIVES ARE TO SURVEY AND CATALOG THE EARTHWORK DAMAGE, DETERMINE THE MECHANISMS INVOLVED IN CAUSING THE DAMAGE, AND TO MAKE RECOMMENDATIONS FOR MINIMIZING EARTHQUAKE DAMAGE ON FUTURE PROJECTS. GROUND BREAKAGE WILL BE MAPED, EARTHWORK DAMAGE WILL BE RELATED TO GEOLOGIC FEATURES, DESIGN, AND CONSTRUCTION METHODS. REPORTS ISSUED: THE SAN FERNANDO EARTHQUAKE-SOILS AND GEOLOGIC INVESTIGATION IN RELATION TO HIGHWAY DAMAGE, R H PRYSOCK, J.P. E. GAN, JR., SEPTEMBER 1971.

PERFORMING AGENCY: California Department of Transportation, Division of Highways, Transportation Laboratory Branch, Study No. 19-632119
INVESTIGATOR: Forsyth, RA; Hannon, JB; Jackura, KA
SPONSORING AGENCY: California Department of Transportation, Division of Highways: Federal Highway Administration, Department of Transportation
RESPONSIBLE INDIVIDUAL: Salberg

HP&R D-5-43
STATUS: Active Notice Date: May 1975 Start Date: Feb. 1971 Completion Date: Dec. 1974 Total Funds: $95,100
ACKNOWLEDGMENT: California Department of Transportation, Federal Highway Administration (173101353)HRIS 63 022737, JR6220117

3R 020875
EVALUATION OF COMPACTION OF CEMENT TREATED BASES
MORE EFFICIENT METHODS WILL BE SOUGHT FOR PLACING AND TRIMMING CEMENT TREATED AGGREGATES TO SECURE STRONGER AND MORE DURABLE BASES. FIELD INVESTIGATIONS WILL BE MADE ON SEVERAL CONSTRUCTION PROJECTS AND SPECIFICATIONS WILL BE RECOMMENDED TO INSURE THAT THE MOST EFFICIENT CONSTRUCTION METHODS ARE USED.

PERFORMING AGENCY: California Department of Transportation, Division of Highways, Transportation Laboratory Branch, Study No. 19-63382
INVESTIGATOR: Skog, JB; Smith, RE; Murray, BD
SPONSORING AGENCY: California Department of Transportation, Division of Highways, Federal Highway Administration, Department of Transportation

HP&R D-2-16
STATUS: Active Notice Date: Oct. 1974 Start Date: July 1967 Completion Date: Dec. 1974 Total Funds: $38,000
ACKNOWLEDGMENT: California Department of Transportation

3R 021106
STATEWIDE FLEXIBLE PAVEMENT PERFORMANCE AND DEFLECTION STUDY

PERFORMING AGENCY: California Department of Transportation, Division of Highways, Transportation Laboratory Branch, Study No. 19-633128
INVESTIGATOR: Skog, JB; Matthews, JA; Bushey, R.W.
SPONSORING AGENCY: California Department of Transportation, Division of Highways: Federal Highway Administration, Department of Transportation
CONSTRUCTION EQUIPMENT AND METHODS

3R 043084

EARTH REINFORCEMENT AND UNDERPINNING
TECHNIQUES FOR USE IN CUT-AND-COVER TUNNELING

This project will attempt to improve methods for protecting adjacent building foundations during cut-and-cover and soft-ground tunneling. This will require the following: (1) Development of a comprehensive, in-depth synthesis of current methods of earth reinforcement and underpinning, in the broadest sense of the term, including manuals for design and for construction planning and execution; (2) Development of innovative concepts for improved earth reinforcement and underpinning methods for the broad range of site conditions encountered; and (3) Recommendations for testing and evaluating the innovative designs and for further needed research to achieve the ultimate objective. (FHWA/)

PERFORMING AGENCY: Goldberg-Zoino and Associates, Incorporated
INVESTIGATOR: Goldberg
SPONSORING AGENCY: Federal Highway Administration, Department of Transportation
INVESTIGATOR: Goldberg
RESPONSIBLE INDIVIDUAL: Gale, HG (Tel 202-426-0743)

Contract DOT-FH-11-8499 (CPFF)

3R 082051
TIME TO CORROSION OF REINFORCING STEEL VERSUS VARIOUS PARAMETERS AND DESIGN CONSTRUCTION

The purpose of this project is to determine the relative time to corrosion of reinforcing steel embedded in concrete slabs fabricated from various mix designs and construction procedures, when the slabs are subject to periodic wetting with a 3 percent sodium chloride solution. The effect of coating breaks on the effectiveness of electrostatically-applied, powdered, epoxy resin rebar coatings will be determined.

PERFORMING AGENCY: Federal Highway Administration, Department of Transportation
INVESTIGATOR: Clear
SPONSORING AGENCY: Federal Highway Administration, Department of Transportation
RESPONSIBLE INDIVIDUAL: Clear

In-House

STATUS: Active Notice Date: Oct. 1975 Start Date: June 1974 Total Funds: $58,000

ACKNOWLEDGMENT: Federal Highway Administration (179314353)

3R 082110
A COMPUTER BASED INFORMATION SYSTEM FOR COUNTY EQUIPMENT COST RECORDS

The objective of this project is to provide an uniform system in all counties for gathering, storing, processing, and using data and information pertaining to costs of county highway equipment.

PERFORMING AGENCY: Iowa University, HR-173
INVESTIGATOR: Poyzer, JD
SPONSORING AGENCY: Iowa State Highway Commission

STATUS: Active Notice Date: Dec. 1974 Completion Date: Dec. 1975 Total Funds: $78,000

ACKNOWLEDGMENT: Federal Highway Administration (024022351)

3R 082177
DEVELOPMENT OF METHODOLOGY FOR DESIGN AND CONSTRUCTION OF COMPACTED SHALE EMBANKMENTS

The purpose is to identify factors responsible for rapid deterioration of shales and develop (1) techniques to evaluate the stability of existing embankments; (2) remedial treatments for existing distressed embankments and (3) design criteria and construction control techniques for compacted shale embankments.
CONSTRUCTION EQUIPMENT AND METHODS

**3R 082299**
**SURFACE COATING OF CONCRETE STRUCTURES**
A "user manual" will be prepared which describes the advantages, cost and construction techniques used in applying surface coatings to concrete structures used in highway construction.

**PERFORMING AGENCY:** Texas University, Austin
**INVESTIGATOR:** Reese
**SPONSORING AGENCY:** Texas State Department of Highways & Public Transportation
**RESPONSIBLE INDIVIDUAL:** Saltsberg

**Status:** Active **Notice Date:** Dec. 1974 **Completion Date:** Sept. 1975 **Total Funds:** $8,000

**ACKNOWLEDGMENT:** Federal Highway Administration (18103356)

**3R 082381**
**EFFECTS OF PAVEMENT TEXTURE ON SKID RESISTANCE**
The objectives of this study are to determine wear factors on asphalt and PCC pavements; to investigate the effect of mix design, material properties, and construction techniques on skid resistance; to determine skid resistance speed gradients and the relationship between locked wheel and peak friction coefficients.

**PERFORMING AGENCY:** Ohio Department of Transportation
**INVESTIGATOR:** Behn
**SPONSORING AGENCY:** Ohio Department of Transportation; Federal Highway Administration, Department of Transportation
**RESPONSIBLE INDIVIDUAL:** Smith, R

**Contract:** DOT-FH-11-8173-1 (CPFF)
**Status:** Active **Notice Date:** Dec. 1974 **Total Funds:** $8,000

**ACKNOWLEDGMENT:** Federal Highway Administration (193014351)

**3R 082498**
**MODIFIED AGGREGATE-LIME-POZZOLAN BASE COURSE**
The purpose is to evaluate the ability of a modified blend of aggregate-lime-pozzolan base material to provide improved stability and increased development of strength, particularly in late season-low temperature construction environments.

**PERFORMING AGENCY:** Pennsylvania Department of Transportation
**INVESTIGATOR:** Brunner, RJ
**SPONSORING AGENCY:** Pennsylvania Department of Transportation; Federal Highway Administration, Department of Transportation
**RESPONSIBLE INDIVIDUAL:** Spellman

**Contract:** DOT-FH-11-8173-1 (CPFF)
**Status:** Active **Notice Date:** Dec. 1974 **Completion Date:** June 1975 **Total Funds:** $30,000

**ACKNOWLEDGMENT:** Federal Highway Administration (193014351)

**3R 082570**
**CAMBER IN PRESTRESSED CONCRETE BEAMS**
Objectives of the study are: (1) Determine the cause or causes of differential camber in pretensioned prestressed concrete bridge beams that are designed and fabricated to be identical, within specified tolerances and construction standards. (2) To recommend changes in design and/or fabrication techniques that will eliminate the cause of differential camber. (3) To test and verify the changes or modification of item 2.

**PERFORMING AGENCY:** Texas Transportation Institute, Texas A&M University, Study No 2-5-75-193
**INVESTIGATOR:** Epps, JA Gallaway, BM
**SPONSORING AGENCY:** Texas State Department of Highways & Public Transportation, Federal Highway Administration, Department of Transportation

**HP&R 176**
**Status:** Active **Notice Date:** Dec. 1974 **Completion Date:** Aug. 1975 **Total Funds:** $195,000

**ACKNOWLEDGMENT:** Federal Highway Administration (188301353)

**3R 082572**
**BITUMINOUS TREATED BASES**
The purpose here is to provide technology for more economical asphalt treated base courses by investigating new, construction techniques and more realistic criteria for material selection and design which will provide the desired performance in a given environment.

**PERFORMING AGENCY:** Texas Transportation Institute, Texas A&M University, Study No 2-6-74-41
**INVESTIGATOR:** Epps, JA Gallaway, BM
**SPONSORING AGENCY:** Texas State Department of Highways & Public Transportation, Federal Highway Administration, Department of Transportation

**HP&R 041**
**Status:** Active **Notice Date:** Jan. 1975 **Completion Date:** Sept. 1975 **Total Funds:** $75,000

**ACKNOWLEDGMENT:** Texas Transportation Institute (240023351), Federal Highway Administration

**3R 082638**
**EVALUATION OF UTAH'S QUALITY CONTROL PROCEDURES RELATED TO CONSTRUCTION**
The objectives are: to establish an overall plan to improve Utah's quality control system. Also those areas of quality control that can be immediately changed or improved will be implemented through this study; those areas requiring a more extensive change-over will be identified for later implementation. Information will be gathered from various individuals throughout Utah related to construction to help identify problem areas and possible solutions. This information will be compared to a literature search or questionnaire aimed at the same problem areas to detect existing problems and their solutions and where these solutions will help improve quality construction and control in Utah.

**PERFORMING AGENCY:** Utah State Department of Transportation, Materials and Tests Division, Study No. 508-927
**INVESTIGATOR:** Leatham, J Peterson, GE Peterson, DE
**SPONSORING AGENCY:** Utah State Department of Transportation; Federal Highway Administration, Department of Transportation

**HP&R**
**Status:** Active **Notice Date:** Oct. 1974 **Completion Date:** July 1975 **Total Funds:** $12,000

**ACKNOWLEDGMENT:** Utah State Department of Transportation
CONSTRUCTION EQUIPMENT AND METHODS

3R 083019
REDUCING THE SEASONALITY OF HOT PLANT-MIX BITUMINOUS PAVING
The relative merit of construction methods which reduce the seasonality of constructing bituminous concrete pavements will be determined.

PERFORMING AGENCY: Montana Department of Highways
INVESTIGATOR: Mackey
SPONSORING AGENCY: Montana Department of Highways; Federal Highway Administration, Department of Transportation
RESPONSIBLE INDIVIDUAL: Olsen

HP&R 7927
STATUS: Active NOTICE DATE: Dec. 1974 COMPLETION DATE: June 1975 TOTAL FUNDS: $2,000
ACKNOWLEDGMENT: Federal Highway Administration (057013356)

3R 085336
STRUCTURAL ANALYSIS OF STEEL-CONCRETE COMPOSITE MATERIAL CONSTRUCTION
At civil engineering constructions consisting of such composite materials as steel-concrete sandwich, reinforced concrete and steel fiber reinforced concrete, investigation of the fundamental material and structural mechanism for composite action of the composite materials is urgently required. Theoretical and numerical analysis for the above purpose will be carried out through electronic computations on the following subjects: (1) Two-dimensional elastic deformation analysis; (2) Extension of the above program to material non-linear problems including plasticity and creep; (3) Three-dimensional elastic and inelastic anisotropic problems; and (4) In addition, crack problems in terms of initiation and propagation and boundary layer problems between different materials will be treated as applied problems.

PERFORMING AGENCY: Osaka University, France
INVESTIGATOR: Maeda, Y Matsui, S
SPONSORING AGENCY: Ministry of Education, Japan

ACKNOWLEDGMENT: International Road Research Documentation, OECD, International Road Federation (IRF 22a(52))

3R 085407
MECHANIZATION OF EXCAVATION FOR OPEN CAISSONS
This study is intended to develop a single machine that will make it possible to excavate either a circular or elliptical space corresponding to the respective shapes of the open caissons to be laid. Such equipment is designed to perform excavation with an underground excavating unit mounted at the tip of a special revolving shaft that gives 3 types of revolving motion, up and down and reciprocation, properly combined. Excavated material is to be removed continuously by means of sand pumps or air lift, and a complete system combining removal mechanism is being developed. /IRRD/RF/

PERFORMING AGENCY: Hazama-Gumi, Ltd. Engineering Research Center
INVESTIGATOR: Matsuangi, K Ebisui, T
SPONSORING AGENCY: Hazama-Gumi, Ltd. Engineering Research Center

STATUS: Programmed NOTICE DATE: May 1975 START DATE: June 1975
ACKNOWLEDGMENT: International Road Research Documentation, OECD, International Road Federation (IRF 8265))

3R 085590
NON-DESTRUCTIVE TEST METHODS IN CONSTRUCTION CONTROL
This project involves evaluating non-destructive apparatus and methods used in or available for construction practice, for precision, reliability and durability, and developing non-destructive methods for quality control, based on probabilistic principles. /IRF/

REFERENCES:
Precrion and Reliability of a Nuclear Meter for Soil and Bituminous Mix Density Determination. Rule, B Internal Report, Feb. 1975

PERFORMING AGENCY: Queensland Main Roads Department, Australia
INVESTIGATOR: Spies, R Rule, B
SPONSORING AGENCY: Queensland Main Roads Department, Australia

ACKNOWLEDGMENT: International Road Federation (IRF 6(49))

3R 085647
THE INFLUENCE OF LAYOUT AND MANAGEMENT POLICIES ON THE PRODUCTIVITY OF MATERIAL FLOW PROCESSES ON CONSTRUCTION SITES
The objective of the study is to establish current practice at the planning level and to develop improved practical techniques suitable for both head office and field agents. This will be achieved by site visits to dams, major road construction, tunnels, high rise buildings and other sites. /IRF/

PERFORMING AGENCY: New South Wales University, Australia, School of Civil Engineering, Dept of Engr Constr & Management
INVESTIGATOR: Woodhead, RW Birdsall, GC
SPONSORING AGENCY: Australian Government

ACKNOWLEDGMENT: International Road Federation (IRF 104(19))

3R 085782
ARID AREA CONSTRUCTION TECHNIQUES
Techniques are to be developed for compacting materials in their dry state and the properties of materials which have been compacted in this condition are to be studied. The work is in the planning phase. /IRRD/RF/

PERFORMING AGENCY: Transport and Road Research Laboratory, Department of the Environment
INVESTIGATOR: Bofig, HE Russell, RB Buchanan, EB
SPONSORING AGENCY: Transport and Road Research Laboratory, Department of the Environment

ACKNOWLEDGMENT: International Road Research Documentation, OECD (IRRD-603085), International Road Federation (IRF 1a(445))

3R 085787
LOADING AND PERFORMANCE OF FALSEWORK IN BRIDGE CONSTRUCTION
Loads on falsework used for building bridges are being determined to improve safety during construction. The methods used are based on site measurements backed by laboratory tests and theoretical analysis. Measurements have just been made on falsework used on successive spans of a motorway viaduct. Results are being analysed. /IRRD/RF/

PERFORMING AGENCY: Transport and Road Research Laboratory, Department of the Environment
INVESTIGATOR: Price, WI Taylor, ME Price, AR
SPONSORING AGENCY: Department of the Environment, England

ACKNOWLEDGMENT: International Road Research Documentation, OECD (IRRD-603092), International Road Federation (IRF 1a(450))

3R 086273
COMPUTER ASSISTANCE IN PRODUCTION PLANNING FOR ROAD CONSTRUCTION
This project consists of coordinating existing computer programs and developing new ones that will be helpful in production planning for road construction. The computer programs are meant to include planning of costs, scheduling of time (for) planning of needs for rees for res sources (machinery) and planning of costs/time. /IRRD/RF/
CONSTRUCTION EQUIPMENT AND METHODS

PERFORMING AGENCY: Norwegian Institute of Technology, Foundation of Scientific and Industrial Research
INVESTIGATOR: Berger, A
SPONSORING AGENCY: Public Roads Administration, Norway
STATUS: Active
NOTICE DATE: June 1975
START DATE: Apr. 1973
TOTAL FUNDS: $21,200

ACKNOWLEDGMENT: International Road Research Documentation, OECD (IRRD-R50498), International Road Federation (IRF 36(6))

3R 087022
SURFACE TYPES OF THIN PAVEMENTS
This project will attempt to evaluate performance of various surface types on thin or staged pavement structures. Two test sections with various widths of cold-mix, single and double sand seals, and shoulder treatments will be evaluated from maintenance records and visual observations. This project was turned over to Research in early 1975 while still under construction.

PERFORMING AGENCY: Saskatchewan Department of Highways & Transp. Can
INVESTIGATOR: Culley, R.W
STATUS: Active
NOTICE DATE: Oct. 1975
START DATE: Aug. 1974
COMPLETION DATE: Dec. 1977

3R 100758
EXPEDIENT MEMBRANE-ENVELOPED-SOIL-LAYERS (MESL) ROADS IN A WINTER ENVIRONMENT
THE OBJECTIVE IS TO DEVELOP ENGINEERING CRITERIA AND CONSTRUCTION TECHNIQUES FOR CONSTRUCTING SUCH ROADS IN A WINTER ENVIRONMENT. LABORATORY FREEZE-THAW TESTING WILL BE CONDUCTED ON VARIOUS FINE-GRAINED SOIL TYPES TO DETERMINE THE APPROPRIATE MOISTURE CONTENTS TO PREVENT MOISTURE MIGRATION AND SENSING DURING FREEZING. LABORATORY CBM (CALIFORNIA BEARING RATIO) TESTS WILL ALSO BE CONDUCTED ON THAWING SAMPLES TO DETERMINE STRENGTH LOSSES DUE TO FREEZING FIELD TESTS WILL PROVIDE TRAFFIC RESPONSE DATA.

PERFORMING AGENCY: Cold Regions Research and Engineering Laboratory, Department of the Army, AT31-03-002
INVESTIGATOR: Smith, N. Eaton, R
SPONSORING AGENCY: Army Corps of Engineers

STATUS: Active
NOTICE DATE: Nov. 1974
START DATE: July 1973
COMPLETION DATE: June 1976
TOTAL FUNDS: $410,000

ACKNOWLEDGMENT: Cold Regions Research and Engineering Laboratory

3R 101335
THE STRUCTURAL DESIGN, DESIGN MIXTURES AND CONSTRUCTION METHOD OF ASPHALT PAVEMENTS
FULL SCALE TEST PAVEMENTS WHICH HAVE MANY TYPES OF ASPHALT MIXTURES WERE CONSTRUCTED. PLASTIC FLOW AND SKIDDING RESISTANCE OF THE MIXTURES ARE BEING MEASURED. THE PERFORMANCE OF ACTUAL LOW COST PAVEMENT ARE BEING SURVEYED. THE PERFORMANCE TESTS OF ASPHALT PLANTS WERE CONDUCTED. 

REFERENCES
Striping of Asphalts Mixtures and Its Preventive Measures Nagumo, S. Public Works Research Institute, (In Japanese)

PERFORMING AGENCY: Public Works Research Institute, Japan, Ministry of Construction, Chiba Branch
INVESTIGATOR: Nagumo, S; Anzaki, Y; Kajima, I
SPONSORING AGENCY: Ministry of Construction, Japan

STATUS: Active
NOTICE DATE: June 1974
START DATE: Apr. 1961
COMPLETION DATE: 1974
TOTAL FUNDS: $256,000

ACKNOWLEDGMENT: International Road Research Documentation, OECD (IRRD-R50498), International Road Federation (IRF 36(6))

3R 101456
UPDATE PAVEMENT CONSTRUCTION METHODS AND EQUIPMENT
THE OBJECTIVE HERE IS TO CONDUCT TESTS, DEVELOP CRITERIA, AND INVESTIGATE NEW PAVEMENT CONSTRUCTION METHODS AND EQUIPMENT TO ASSURE OPTIMUM UTILIZATION OF THE MOST ADVANCED AND PRODUCTIVE CAPABILITIES FOR THE DESIGN AND CONSTRUCTION OF HEAVY-LOAD AIRFIELD PAVEMENTS. NEW AND INNOVATIVE CONSTRUCTION METHODS AND EQUIPMENT ARE BEING STUDIED TO DETERMINE COMPARABILITY BETWEEN HEAVY-LOAD AIRFIELD PAVEMENT DESIGN REQUIREMENTS AND CONSTRUCTION PRACTICES. INFORMATION IS GATHERED THROUGH TESTS AND ANALYSIS OF TECHNOLOGY ADVANCES IN CONSTRUCTION EQUIPMENT AND HEAVY CONSTRUCTION PRACTICES. INSPECTION OF PAVEMENT CONSTRUCTION PROJECTS, AND THROUGH DISCUSSIONS WITH CONTRACTORS AND EQUIPMENT MANUFACTURERS. THIS INFORMATION WILL BE EVALUATED TO DETERMINE APPLICABILITY TO MILITARY CONSTRUCTION IN ORDER TO ACHIEVE DESIGN REQUIREMENTS TO SATISFY USER REQUIREMENTS. DATA AND INFORMATION COLLECTED WILL BE ANALYZED FOR ENGINEERING AND ECONOMIC (COST) IMPACT ON MILITARY AIRFIELD PAVEMENT DESIGN AND CONSTRUCTION. CRITERIA AND METHODS DEVELOPED WILL BE USED IN FORMULATING SPECIFICATIONS AND WILL BE INCORPORATED INTO GUIDE SPECIFICATIONS AND TECHNICAL MANUALS. AREAS UNDER INVESTIGATION INCLUDE: VIBRATORY ROLLERS, HOT-MIX RETENTION BINS, DRYER-DRUM MIXING PLANTS, FULL-WIDTH PAVING UNITS, SLIP-PERM CONCRETE PLACEMENT EQUIPMENT, DEEP-LIFT LAYDOWN OF ASPHALTIC CONCRETE, AND MODIFICATION OF MIXING-TIME REQUIREMENTS IN BOTH PCC AND ASPHALTIC CONCRETE PRODUCTION.

PERFORMING AGENCY: Waterways Experiment Station, Army Corps of Engineers
INVESTIGATOR: White, TD; Malison, KD
SPONSORING AGENCY: Waterways Experiment Station, Army Corps of Engineers

STATUS: Active
NOTICE DATE: Apr. 1975
START DATE: Apr. 1972
TOTAL FUNDS: $150,000

ACKNOWLEDGMENT: Science Information Exchange (QZA248156)

3R 101631
THE REACTION OF HIGHWAY PAVEMENTS TO DYNAMIC LOADING. PART C: STUDIES OF THE EXPERIMENTAL SUBGRADE, B 288
THIS IS PART OF A CONTINUING PROGRAM IN WHICH 22 SECTIONS OF AN EXPERIMENTAL ROAD HAVE BEEN SUBJECTED TO HEAVY TRAFFIC SINCE 1959. THE B 288 SECTION, WHICH SUCCESSES THE B 36 AND B 29 SECTIONS FOR THE STUDY OF ROAD BASES WITH VERY DIFFERENT STRUCTURES, EMPLOYS CONSTRUCTION METHODS THAT FROM EXPERIENCE ON OTHER EXPERIMENTAL SITES AND NEW ROADS APPEAR TO BE ESPECIALLY PROMISING FOR THE DEVELOPMENT OF STANDARD TYPES. THE STUDIES EMBRACE THE VARIOUS CONSTRUCTIONAL ELEMENTS AND THEIR MINIMUM THICKNESSES.

PERFORMING AGENCY: Federal Institute of Road Research, West Germany, 661
INVESTIGATOR: Buseck, H
SPONSORING AGENCY: Federal Ministry of Transport, West Germany

STATUS: Active
NOTICE DATE: May 1974
START DATE: 1964

ACKNOWLEDGMENT: International Road Research Documentation, OECD (IRRD-R700040), International Road Federation (IRF 11(12))
CONSTRUCTION EQUIPMENT AND METHODS

3R 101730

RELATIONS BETWEEN THE STRUCTURE, DURABILITY AND SKID RESISTANCE OF EXCEPTIONALLY GOOD OR BAD FLEXIBLE PAVEMENTS

Tests are being carried out on 85 sections of road to see whether the skidding resistance is due to the structure of the road and to establish the relations which exist between road structure and skidding resistance. The age of and the traffic volume carried by the surfacing is also being taken into account. The measurements of skidding resistance are being taken annually over a period of 5 years with the Stuttgart Friction Meter (locked trailer wheel), and the road structure is being established by means of cores. The aim is to establish reasons for skidding resistance so that appropriate recommendations can be made with regard to road construction. The Bavarian Road Authorities will report on roads which are known to have good or bad non-skid properties. The measurements of skid resistance will be compared and a relationship between construction, durability and slipperiness will be sought.

Acknowledgment: International Road Research Documentation. OECD (IRRD-R700421). International Road Federation (IRF 150)

Performing Agency: Federal Institute of Road Research, West Germany
Investigator: Schmitz, H
Sponsoring Agency: Federal Ministry of Transport, West Germany

Status: Active
Notice Date: May 1974
Total Funds: $750,000

3R 102017

ENVIRONMENTAL DETERIORATION OF PAVEMENT

The objectives are to provide usable and economical methods of improving remedial maintenance and pavement design and reducing costs of construction and maintenance. (A) identifying the causes of pavement cracking in West Texas, and (B) testing the efficiency of selected remedies for the problem. The study will provide a basis for evaluating the causes of non-traffic load associated cracking. Once the causes are determined, remedial maintenance, future design and construction methods, and materials specifications can be examined and altered, as appropriate to establish the necessary changes to reduce or eliminate this type of distress. Pavement overlay systems will be suggested which will be aimed at providing a relatively maintenance-free surfacing.

Performing Agency: Texas Transportation Institute, Texas A&M University, Study No 1-8-73-18
Investigator: Lyon, RL. Epps, JA
Sponsoring Agency: Texas State Department of Highways & Public Transp, Federal Highway Administration, Department of Transportation
Responsible Individual: McComb

HP&R 018

Status: Active
Notice Date: Jan. 1975
Start Date: Sept 1972
Completion Date: Aug. 1976
Total Funds: $140,000

Acknowledgment: Texas Transportation Institute, Federal Highway Administration (237402353)

3R 102045

IMPROVE PORTLAND CEMENT CONCRETE WEARING SURFACES

This study was undertaken to determine through field experimentation and observation the effects that construction techniques and materials have on the production of durable textured concrete surfaces which result in enduring skid resistance. Changes in contract controls and construction procedures accordingly are recommended.

Performing Agency: California Department of Transportation, Division of Highways, Transportation Laboratory Branch, Study No. 19-6-35293
Investigator: Spellman, DL. Bailey, SN Woodstrom, JH Spickelmire, LS
Sponsoring Agency: California Department of Transportation, Division of Highways. Federal Highway Administration, Department of Transportation
Responsible Individual: Smith, R

HP&R 3-49

Status: Active
Notice Date: Oct. 1974
Start Date: Mar. 1973
Completion Date: June 1977
Total Funds: $201,800

Acknowledgment: California Department Transportation, Federal Highway Administration (256012351)

3R 102810

BRIDGE DECKS SPECIALLY CONSTRUCTED FOR INCREASED DURABILITY

Conventional design and construction practices for several bridges have been modified and construction and performances will be monitored to ascertain whether the modifications may practically and economically yield increased durability for decks construction has been closely monitored & periodic performance surveys will be
CONSTRUCTION EQUIPMENT AND METHODS

CONDUCTED FOR AT LEAST FOUR YEARS OR UNTIL SUCH A TIME AS DEFINITE CONCLUSIONS MAY BE FORCING CONSTRUCTION OF BRIDGES CONTAINING GALVANIZED STEEL WILL BE MONITORED AND THEIR MAINTENANCE RECORDS WILL BE COMPARED TO CONVENTIONAL STEEL BRIDGES TO DETERMINING THE POTENTIAL ECONOMY OF USING GALVANIZED STEEL DECKS CONTAINING MODULAR EXPANSION SYSTEMS WILL BE STUDIED.

PERFORMING AGENCY: Kentucky Department of Transportation, Bureau of Highways, Research Division, KYP-71-25
INVESTIGATOR: Havens, JH Hughes, RD Rahal, A
SPONSORING AGENCY: Kentucky Department of Transportation, Bureau of Highways


ACKNOWLEDGMENT: Kentucky Department of Transportation

3R 102569

COMPUTERIZED DESIGN PROCEDURES FOR PREDICTING, EVALUATING, AND OPTIMIZING TIME-DEPENDENT EFFECTS IN REINFORCED, PARTIALLY PRESTRESSED AND FULLY PRESTRESSED NONCOMPONENT CONCRETE STRUCTURES

INVESTIGATOR: Branson, DE
SPONSORING AGENCY: Iowa State Highway Commission, Iowa University, Iowa City


ACKNOWLEDGMENT: American Concrete Institute

3R 103090

SHEAR CONNECTORS FOR PRECAST COMPOSITE CONSTRUCTION

AN ATTEMPT IS BEING MADE TO DEVELOP DESIGN TECHNIQUES AND DESIGN CRITERIA FOR CERTAIN TYPES OF SHEAR CONNECTORS. /IRF/

PERFORMING AGENCY: Queensland University, Australia, Department of Civil Engineering
INVESTIGATOR: Kureisky, AV
SPONSORING AGENCY: Australian Road Research Board

STATUS: Active NOTICE DATE: June 1974 START DATE: 1968

ACKNOWLEDGMENT: International Road Federation (IRF 1a(20))

3R 103770

DETERIORATION OF CONCRETE BRIDGE DECKS


PERFORMING AGENCY: Missouri State Highway Commission, Division of Materials and Research, Study No. 62-1
SPONSORING AGENCY: Missouri State Highway Commission: Federal Highway Administration, Department of Transportation
RESPONSIBLE INDIVIDUAL: Clear

HP&R 62-1

ACKNOWLEDGMENT: Missouri State Highway Commission, Federal Highway Administration (296003511)P72020270, P72020226. 2R3201254

3R 103894

LEAN CEMENT CONCRETE FOR ROADBASES

THE RHEOLOGY, COMPACTION AND OTHER CONSTRUCTION TECHNIQUES: ECONOMICS, LOAD-CARRYING CAPACITY AND PERFORMANCE OF LEAN CEMENT CONCRETE ARE STUDIED AS MATERIAL FOR BONDED UNDERLAY AND ROADBASES. /IRF/

PERFORMING AGENCY: Central Road Research Institute, India, Council for Scientific and Industrial Research
INVESTIGATOR: Ghosh, RK Garg, AK Malhotra, JN
SPONSORING AGENCY: Council for Scientific & Industrial Res. India

STATUS: Active NOTICE DATE: May 1974 START DATE: 1965

ACKNOWLEDGMENT: International Road Federation (IRF 1a(39))

3R 103895

POZZOLAN CEMENT CONCRETE, LIME-POZZOLAN CONCRETE AND LIME-POZZOLAN MIXTURE-BOUND MACADAM FOR PAVEMENTS

THE RHEOLOGY, CONSTRUCTION TECHNIQUES, ECONOMICS, LOAD-CARRYING CAPACITY AND PERFORMANCE OF POZZOLAN CEMENT CONCRETE, LIME-POZZOLAN CONCRETE AND LIME-POZZOLAN MIXTURE-BOUND MACADAM ARE BEING STUDIED AS PAVEMENT MATERIAL IN SURFACINGS, COMPOSITE CONSTRUCTION AND ROADBASE, WITH A VIEW TO PROVIDING ALTERNATIVE AND ECONOMICAL MATERIALS FOR PAVEMENT CONSTRUCTION. /IRF/

PERFORMING AGENCY: Central Road Research Institute, India, Council for Scientific and Industrial Research
INVESTIGATOR: Ghosh, RK Sethi, KJ
SPONSORING AGENCY: Council for Scientific & Industrial Res. India

STATUS: Active NOTICE DATE: May 1974 START DATE: 1965

ACKNOWLEDGMENT: International Road Federation (IRF 1a(39))

3R 104330

SUMMARY REPORTS: CONCRETE-POLYMER TECHNOLOGY

THESE REPORTS WILL SUMMARIZE INDEX OF THE OUTCOME OF THE ECONOMIC BENEFITS IF THE OUTCOME OF THE ECONOMIC BENEFITS IF THE OUTCOME OF THE PREVIOUSLY PUBLISHED TOPICAL REPORTS COVERS THE PROGRESS OF THE JOINT RESEARCH ON CONCRETE-POLYMER MATERIALS. FIVE REPORTS ON INDIVIDUAL AREAS OF TECHNOLOGY ARE PLANNED: (1) OVER-ALL CONCRETE-POLYMER STUDIES, (2) MONOMER AND COMPOSITE EXPERIMENTS, (3) PROCESS TECHNOLOGY, (4) STRUCTURAL PROPERTIES, AND (5) APPLICATION DEVELOPMENT. THE REPORTS WILL SUMMARIZE IN A READILY USEFUL FORM INFORMATION AND EXPERIENCE GATHERED OVER SEVERAL YEARS OF RESEARCH IN THIS FIELD.

PERFORMING AGENCY: Bureau of Reclamation, DR-370
INVESTIGATOR: Santner, CE
SPONSORING AGENCY: Bureau of Reclamation


ACKNOWLEDGMENT: Bureau of Reclamation

3R 104332

POLYMER-IMPREGNATED CONCRETE (PIC PIPE)

BEFORE A SYSTEM OF PIC PIPE CAN BE DESIGNED FOR USAGE. A THOROUGH DESIGN KNOWLEDGE MUST BE OBTAINED AND THE SERVICE REQUIREMENT STANDARDS MUST BE INVESTIGATED. THE PROGRAM IS DESIGNED TO COMPARE UNREINFORCED PRECAST PIC PIPE WITH REINFORCED PRECAST CONCRETE PIPE. GOALS OF THE PROGRAM ARE TO YIELD COMPLETE DESIGN INFORMATION, SERVICE REQUIREMENTS, MANUFACTURING TECHNIQUES, AND AN EVALUATION OF THE ECONOMIC BENEFITS IF THE OUTCOME OF THE ECONOMIC STUDY OF PIC PIPE IN FY74 IS FAVORABLE, IT IS
CONSTRUCTION EQUIPMENT AND METHODS

3R 104588
LONG-TERM SETTLEMENT STUDY OF BRIDGE APPROACHES
CONSTRUCTION PROCEDURES WILL BE DEVELOPED TO DECREASE THE CORRECTIVE WORK TO REDUCE BUMPS AT STRUCTURE APPROACHES AFTER FREeways ARE OPENED TO PUBLIC TRAFFIC. ANY HYPOTHESIS DEVELOPED DURING THE STUDY WILL LATER BE SUBJECT TO VERIFICATION BY OTHER FULL-SCALE EXPERIMENTAL TEST SECTIONS.

PERFORMING AGENCY: California Department of Transportation, Division of Highways, Transportation Laboratory Branch, Study No. 19-63400
INVESTIGATOR: Forsyth, RA; Hirsch, AD; Yee, WS
Sponsoring Agency: California Department of Transportation, Division of Highways, Federal Highway Administration, Department of Transportation
RESPONSIBLE INDIVIDUAL: Krylowski
HP&R D-4-035
STATUS: Active Notice Date: Oct. 1974 Start Date: Aug. 1965 Completion Date: Dec. 1974 Total Funds: $80,800
ACKNOWLEDGMENT: California Department of Transportation, Federal Highway Administration (05942353)

3R 104601
COLD WEATHER CONSTRUCTION
PROCEDURES WILL BE DEVELOPED WHICH WILL ALLOW CONSTRUCTION TO BE EFFECTIVELY AND ECONOMICALLY PERFORMED UNDER COLD WEATHER CONDITIONS. LABORATORY AND FIELD TESTS WILL BE CONDUCTED TO EVALUATE AND COMPARE DESIGN AND CONSTRUCTION METHODS UTILIZING WINTERTIME CONSTRUCTION PROCEDURES.

PERFORMING AGENCY: Cold Regions Research and Engineering Laboratory, Department of the Army
INVESTIGATOR: Sayles, F
Sponsoring Agency: Army Corps of Engineers, Department of the Army
STATUS: Active Notice Date: Nov. 1974 Start Date: July 1968 Completion Date: June 1975 Total Funds: $313,000
ACKNOWLEDGMENT: Cold Regions Research and Engineering Laboratory

3R 104699
METHODS FOR SAMPLING AND CONTROL OF ROAD CONSTRUCTION
THE NIIK IS AIMING AT INTRODUCING ITS SCHEME FOR QUALITY CONTROL INTO GENERAL ROAD PRACTICE IN SOUTH AFRICA. THE FEASIBILITY OF USING THE SCHEME IN PRACTICAL ROAD CONSTRUCTION WILL BE TESTED. ASSISTANCE IS BEING OFFERED TO ROAD AUTHORITIES IN THE DRAFTING OF SPECIFICATIONS IN ACCORDANCE WITH THE SCHEME. DATA WILL BE COLLECTED ON COSTS AND ON THE VARIABILITY OF PARAMETER, WHICH CAN BE USED TO IMPROVE THE EFFECTIVENESS OF THE PRACTICAL USE OF THIS QUALITY CONTROL SCHEME.

PERFORMING AGENCY: Nat Inst Road Research /S Africa/, 9431/4541
INVESTIGATOR: Kuhn, SH; Walker, RN
Sponsoring Agency: Nat Inst Road Research /S Africa/, 9431/4541
STATUS: Active Notice Date: Jul. 1970 Start Date: 1970 Completion Date: 1975
ACKNOWLEDGMENT: International Road Federation/RF 1A(66), 2R33600799

3R 105053
CORROSION OF STEEL PILES
THE EFFECT OF THE SAN FRANCISCO BAY ENVIRONMENT ON STEEL "H" PILES. METHODS OF ARRESTING CORROSION OF EXISTING STEEL PILES, AND PROPOSED CONSTRUCTION METHODS THAT MIGHT PREVENT EXCESSIVE CORROSION WILL BE INVESTIGATED.

PERFORMING AGENCY: California Department of Transportation, Toll Bridge Administration, Study No. 15,627137
INVESTIGATOR: Spellman, DL; Stratfull, RF; Batala, B
Sponsoring Agency: California Department of Transportation, Division of Highways: Federal Highway Administration, Department of Transportation
RESPONSIBLE INDIVIDUAL: Berman
HP&R D-3-50
STATUS: Active Notice Date: Oct. 1974 Start Date: Apr. 1972 Completion Date: June 1975 Total Funds: $247,000
ACKNOWLEDGMENT: California Department of Transportation, Federal Highway Administration (15201351)

3R 105108
UNDERWATER WELDING
THIS PROGRAM WAS DESIGNED TO INVESTIGATE THE METALLURGICAL FACTORS OF SIGNIFICANCE IN THE UNDERWATER WELDING OF FERRIC MATERIALS. WHILE SOME DEGREE OF SUCCESS HAS BEEN REPORTED USING DEVICES WHICH EFFECTIVELY EXPEL THE WATER FROM THE ZONE OF WELDING, THESE METHODS SEVERELY LIMIT THE TYPE AND Versatility OF WELDS WHICH MAY BE NEEDED TO PRODUCE. WHETHER OR NOT THE WATER IS IN CONTACT WITH THE WELDING OPERATION, THE WELD METAL AND ASSOCIATED HEAT AFFECTED ZONE ARE SUBJECT TO EXTREMELY RAPID COOLING RATES RESULTING IN WELDS OF HIGH HARDNESS AND RESULTANT HIGH CRACK SENSITIVITY. WHEN THE WELD IS PRODUCED IN CONTACT WITH WATER, THE WELD METAL IS FURTHER SUBJECT TO POROSITY. ACCORDINGLY, THE CONTRIBUTIONS TO THESE PROBLEMS OF THE ALLOYING ELEMENTS PRESENT IN STEELS TO BE WELDED, AND THE WELD METAL ITSELF, MUST BE DETERMINED IN ORDER TO ESTABLISH THE LIMITING CONDITIONS FOR UNDERWATER WELDING. FURTHER STUDY SHOULD ALSO BE GIVEN TO OTHER METALLURGICAL PARAMETERS SUCH AS RATE OF SOLIDIFICATION, MODEL MODE OF SOLIDIFICATION, RATE OF COOLING THROUGH THE CRITICAL TRANSFORMATION, RESPONSE TO COOLING RATE, ETC.
CONSTRUCTION EQUIPMENT AND METHODS

PERFORMING AGENCY: Wisconsin University, Madison
INVESTIGATOR: Looper, C, Miller, R
SPONSORING AGENCY: Commonwealth Dept of Works /Australia/: Nat Oceanic & Atmospheric Admin, Noaa

ACKNOWLEDGMENT: Science Information Exchange

3R 105233

RELATIONSHIP BETWEEN THE PETROLOGICAL NATURE OF SHALES, WEATHERING TESTS, CONSTRUCTION TECHNIQUE AND SERVICE RECORD

TESTING PROCEDURES ARE BEING DEVELOPED TO INDICATE THE SUITABILITY OF SHALES AND SIMILAR FISSILE ROCKS FOR USE AS PAVEMENT MATERIALS. A METHOD SIMULATING BREAKDOWN UNDER COMPACTION EQUIPMENT BY REPETITIVE COMPACTION IN THE LABORATORY HAS BEEN ADOPTED TENTATIVELY. OTHER PROCEDURES RESULTING FROM WORK CARRIED OUT BY THE INSTITUTE OF HIGHWAY AND TRANSPORT RESEARCH (UNIVERSIT) OF N.S.W.) FOR THE DEPARTMENT OF MAIN ROADS, ARE TO BE TRIED. /IRF/

REFERENCES:

2. PERFORMING AGENCY: New South Wales Department of Main Roads-Australia
INVESTIGATOR: Davidson, WI
SPONSORING AGENCY: New South Wales Department of Main Roads-Australia

ACKNOWLEDGMENT: International Road Federation (IRF) 5(5)

3R 105356

SUBAQUEOUS TUNNELS

STUDIES AND TESTS WILL BE CONDUCTED ON METHODS OF CONSTRUCTION FOR TRENCH TYPE TUNNELS AND METHODS OF TUNNEL EXCAVATION UNDER HIGH WATER PRESSURES IN CASE OF SUBAQUEOUS TUNNELS. /IRRD/IRF/

REFERENCES:

1. Stress Analysis on Six Lane Immersed Tunnel Tateishi, S; Mizutani, T, Civil Engineering Journal, Aug. 1970
2. A Test of Sand Jetting for Foundation on Immersed Tunnels Tateishi, S; Mizutani, T; Maruyama, Technical Memorandum of PWRI
3. PERFORMING AGENCY: Public Works Research Institute, Japan, Ministry of Construction. Chiba Branch
INVESTIGATOR: Kondo, T Mizutani, T
SPONSORING AGENCY: Ministry of Construction, Japan

ACKNOWLEDGMENT: International Road Research Documentation, OECD (IRRD-R51084), International Road Federation (IRF 16(5))

3R 105656

REPAIR OF ROADS AND AIRFIELDS IN A WINTER ENVIRONMENT

THE OBJECTIVE IS TO PROVIDE FIELD ENGINEERS WITH ENGINEERING CRITERIA AND CONSTRUCTION TECHNIQUES FOR RAPIDLY REPAIRING DAMAGED ROADS AND AIRFIELDS IN A WINTER ENVIRONMENT IN THE THEATER OF OPERATIONS. LABORATORY AND FIELD TESTS WILL BE CONDUCTED ON RAPID-SETTING CONCRETES AND SYNTHETIC MATERIALS IN COLD ENvironments. NEW AND IMPROVED METHODS FOR USING INDIGENOUS MATERIALS, INCLUDING SNOW AND FROZEN SOIL, WILL BE STUDIED.

PERFORMING AGENCY: Cold Regions Research and Engineering Laboratory, Department of the Army
INVESTIGATOR: Smith, N
SPONSORING AGENCY: Army Corps of Engineers, Department of the Army

ACKNOWLEDGMENT: Cold Regions Research and Engineering Laboratory

3R 105558

SPECIAL TESTING FOR DUST ABATEMENT AND ROAD STABILIZATION

THE OBJECTIVES ARE: (1) ACQUAINT ENGINEERS WITH METHODS, PRODUCTS AND EQUIPMENT AVAILABLE FOR ROADWAY DUST CONTROL AND STABILIZATION; (2) DETERMINE THROUGH PROPER CONSTRUCTION METHODS FOLLOWED BY LONG-TERM EVALUATION, WHAT METHODS AND MATERIALS ARE EFFECTIVE AND ECONOMICAL FOR USE ON, OR WITHIN, UNIMPROVED SECONDARY ROADS; AND (3) INTRODUCE ENGINEERS TO METHODS OF RECLAIMING AND/OR UPGRADE EXISTING SECONDARY ROADS THAT ARE FAILING UNDER TRAFFIC AND OR ENVIRONMENTAL CONDITIONS.

This is a cooperative research project in affiliation with: Allis-Chalmers Construction Machinery Division; American Admixtures; American Can Company; Armaak Highways Chemicals Department; Bitucoat Products Company; CIBA-Geigy; Del Chemical Corporation; Dow Chemical U.S.A.; Emulsified Asphalt, Inc.; Flamebrew Paper Company; ITT Rayonier, Inc.; Linwood Stone Products Company, Inc.; National Ash Association; National Chemical Stabilization Association; National Lime Association; Salt Institute; Sandar Inc.; Saunders Petroleum Company; and Scott Paper Company.

ACKNOWLEDGMENT: Holding The Roads 1.S.U. Film Production Unit Koebring Rd Div, Educational Film, 1973

SPONSORING AGENCY: Engineering Research Institute, Iowa State University, 1049-S

INVESTIGATOR: Hoover, J M Handy, RL

ACKNOWLEDGMENT: Iowa State University

3R 109011

NEGATIVE SKIN FRICTION ON PILES IN CLAY SOILS

A CLAY SOIL CONSOLIDATING AROUND A PILE FOUNDATION IS SUBJECTED TO AN ADDITIONAL VERTICAL FORCE DUE TO SKIN FRICTION FORCES DEVELOPED AS THE CLAY MOVES DOWNWARD RELATIVE TO THE PILE TO STUDY THE NATURE AND MAGNITUDE OF SKIN FRICTION IN LEDA CLAY SOILS, TWO STEEL-CONCRETE COMPOSITE PILES, 39 INCHES IN DIAMETER BY 300 FEET LONG, WERE DRIVEN TO BEDROCK TO SUPPORT AN OVERPASS ON THE NORTH SHORE AUTORoute IN QUEBEC. AT THE SAME SITE A FLOATING 12 INCH DIAMETER BY 160 FOOT LONG HOLLOW STEEL FRICTION TEST PILE WAS INSTRUMENTED TO STUDY THE NATURE AND MAGNITUDE OF BOTH NEGATIVE AND POSITIVE SKIN FRICTION LOADS GENERATED ON IT. AT ANOTHER SITE, NEAR OTTAWA, ONTARIO, A 16 INCH DIAMETER HOLLOW STEEL END BERING PILE IS INSTRUMENTED THE CLAY SOIL AROUND IT WERE CHARGED WITH A CIRCULAR FILL. INSTRUMENTATION OF THESE PILES CONSISTED OF MECHANICAL DEFORMATION GAUGES TO MEASURE THE DEFORMATION IN THE PILES, ELECTRICAL STRAIN METERS, VERTICAL SETTLEMENT GAUGES TO MEASURE THE SETTLEMENT IN THE SURROUNDING SOIL AND PIEZOMETERS. LABORATORY TESTS ARE UNDERWAY TO MEASURE THE COEFFICIENT OF FRICTION BETWEEN THE PILE & THE SOIL. /RTAC/ REPORTS ISSUED:

ACKNOWLEDGMENT: Lehigh University

ACKNOWLEDGMENT: Canadian Geotechnical Journal, Vol. 9, No 2, P 127, MAY 72
CONSTRUCTION EQUIPMENT AND METHODS

**3R 110402**
STRESS ON COMPARABLE FROST-RESISTANT ROAD STRUCTURES
APART FROM THE STANDARD BITUMINOUS PAVEMENTS AND
CONCRETE PAVEMENTS IN ACCORDANCE WITH THE SPECIFICATIONS
TV-BETON 72, RECENTLY THERE HAVE BEEN NEW
DEVELOPMENTS IN THE FORM OF FULL-DEPTH ASPHALT PAVEMENTS
AND CONSTRUCTION METHODS EMPLOYING HEAT INSULATING COURSES. THE WORKING COMMITTEE ON
FROST HAS DECIDED TO STUDY THE EQUIVALENT OF THESE
CONSTRUCTION METHODS. IT IS NOT SUFFICIENT TO COMRE
THE DIFFERENT ROAD STRUCTURES SOLELY IN RESPECT TO POSSIBLE FROST PENETRATION. AT THE SAME TIME THE STRESSING OF THESE STRUCTURES BY TRAFFIC LOADS,
PARTICULARLY DURING THE CRITICAL PERIOD OF THAW, NEEDS TO BE CONSIDERED. FIRST A SELECTION OF EIGHT POSSIBLE FROST-RESISTANT METHODS OF CONSTRUCTION
WAS MADE. THESE ARE TO BE EXAMINED TO DETERMINE THE STRESS CAUSED BY TRAFFIC. FOR THIS, CALCULATION
BY MEANS OF MULTI-LAYERED THEORY OF THE STRESSES AND DEFORMATIONS WHICH OCCUR IN THE INDIVIDUAL LAYERS OF THE STRUCTURE IN RELATION TO DIFFERENT PERIODS OF THE YEAR (TEMPERATURE, SUBSOIL BEARING CAPACITY) IS NECESSARY. THE STRESSES AND DEFORMATIONS WHICH OCCUR HAVE TO BE COMPARED WITH PERMITTED VALUES. IN ASSOCIATION WITH THE RESULTS OF THE HEAT FLOW CALCULATION (FROST PENETRATION) FOR THESE METHODS, A STATEMENT CAN BE MADE ABOUT THEIR EQUIVALENCE. /IRRD/IRF/

**Performing Agency:** Technical University of Munich, West Germany
**Sponsoring Agency:** Federal Ministry of Transport, West Germany

**Status:** Active  **Notice Date:** May 1974  **Start Date:** 1973

**References:**
- International Road Research Documentation, OECD (IRRD-R700166), International Road Federation (IRF 28(6))
- International Road Research Documentation, OECD (IRRD-R511147), International Road Federation (IRF 16(14))

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**3R 109478**
DESIGN CRITERIA FOR FOUNDATIONS IN COLD REGIONS
CRITERIA FOR ADEQUATE AND ECONOMICAL DESIGN AND
CONSTRUCTION AND MAINTENANCE OF FOUNDATIONS IN
PERMAFROST AREAS UNDER VARIOUS CONDITIONS OF
LOADING WILL BE DEVELOPED. THEORETICAL STUDIES AND
DESIGN PROCEDURES WILL BE CONSOLIDATED. PERFORMANCE SURVEYS WILL BE MADE OF EXISTING FOUNDATIONS.
LABORATORY AND FIELD OBSERVATIONAL PROGRAMS WILL
BE CONDUCTED. REPORTS ISSUED: INSTALLATION OF

**Performing Agency:** Cold Regions Research and Engineering Laboratory, Department of the Army, AT06-04-001
**Investigator:** Crotchie, F Blouin, S Sayles, F
**Sponsoring Agency:** Army Corps of Engineers, Department of the Army

**Status:** Active  **Notice Date:** Nov. 1974  **Start Date:** July 1969  **Completion Date:** June 1978  **Total Funds:** $756,000

**Acknowledgment:** Cold Regions Research and Engineering Laboratory

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**3R 109915**
METHODS OF ROAD CONSTRUCTION FOR LANDSLIDE AREAS
THE BEHAVIOR OF LANDSLIDES IN THE EXPERIMENTAL AREA IS BEING OBSERVED. ROAD CONSTRUCTION METHODS IN LANDSLIDE AREAS ARE BEING STUDIED. /IRRD/IRF/

**References:**
- Public Works Research Institute, Japan, Niigata Experimental Laboratory

**Performing Agency:** Public Works Research Institute, Japan, Niigata Experimental Laboratory
**Investigator:** Sakai, A
**Sponsoring Agency:** Ministry of Construction, Japan

**Status:** Active  **Notice Date:** May 1974  **Start Date:** 1963  **Completion Date:** 1975

**Acknowledgment:** International Road Research Documentation, OECD (IRRD-R51147), International Road Federation (IRF 16(14))
CONSTRUCTION EQUIPMENT AND METHODS

3R 115254
PLANNING AND CONTROL OF CONSTRUCTION PROCESS
Based on many observations and studies for operations and circumstances in some constructions, a planning and controlling system of the project with a computer model that simulates the construction process is developed. This system has given the optimal decision in planning and controlling of the construction process. /IRRD-IRF/

PERFORMING AGENCY: Public Works Research Institute, Japan, Ministry of Construction, Chiba Branch
INVESTIGATOR: Chida, S; Kumagai, K; Aida, M
SPONSORING AGENCY: Ministry of Construction, Japan

3R 115257
SAFETY IN CONSTRUCTION MACHINERY
The purpose of this study is to investigate the security of construction machinery. Operator-protecting equipments are being evaluated in field tests of different construction machines. /IRRD-IRF/

PERFORMING AGENCY: Public Works Research Institute, Japan, Ministry of Construction, Chiba Branch
INVESTIGATOR: Senzawa, T; Nakano, S
SPONSORING AGENCY: Ministry of Construction, Japan

3R 115323
UNDERWATER CONCRETING METHODS [Suichu Konkurito Sekoho]
The authors studies preplaced aggregate concrete and tremie concrete methods for the past ten years and have executed many concrete structures under water using these methods. But in these procedures, it was apparent that these methods have substantial, unavoidable defects. So, a new type of tremie method called the KDT tremie method was developed and studied. This new tremie method was found to have many advantages in comparison with the conventional tremie method. The study has been continued to obtain detailed data at the job site. An experimental application of the method to an underwater reinforced concrete slab is now under study. /IRRD-IRF/

PERFORMING AGENCY: Kajima Institute of Construction Technology, Japan
INVESTIGATOR: Nakahara, Y; Ohtomo, T; Yokota, S
SPONSORING AGENCY: Kajima Corporation

3R 115400
OBSERVATION OF THE PERFORMANCE OF OPERATION PAVEMENTS
The study of the behaviour of full-scale pavements as a check on design, analysis and construction procedures is undertaken. /IRF/

PERFORMING AGENCY: Commonwealth Scientific & Ind Res Organ, Australia, Melbourne Division of Applied Geomechanics
INVESTIGATOR: Richards, BG; Poppin, JW
SPONSORING AGENCY: Commonwealth Scientific & Ind Res Organ, Australia

3R 115510
REDUCTION OF CRACKING IN CONCRETE
This project will examine and collate as much available information as possible on the control and reduction of cracking in concrete by design and construction procedures. /IRF/

PERFORMING AGENCY: Sydney University, Australia. School of Civil Engineering
INVESTIGATOR: Campbell-Allen, D
SPONSORING AGENCY: Australian Road Research Board

3R 115797
VEHICLE ROAD SYSTEMS ON SNOW AND ICE
This project is developing techniques for constructing and maintaining year-round roads on perennial snowfields, ice and glacier ice suitable for passenger vehicles, pickups, vans, trucks, and truck-trailer combinations of cross combination weights up to 75,000 pounds operating in polar regions. A review of the requirements for roads on snow and ice for vehicles with flotation tires weighing up to 75,000 pounds showed the need to develop: (1) Roads suitable for vehicles with single front axle loads up to 13,000 pounds, single rear axle loads up to 18,000 pounds, and rear axle loads up to 32,000 pounds at travel speeds up to 45 mph; (2) engineering criteria for designing and maintaining heavy-duty, high-speed vehicle roads on snow and ice; (3) road-building equipment of optimum design for rapid construction using two vehicles up to size six snow tractors; (4) road maintenance equipment of optimum design for high-speed surface grading with wheeled equipment; (5) construction and maintenance techniques; (6) high-strength wearing surfaces for areas subject to severe usage deterioration and abrasion; (7) marking and guidance control; and (8) construction and maintenance manuals for control and operation. /ZIE/

PERFORMING AGENCY: Department of the Navy, Civil Engineering Laboratory
INVESTIGATOR: Beard, WH
SPONSORING AGENCY: Naval Facilities Engineering Command, Navy, DN744029

3R 115848
DIAPHRAGM WALLING
This project is attempting to develop simpler techniques of constructing diaphragm walls and to apply these techniques in the field and evaluate their performance and economy. /IRF/

PERFORMING AGENCY: Central Road Research Institute, India, Council for Scientific and Industrial Research
INVESTIGATOR: Mohan, D; Jain, GRS; Makol, RL
SPONSORING AGENCY: Central Road Research Institute, India, Council for Scientific and Industrial Research

ACKNOWLEDGMENT: COLD REGIONS RESEARCH AND ENGINEERING LABORATORY

ACKNOWLEDGMENT: International Road Federation (IRF 37(29))

ACKNOWLEDGMENT: International Road Federation (IRF 37(32))

ACKNOWLEDGMENT: International Road Federation (IRF 37(21))

ACKNOWLEDGMENT: International Road Federation (IRF 1B(17))
3R 115860
PROVIDING HARD SHOULDERs FOR PAVEMENTS: DESIGN AND MATERIALS
This project is making an analysis of the design requirements for unpaved and paved shoulders and the influence of such shoulders on the methods used in the construction of the highway. /IRF/

PERFORMING AGENCY: Tamil Nadu Highways & Rural Works Dept. India, Highways Research Station
SPONSORING AGENCY: Tamil Nadu Highways & Rural Works Dept. India, Highways Research Station
STATUS: Active NOTICE DATE: Nov. 1974 COMPLETION DATE: 1978
ACKNOWLEDGMENT: International Road Federation (IRF 5A104))

3R 128911
DESIGN AND CONSTRUCTION METHODS FOR CONCRETE PAVEMENT
The purpose of the project is to investigate the daily and annual change of temperature, abrasive properties and cracking of cement concrete pavement to obtain a design and construction method. /IRRD/IRF/

PERFORMING AGENCY: Hokkaido Development Bureau, Japan, Civil Engineering Research Institute
INVESTIGATOR: Kubo, H
SPONSORING AGENCY: Hokkaido Development Bureau, Japan
5700
ACKNOWLEDGMENT: International Road Research Documentation. OECD (IRRD-603334), International Road Federation (IRF 8a45))
The source index lists funding and performing agencies in alphabetical order. The research project summaries identify each agency as the performing research agency or the funding agency or as both the performing and the funding agency. The index gives the name of the agency as it appears on the HRIS research project summary (names have been altered in some cases to conform to the constraints of the system design). The mailing address of the agency is given following the name. Subject area and TRIS accession numbers of research summaries associated with each agency are then listed in ascending numerical order. For example, the research project summary identified by TRIS accession number 101481 and assigned subject area 1R, System Construction, Management, and Quality Control, appears under Georgia Department of Transportation. Some organizations are listed more than one time in this index because various units within the agency are associated with research projects.

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<td>Ministry of Equipment and Housing; 58 Boulevard Lefebvre; 75732 Paris Cedex 15, France</td>
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<td>Melbourne Division of Applied Geomechanics; P.O. Box 54; Mt Waverley, Victoria 3149, Australia</td>
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Purdue University Lafayette, Indiana, 47907

Queensland Main Roads Department, Australia P.O. Box 1412; Brisbane 4001, Queensland, Australia 2R 101520, 3R 085590

Queensland University, Australia Department of Civil Engineering; St. Lucia, Queensland 4067, Australia 3R 103909

Road Research Lab. Ceylon/ Research & Development Division 2R 109372

Road Research Society, West Germany West Germany 2R 101520, 3R 085590

Roads and Transportation Association of Canada 1765 St. Laurent Boulevard; Ottawa, Ontario, Canada 2R 082597

Saskatchewan Department of Highways & Transp. Regina, Saskatchewan, Canada 3R 087022

Soil Testing Services, Incorporated 11 Pfingsten Road, P.O. Box 266; Northbrook, Illinois, 60062 2R 105116

South Dakota Department of Transportation Transportation Building; Pierre, South Dakota, 57501 2R 020108

State Road Office Hesse, West Germany Wiesbaden, Hesse, West Germany 3R 101592

Saskatchewan Department of Highways & Transp. Regina, Saskatchewan, Canada 3R 087022

Stuttgart University, West Germany Official Research & Materials Testing Inst for Construction; Soils and Foundations Division; Pfaffenwaldring 4; D-7000 Stuttgart 80, West Germany 2R 085440

Stuttgart University, West Germany Official Research and Materials Testing Inst. for Constr.; Pfaffenwaldring 4; D-7000 Stuttgart, West Germany 2R 085440

Sydney University, Australia School of Civil Engineering; Sydney, New South Wales, Australia 3R 115510

Sydney University, Australia School of Civil Engineering; Sydney, New South Wales, Australia 2R 115510

Tamil Nadu Highways & Rural Works Dept, India Highway Research Station; Madras 600025, Tamil Nadu, India 2R 104373

Tamil Nadu Highways & Rural Works Dept, India Highways Research Station; Madras 600025, Tamil Nadu, India 3R 115560

Tamil Nadu State of, India Madras, Tamil Nadu, India 2R 104373

Technical University of Aachen, West Germany Building Research Institute; Schinkelstrasse 3; 51 Aachen, West Germany 2R 086366

Technical University of Munich, West Germany Department of Steel Structures; Theresienstrasse; D-8000 Munich, West Germany 2R 086345

Technical University of Munich, West Germany Institute for Construction of Land Transport Routes; Arcisstrasse 21; 8 Munich, West Germany 3R 110412

Technical University of Munich, West Germany Institute of Bituminous Materials; Arcisstrasse 21; 8 Munich, West Germany 2R 105317

Texas State Department of Highways & Public Transp. P.O. Box 501; Austin, Texas, 78701 2R 082554, 3R 082559, 5R 082572, 3R 102017

Texas Transportation Institute Texas A&M University; College Station, Texas, 77843 2R 082554, 3R 082570, 3R 082572, 3R 102017

Texas University, Austin Austin, Texas, 78712 1R 115945, 3R 082559

Texas University, Austin School of Engineering, Dept of Architectural Engineering; 200 West 21st Street; Austin, Texas, 78712 1R 115945

Tokyo University, Japan 7-3-1 Hongo, Bunkyo-ku, Tokyo, Japan 2R 085341

Transport and Road Research Laboratory Department of the Environment; Old Wokingham Road; Crowthorne, Berkshire RG11 6AU, England 1R 085786, 2R 085782, 3R 085787

Urban Mass Transportation Administration Department of Transportation; 400 7th Street, SW; Washington, D.C., 20590 2R 000061

Utah State Department of Transportation Materials and Tests Division; 757 West Second South; Salt Lake City, Utah, 84104 2R 105377, 3R 048638

Utah State Department of Transportation 757 West Second South; Salt Lake City, Utah, 84104 2R 105377, 3R 048638

Utah University Salt Lake City, Utah, 84112 2R 103577

Virginia University Department of Civil Engineering; Charlottesville, Virginia 2R 082601

Waitemata County Council /New Zealand/ 2R 103137

Washington Metropolitan Area Transit Authority 950 E. Enfant Plaza, SW; Washington, D.C., 20006 3R 110098

Waterways Experiment Station 2R 104652, 2R 104545

Waterways Experiment Station Office, Chief of Engineers 2R 109545

Waterways Experiment Station Army Corps of Engineers; P.O. Box 631; Vicksburg, Mississippi, 39180 2R 083104, 3R 082277, 3R 101486

Western Australia Main Roads Department, Australia Waterloo Crescent; East Perth, W Australia 6000, Australia 3R 115490

Wisconsin University, Madison

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INVESTIGATOR INDEX

This index gives all investigators whose names appear on research summaries included in this publication. Under each name are the document record numbers, which include the subject area number and the TRIS accession number, of those summaries for which the person has been named as a project investigator. Names are alphabetized only as far as the first four surname letters.

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The terms are arranged alphabetically. Under each term are listed the two-digit subject area number and the six-digit TRIS accession number for those summaries in this part that have been assigned to the term.

Coordinating two or more terms is often useful in the search for summaries. Someone who is interested in research projects pertaining to settlement of bridge approaches, for example, should look up summaries under each of the terms.

BRIDGE APPROACHES and SETTLEMENTS. The answer in this case is the summary identified by TRIS accession number 020022 listed in subject area 3R, Construction Equipment and Methods. The coordination process can be extended to more than two terms and to the other indexes. Computer retrieval will often be more convenient to use for complicated coordinations.

Certain terms are not useful retrieval terms unless coupled or coordinated with other terms, for example, DESIGN or EVALUATION. Summaries listed under both DESIGN and STRAIN GAGES are likely of a different nature from summaries listed under both EVALUATION and STRAIN GAGES.

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PART 2
ABSTRACTS OF PUBLISHED TECHNICAL PAPERS, JOURNAL ARTICLES, AND RESEARCH REPORTS

1A 039272
TUNNELING COST ANALYSIS
The report provides the Office of High Speed Ground Transportation with a review and analysis of tunnel construction costs. The data for all cost analyses in the report were obtained from historical records of tunnel owners, contractors, and equipment and materials manufacturers throughout the United States. The report proper includes discussions regarding the data gathering process, the methods of analysis employed, and the tunneling cost estimating relationships. Also, included is a brief review of the cost impact of differences in tunnel design and construction policies. (Author)

Spittel, LA; Wiltshire, JC
RMC Incorporated Final Rpt RMC-UR-151, Mar. 1971, 166 pp

Contract DOT-FR-0-0040

ACKNOWLEDGMENT: NTIS (PB-201363)
PURCHASE FROM: NTIS Repr PC, Microfiche

1A 051065
INSTITUTIONAL IMPLICATIONS OF U.S. DEEPWATER PORT DEVELOPMENT FOR CRUDE OIL IMPORTS
The report provides an overall appraisal of the institutional problems associated with the planning, construction, and operation of deep draft port facilities in the U.S. and adjacent waters for the reception and transshipment of imported crude petroleum. It defines the public interest in such ports, the characteristics which distinguish such ports from conventional ports, problems of legal jurisdiction at international, federal, state, and local levels, the political setting, problems of finance, ownership, and economics, and regulation of deepwater ports and related land-side developments. It makes recommendations for legislation and organization. (Modified author abstract)

Brant, MR; Gladieux, BL; Knight, HG; Ulin, JC; Brown, RE
Nathan (Robert R) Associates Incorporated Final Rpt June 1973, 184 pp

Contract DACW31-73-C-0016

ACKNOWLEDGMENT: NTIS (AD-766285/1)
PURCHASE FROM: NTIS Repr PC, Microfiche

1A 080544
EXPERIENCE WITH RELATIVE DENSITY AS A CONSTRUCTION CONTROL CRITERION
LIMITATIONS OF SEVERAL, SHALLOW AND DEEP, DIRECT AND INDIRECT METHODS TO OBTAIN RELATIVE DENSITIES ARE DISCUSSED, AND OPINIONS ARE GIVEN CONCERNING THE USE OF THESE METHODS FOR CONSTRUCTION CONTROL PURPOSES. EXPERIENCE FROM TWO EARTHWORK PROJECTS ARE GIVEN FOR (1) DIRECT METHODS-CONVENTIONAL SAND CONE AND WATER BALLOON, CUTTING CYLINDER, MANUALLY EXCAVATED PIT, AND DENISON SAMPLER, AND (2) INDIRECT METHODS-NUCLEAR, STANDARD PLATE LOAD TEST, STANDARD PENETRATION TEST, AND STATIC CONE PENETRATION TEST. SOME OF THESE METHODS PROVED SATISFACTORY AS A MEANS OF OBTAINING RELATIVE DENSITIES, OTHERS DID NOT. THE WATER-BALLOON METHOD WAS FOUND MORE SUITABLE THAN THE SAND-CONE METHOD. REFERENCE CURVES WERE EFFECTIVE IN SOME CASES. USE OF 6- IN. DIAMETER CUTTING CYLINDERS TO OBTAIN FIELD DRY UNIT WEIGHS WAS FOUND UNSATISFACTORY FOR SAND CONTAINING GRAVEL. RELATIVE DENSITIES OBTAINED FROM MEASUREMENTS OF INDIVIDUAL LAYERS FROM A MANUALLY EXCAVATED PIT WERE FOUND TO BE GREATER THAN THOSE OBTAINED FROM THE WATER-BALLOON METHOD DRY UNIT WEIGHS OBTAINED FROM DENISON SAMPLES GAVE REASONABLE RELATIVE DENSITY VALUES. RELATIVE DENSITIES FROM NUCLEAR METHODS ARE ONLY APPROXIMATE USE OF THE STANDARD PLATE LOAD TEST TO OBTAIN RELATIVE DENSITIES WAS NOT SUCCESSFUL. HIGH STANDARD PENETRATION RESISTANCES RESULTING FROM RESIDUAL LATERAL STRESSES WERE OBTAINED IN SAND FILL COMPACTED IN LAYERS BY VIBRATORY COMPACTORS AND LEAD TO VERY HIGH INFERRED RELATIVE DENSITIES. STATIC CONE PENETRATION RESISTANCES GIVE QUALITATIVE MEASURES OF RELATIVE DENSITY OF COMPLETED EARTHWORK AND ARE USEFUL IN EVALUATING UNIFORMITY OF COMPACTION. (Author)


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 210350)

1A 080574
MATERIAL TESTS FOR ROAD CONSTRUCTION WORK AND THEIR INFLUENCE ON THE QUALITY OF CONSTRUCTION ATTAINED [Materialprüfungen bei Straßenbauarbeiten und ihr Einfluss auf die erreichte Ausführungskualität]
APART FROM INTENSIVE SUPERVISION BY THE CONTRACTOR AS PART OF QUALITY TESTING, CONTINUOUS CONTROL EXAMINATIONS ARE CONSIDERED NECESSARY SO THAT DIRECT INFLUENCE ON THE QUALITY OF THE CONSTRUCTION CAN BE ATTAINED. THE EXTENSIVE CONTROL TEST RESULTS AVAILABLE AT THE MUNICH MATERIALS TESTING CENTRE WERE EVALUATED STATISTICALLY. TWO IMPORTANT CHAR-
ACTERISTIC FEATURES WERE TAKEN FROM THE PRESENT PROGRAMME OF DETERMINING QUALITY CHARACTERIS-
TICS, AND THE CHANGES IN THE FEATURES DURING THE LAST FOUR YEARS ARE ILLUSTRATED GRAPHICALLY. FROM
THIS, SOME INTERESTING CONCLUSIONS CAN BE DRAWN: IT WAS FOR EXAMPLE ESTABLISHED THAT THE CHIPPINGS
CONTENT OF GUSSASPHALT FOR URBAN ROAD CONSTRUCTION COULD BE REGARDED AS BEING OPTIMUM AT 47
PERCENT OF WEIGHT, BECAUSE OF PROCESSING. MOREOVER IT WAS REGULAR CHECKS. SIGNIFICANTLY DURING THE
CONSTRUCTION PERIOD AS A RESULT OF [German]

Spaeth, M Strasse und Autobahn Vol. 23 No. 8, Aug. 1972, pp 415-417, 2 Fig., 1 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 300691)

1A 080708 PROBLEMS ASSOCIATED WITH THE CENTRALIZED ADMINISTRATION OF THE CONSTRUCTION OF RIGID
PAVEMENTS ON FEDERAL MOTORWAYS [Probleme der Zentralverwaltung beim Betondeckenbau auf Bundesautobahnen]

After a brief reference to the construction of motorways in Czechoslovakia and the increasing use of rigid pavements, the author describes problems associated with the letting of contracts for the construction of concrete pavements in Austrian motorways. The question of one or two-stage construction and the alternating of surfacings on continuous sections is discussed. [German]

Matl, F Zement und Beton pp 27-30, 2 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 301120)

1A 080799 STAGING INTER URBAN HIGHWAY CONSTRUCTION BY DYNAMIC PROGRAMMING

This paper presents a method of scheduling highway network construction which can maximize the long-term advantages of such an undertaking. The approach taken is spatial-analytic, and thus somewhat unrealistic from economic or planning points of view. Rather, a simple accessibility function is used to explore the implications of alternate staging policies. The model could easily be adapted to more realistic or satisfying goals, however. The model presented does not require a typical dynamic programming tableau of the benefits of advancing from one network state to each other, but calculates these values only as they are required. An heuristic modification of the struct dynamic model allows the treatment of problems of realistic size. The model is applied to scheduling a highway network for a set of Ontario and Quebec sites. The dynamic strategy appears to be only marginally more beneficial than a myopic one, suggesting that it might be better to pursue a policy of building highway networks to meet present needs.


1A 081395 SUMMARY OF SYMPOSIUM ON PAVEMENT DESIGN AND MANAGEMENT SYSTEMS

The trend toward pavement management systems to incorporate design methods with construction, maintenance and research is discussed. Brief summaries of the 6 papers are given. Haas describes pavement systems methodology. Lewis reports on an operational pavement management system in Texas; Peterson describes the incorporation of pavement evaluation methods with planning, programming and budgeting, and the information system which handles the data. Phang explains how pavement design methodologies are being codified into a pavement management system. The implemented structural analysis subsystem being developed by the Federal Highways Administration is detailed by McMahon, and Lytton reports on the implementation of the Systems Analysis Method for Pavements (SAMP).

Hudson, WR (Texas University, Austin) Transportation Research Record No. 512, 1974, pp 1-2

PURCHASE FROM: TRB Publications Off Orig. PC

1A 081396 GENERAL CONCEPTS OF SYSTEMS ANALYSIS AS APPLIED TO PAVEMENTS

A pavement management system can incorporate a large number of activities in planning, design, construction, maintenance, evaluation, and research. Its primary purpose is to achieve the best possible use of available funds, consistent with providing safe and smooth pavements. Systems analysis methods can provide a means for the comprehensive and efficient handling of the various activities and for achieving the desired end result. This paper demonstrates that such systems methodology can be used to provide a framework for the pavement management activities as well as provide the techniques for developing actual working management systems. It describes the general nature and applicability of the systems methodology, and it defines the basic structure of a pavement management system. The various levels of management are indicated. Design, one of the major subsystems, is selected as an example of the more in-depth use that might be made of systems analysis methods. Particular consideration is given to the input information needs of the designer, the generation of alternative design strategies, the nature of the outputs, and the economic evaluation of the outputs for selecting an optimal strategy.

Haas, R (Waterloo University, Canada); Friez, TL (Science Applications, Incorporated); Zueback, JM Transportation Research Record No. 512, 1974, pp 3-16, 5 Fig., 32 Ref.

PURCHASE FROM: TRB Publications Off Orig. PC

1A 081647 FULL-DEPTH CONSTRUCTION METHOD-THE NEW METHOD BUILDING FLEXIBLE PAVEMENTS [Full-Depth-Bauweise-Die
Neue Baumethode im Asphaltstrassenbau]

The author explains the importance of correct pavement design. He gives details of the conventional design in accordance with the three-layer system and calculates soil pressure stresses for conventional road pavements. Problems involved in the construction of frost blankets are also discussed. Possible replacement of the conventional frost blanket by an asphalt pavement are discussed in detail. In this case theoretical design is simpler as it can be carried out in accordance with the two-layer system. This thickness of the asphalt pavement is selected in such a way that the soil pressure stresses reach, at a maximum, the values which occur during the incorporation of a normal frost blanket. Experiments with full-depth asphalt pavements and specifications for their construction in various countries are discussed. The article concludes with an explanation of the advantages of the full-depth asphalt method from an economic and heat engineering point of view. [German]


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 303870)

1A 081654 EXPERIMENTAL STRETCHES OF ROAD [Les Sections D'Essai De Chaussées.]

A number of experimental stretches of road, approximately thirty in all was built in all regions in France. This article describes the conditions under which the experimental programme was established, the various construction techniques represented in the experiment and the main results obtained. The necessity of having a thorough knowledge of the pavement before strengthening and of the manufacturing conditions for materials and in-situ operational conditions was shown to be a first requirement. Measurements were taken of deformability, and the deformation of longitudinal and transverse profiles; the light-weight vibrator was used together with core boring for evaluating the pavement structure and its evolution. The importance and effects of heavy traffic were studied. [French]

Sauterey, R Siffert, M Bulletin de Liaison des Labs des Ponts et Chaussees No. 63, Jan. 1973, pp 83-91, 4 Fig., 1 Tab.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 801045)
consolidation; and concentration of the loads of embankment on the sand column. This compacted sand pile also serves for preventing slips of foundations of the embankment and other structures on the soft ground.

cohesive soil of...the sticky soil which was remolded during after placing compacted sand pile on the foundation of embankment; forced operation of increasing the width of caterpillars etc. or decreasing the air pressure of tires. Restoration of bearing capacity is considerable. It is accompanied by the soil profile is usually prepared by means of simple soundings, and detailed investigations are conducted by mechanical boring and sampling. Some effort has been made to reduce the contact pressure of machines by bearing capacity of the subgrade and sub bases. Problems of earth works with the topographical and climatic conditions and the problematic characteris­-tions of road construction practice. This document gives details of the types of construction where bitumen emulsion was found to give satisfactory performance, together with some of the most common road construction and maintenance specifications. /Author/ 

South African Council for Scientific & Indus Res Standard June 1972, 36 pp, 1 Fig., 10 Tab.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRD 20 09 82)

1A 08 3 6 1 1

STATISTICAL QUALITY CONTROL METHODS IN ROAD CONSTRUCTION

THE USE OF STATISTICAL QUALITY CONTROL METHODS IN ROAD CONSTRUCTION IS DISCUSSED. THE PRINCIPLES OF THESE METHODS ARE OUTLINED AND THE CONSEQUENCES OF THEIR USAGE SHOWN IN TERMS OF PROBABILITIES. THE BASIC CONCEPTS ARE EXPLAINED AND APPLIED TO AN EXAMPLE FROM WHICH SOME GENERAL CONCLUSIONS ARE DRAWN. /Author/ 

Salvik, MM (National Institute for Road Research, South Africa) Civil Engineer in South Africa Vol. 16 No. 8, Aug. 1974, pp 261-265, 1 Fig., 3 Tab., 3 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRD 21 14 85)

1A 08 3 7 8 0

BIG PROGRESS MADE IN EARTH WORKS FOR ROAD CONSTRUCTION

The topographical and climatic conditions and the problematic characteristics of road construction in Japan are reviewed, and features of road earth works are discussed. Soil investigation and quality control are described. A soil profile is usually prepared by means of simple soundings, and detailed investigations are conducted by mechanical boring and sampling. Some typical field measurement methods have been developed to determine the bearing capacity of the subgrade and subbases. Problems of earth works with cohesive soil of high water content (especially volcanic ash) are discussed. Effort has been made to reduce the contact pressure of machines by increasing the width of caterpillar, etc., or decreasing the air pressure of tires. It has been observed that the sticky soil which was remolded during operation of works may have a considerable thixotropic regain and restoration of bearing capacity is considerable. It is accompanied by the effect of drying with the lapse of time. Counter measures for soft ground are considered. Several ways have been tried for the prevention of embankment settlement displacement of press-in compacted sand column for the soft soil after placing compacted sand pile on the foundation of embankment; forced consolidation; and concentration of the loads of embankment on the sand column. This compacted sand pile also serves for preventing slips of foundations of the embankment and other structures on the soft ground.

Construction Technique Vol. 4 No. 3, Feb. 1966, pp 70-73

1A 09 4 2 2 3

COMPARISON OF CONSTRUCTION LABOR AGREEMENTS

Provisions of labor agreements negotiated by Associated General Contractors of America (AGC) chapters in St. Louis, Kansas City, and outstate Missouri, and various local carpenter, laborer, operating engineers, and teamster unions are examined. Differences in provisions covering wages, hours, and working conditions between crafts in a given area are noted as are differences in skill classifications and geographic jurisdiction. Provisions of labor agreements between various locals of the carpenters and several AGC chapters also are examined. Regional differences in provisions relating to wages, hours, and working conditions are examined. (Author)


ACKNOWLEDGMENT NTIS PURCHASE FROM: NTIS Repr. PC, Microfiche NTIS/PS-75/253/5ST, DOTL/NTIS

1A 09 3 7 2

CONSTRUCTION MONITORING OF SOFT GROUND RAPID TRANSIT TUNNELS, VOLUME 1: A DEFINITION OF NEEDS AND POTENTIAL DEVELOPMENTS

The Urban Mass Transportation Administration (UMTA) Tunneling Program Concentrates its efforts on reducing tunneling costs, minimizing environmental impact and enhancing safety as it applies to the planning, organization, design, construction and maintenance cycles of rapid transit tunnels in the urban environment. This study investigates the area of construction monitoring of rapid transit tunnels in soft ground. Soft ground tunnel construction monitoring has the potential to reduce construction costs, safety hazards and environmental impacts. Monitoring can diagnose face stability and ground movement problems, and allow appropriate preventive or remedial action. Monitoring provides data for prediction of ground movements and allows the compilation of useful legal documentation. Such data are also required for improving design and prediction methods.


Contract DOT/TSC-661

ACKNOWLEDGMENT: NTIS PURCHASE FROM: NTIS Repr. PC, Microfiche PB-241536/2ST, DOTL NTIS

1A 09 1 7 3

CONSTRUCTION MONITORING OF SOFT GROUND RAPID TRANSIT TUNNELS, VOLUME II: APPENDIXES

The Urban Mass Transportation Administration (UMTA) Tunneling Program Concentrates its efforts on reducing tunneling costs, minimizing environmental impact and enhancing safety as it applies to the planning, organization, design, construction and maintenance cycles of rapid transit tunnels in the urban environment. This study investigates the area of construction monitoring of rapid transit tunnels in soft ground. Monitoring practices now in use do not usually allow full utilization of the data for the project from which they were gathered. Deficiencies in present practices are
pointed out, and a systematic approach to monitoring is presented. Information presented will aid owners, designers, specification writers and instrumentation engineers. A computer program for data storage, interpretation and retrieval is proposed. An interim quality control specification for instrumentation procurement is presented, and instrumentation hardware improvements are suggested.


Schmidt, B. Dannichif, CJ
Parsons, Brinckerhoff, Quade and Douglas, Inc. Transportation Systems Center, Soil and Rock Instrumentation, Incorporated Final Rpt. 3-V2
DOT-TSC-UMTA-75-S-V2, UMTA-MA-06-0025-74-1, Nov. 1974, 104p

Contract DOT/TSC-661

ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
PB-241537/0ST, DOTL NTIS

1A 091495
FEDERALLY COORDINATED PROGRAM OF RESEARCH AND DEVELOPMENT IN HIGHWAY TRANSPORTATION, VOLUME 6. CONSTRUCTION, MAINTENANCE, IMPLEMENTATION, AND MANAGEMENT

The Federally Coordinated Program emphasizes the development and transfer of research results into practice, e.g., bridging the gap between research and operations. The objective of this category is to stimulate and expand the application and practical use of the products of highway research and development. To achieve this objective, the program will emphasize the development of an environment that is conducive to nationally coordinated and cooperative implementation efforts by the Federal Highway Administration, State highway agencies and other highway organizations. It will also emphasize systematic management and the assessment of the success of implementation including the benefits realized.

Paper copy also available in set of 7 reports as PB-242 057-SET, PC$42.00.

Federal Highway Administration FHWA/RD-FCP-007, July 1973, 58 pp

ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
PB-242064/4ST

1A 091757
TUNNEL COST ESTIMATING UNDER CONDITIONS OF UNCERTAINTY

Of all areas of heavy construction, tunnel projects are subject to perhaps the greatest degree of uncertainty from the standpoint of predicting cost and progress. Sources of uncertainty include the unknown nature of geologic conditions along the tunnel alignment, and the difficulty of estimating the performance of men and equipment within the narrow confines of the tunnel. In this report a method is presented for explicitly reflecting these uncertainties in estimates of the time and cost of tunnel construction.

Also pub. as Tunnel Construction-5.

Wyatt, RD
Massachusetts Institute of Technology, National Science Foundation Tech. Rpt. R75-13, Sept. 1974, 211 pp

Grant NSF-GI-34029

ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
PB-242426/1ST, DOTL NTIS

1A 091758
THE PROBABILISTIC ESTIMATION OF CONSTRUCTION PERFORMANCE IN HARD ROCK TUNNELS

This report concerns the development of a computer-based simulation model which can be used to evaluate costs and risks associated with hard rock tunneling. This report is the 4th in a series of reports dealing with this subject. The report examines conventional cost estimating procedures and concludes that there are two major inadequacies which exist: (1) the inability to account for the uncertainty in suspected geologic conditions at the tunnel depth; and (2) the inability to quantify the effect of uncertain geology and the effect of the additional uncertainty in productivity of men and equipment on the performance of a construction strategy. The model employs techniques of probability and simulation to avoid these two shortcomings. Also pub. as Tunnel Construction-4.

Minott, CH
Massachusetts Institute of Technology, National Science Foundation Tech. Rpt. R74-47, July 1974, 198 pp

Grant NSF-GI-34029

ACKNOWLEDGMENT NTIS
PURCHASE FROM NTIS Repr. PC, Microfiche
PB-242427/3ST, DOTL NTIS

1A 094294
FIELD TEST SECTIONS SAVE COST IN TUNNEL SUPPORT

This study summarizes 50 case histories where instrumented test sections were a key factor in realizing major savings from newer concepts in designing underground works. Savings were most often in the item of tunnel support, using field tests to validate newer approaches. Where the tests formed a coordinated program, savings have been spectacular. One example cited in Britain saved half the construction cost on recent London tunnels. In Sweden, cost of underground works has been reduced to equal or below that of surface alternatives for many facilities such as power plants, sewage and water treatment, oil storage, and parking. Despite growing objections to locating such facilities in the surface environment, high cost has deterred U.S. planners from considering the underground alternative. Major cost improvement could change this, allowing greater use of the underground to alleviate several U.S. problems: urban congestion, pollution and energy waste. The case record charts the road: wider trial of newer and less costly concepts (many developed abroad), using field tests to validate their applicability for U.S. conditions.

Lane, KS

Grant NSF-GI-41842

ACKNOWLEDGMENT: NTIS
PURCHASE FROM NTIS NTIS Price, /MF$2.25
PB-246982/3ST

1A 096234
AUTOMATIC SYSTEM FOR ESTABLISHING CONSTRUCTION WORK CONDITIONS [Notas sobre un Sistema Automatizado de Certificaciones en Obras]

A brief description is given of the transistorized electronic equipment used for establishing construction budgets, state of the work, and cost analysis. This equipment is designed so that peripheral units for input and output data can be added to the main machine. /TRRL/ [Spanish]

Garciaez, JAA
Informes de la Construccion N° 237, Nov. 1971, pp 63-67, 3 Fig.

ACKNOWLEDGMENT: Transportation & Soil Mechanics Laboratory, Spain, Laboratoire Central des Ponts et Chaussees, Transport and Road Research Laboratory (IRRDR 100816)

1A 096291
REINFORCED EARTH ON M62 MOTORWAY

A new technique is outlined for reinforced earth structures (made up of soil, reinforcement and facing unit) in which the vertical reinforcing member is incorporated with the horizontal reinforcement and the facing is a non-structural unit. On the basis of economy, galvanized mild steel traps were chosen for the horizontal reinforcement. A block of 100 straps supporting a section near the middle of the wall was made of glass fiber roving impregnated with polyester resin as an additional experiment. The facing unit was a hexagonal-based pyramid, 125 mm deep and measuring 600 mm across the flat. A glass reinforcement cement was used for the facing unit. Bunter sandstone from a borrow pit on site was used as the fill material. A discrete gap was formed between each facing unit. Details of construction
CONSTRUCTION GUIDE FOR SOILS AND FOUNDATIONS

This book is intended to provide contractors and subcontractors with the practical aspects of foundation construction. It discusses soils, soil behaviour and the construction of foundations, emphasizing that the soil is as much a part of the overall structure as are the components of the superstructure. Potential problems in specifications, contracts, soils data, etc., are pointed out and some solutions offered. Special emphasis is given to: the importance of obtaining all available information on subsurface, rock, and groundwater conditions; the difficulties in the installation of specialized foundation elements such as piles, caissons and underpinning; and the necessity for proper engineering of all temporary construction, excavation slopes, sheeting and bracing, and other measures to prevent property damage.

Jones, C. F. (West Yorkshire Metropolitan County Council, Eng.) Planning and Transport Res. and Computation Co Ltd. PTRC/P/108, July 1974, pp 246-255, 3 Fig., 8 Ref.


1A 096986

THE NEW MONTREAL INTERNATIONAL AIRPORT

This paper describes the methods and procedures used by a project team established by the Canadian Federal government plan, design, and construct a large and complex project, the New Montreal International Airport at Mirabel. The project is being executed on the basis of Project Management with the help of a Consortium of consultants for design coordination and field construction management, using over 40 consulting firms for design and over 100 major contract packages for construction. The paper gives a general description of the project and outlines the organization, methods of design and construction management, the special design and construction management features, and the special problems encountered. Prominent phases of construction are shown by construction photographs.

Sebastyan, GY (Canadian Ministry of Transport) ASCE Journal of the Construction Division Proc Paper Vol. 101 No. C02, ASCE 11346, June 1975, pp 317-334, 19 Fig.

1A 097488

USE OF SULPHUR IN SULPHUR-ASPHALT PAVEMENTS. VOLUME 3: TASK 3: PRELIMINARY DESIGN, CONSTRUCTION AND QUALITY CONTROL PROCESSES

This effort which represents the third phase of a study to provide a preliminary comparison of the engineering characteristics of sand-asphalt sulphur (S-A-S) with conventional asphalt concrete pavements, presents a users manual and sets forth some preliminary specifications and recommended procedures for selecting an optimum mix design and constructing highway pavements with S-A-S composites. The manual on "Recommended Practices" explains the engineering, economic and ecological basis of the specifications and offers recommendations for the accomplishment of these requirements. Considerable information on sulphur is included, and details are presented on the preparation of paving mixtures, especially emphasizing tolerances and the effect of variations on the properties of the finished pavement. Paving equipment is reviewed. The manual on "Construction Specification" provides the basis for a contractual agreement between the contractor of the highway demonstration facility and the sponsor of the project. The "Quality Control" manual relates largely to the paving materials and to the sampling and testing of these materials and compositions thereafter. Raw materials, pavement mix design, and field sampling and testing are covered.

Sponsored by Bureau of Mines and the Sulphur Institute.


1A 099611

SIMPLE METHOD FOR OBSERVING THE OPERATION OF COMPACTORS [Methode simple pour suivre le fonctionnement des compresseurs]

Studies are being conducted to establish specifications regarding compaction. It is necessary to define practical methods of controlling the application of the specifications envisaged. One of the means considered is the control of the operation of compacting machines. With this aim in view it is proposed to observe visually the operation of the compactor(s) to see whether or not it conforms to the planned organization of the construction site as described by the engineering firm, and to determine the relation between the volume of materials laid during a given period of time and the surface covered by the compactor during the same period. This note describes how the latter arrangements were implemented on an earthworks site in the Paris region. To assess the level of use to which the compactor was put, the compactor was supplied with a kilometer counter recording on disc the distance covered, speeds, operation and stop times. At the end of the day, data obtained were recorded together with the volume of materials laid, thus enabling the relation between the volume and surface covered to be calculated. The quality of compaction operations and especially the thickness of the layers were also controlled.

/TRL/ [French]

Schaeffer, M Bauchard, M Dejonchere, G Bulletin de Liaison des Lab des Ponts et Chaussees No. 62, Nov. 1972, pp 22-26, 4 Fig., 2 Phot., 8 Ref.

ACKNOWLEDGMENT: Laboratoire Central des Ponts et Chaussees, Transport and Road Research Laboratory (IRRD 100783)

PURCHASE FROM: Laboratoire Central des Ponts et Chaussees 58 Boulevard Lefebvre, 75732 Paris Cedex 15. France Orig. PC

1A 099622

USE AND IMPORTANCE OF DEFLECTION MEASUREMENTS MADE ON ROADS IN FRENCH SPEAKING AFRICA AND IN MADAGASCAR [Utilisation et l'intérêt des mesures de déflexion sur chaussées en Afrique Francophone et à Madagascar]

The author recalls the extensive use of deflection measurements as a non-destructive means of testing pavements for the design of new pavements and control of application during construction. The measurements give highly representative results of the mechanical behaviour of the pavements. The technique is widely utilized in French speaking Africa and in Madagascar. Details are given of the evolution of the technique and of some results obtained on flexible pavements. Precautions to take while carrying out measurements are mentioned. /TRL/ [French]


ACKNOWLEDGMENT: Laboratoire Central des Ponts et Chaussees, Transport and Road Research Laboratory (IRRD 101555)

1A 099711

A GUIDE TO GOOD PRACTICE FOR ROAD EDGE DETAILS

This report classifies the various types of edge detail in current use and gives a guide to their design construction and maintenance and to the materials used. After setting out their functions the report gives descriptions of the types available and includes a comprehensive table showing the applications of the different types in various types of road. Edge details are next considered in relation to general requirements followed by a comprehensive...
chapter covering design practice which includes a table which considers the
names available in relation to design requirements. The next chapter is
concerned with the choice of form of construction and includes information
on concrete and natural stone kerbs and channels, extruded edges, cast in
situ edges and kerbs and channels cast integrally with the pavement.
Maintenance is the subject of the next chapter, which is followed by
information relating to relative costs of the various methods. The final
chapter gives conclusions and comprehensive recommendations and an
appendix gives drawings of 22 recommended details. /TRRL/

Gone by March, 18 Phot., 15 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRR/D
212155)

1A 099755
GOALS FOR BASIC RESEARCH IN CONSTRUCTION
This report and the workshop upon which it was based were designed to
identify, set priorities for, and focus high-level attention on the need for basic
research in construction engineering and management, especially in man-
power and organizational development, management methodologies, innova-
tions in construction methods, and construction industry dynamics.
Closer working relationships were developed between the construction
industry, private and government consumers of construction services, and
university programs in construction engineering management. In the private
sector, several participants suggested that an organization such as the
Business Roundtable could provide leadership in establishing a coordinated
program for funding basic research in construction.
Presented at a workshop sponsored by the Stanford Construction
Institute.

Paulson, BC, Jr
Stanford University July 1975, 64 pp

1A 125290
EARTHWORKS AT THE PLANNING STAGE [El transporte de
suelos en la ejecucion de la obra basicas]
Various solutions are proposed to the problems of earthworks at the
planning stage, taking account of possible adjustments having to be
considered during construction. The initial earthwork plant must be flexible
eough to allow for a number of contingencies; controls must be carried out
and necessary modifications made in order to obtain minimum volumes to
be transported over maximum distances. Finally A solution is put forward for
the problem of measuring already completed earthworks, that, because of
negligence, lack of foresight or material impossibility, were not recorded
as constructed. The number of the covering abstract is IRR/D
Annex No. 100834. /TRRL/ /Spanish/

Francesio, C
Decimo Concurso de Trabajos sobre Temas Viales Conf Paper
No. 84, Oct. 1968, pp 15-44, 18 Fig., 6 Tab.

ACKNOWLEDGMENT: Transportation & Soil Mechanics Laboratory, Spain,
Laburatorio Central des Ponts et Chaussees, Transport and Road Research
Laboratory (IRR/D 100838)

1A 125294
SAFETY IN THE CONSTRUCTION OF BITUMINOUS
SURFACINGS [Seguridad de la construccion de pavimentos asfalticos]
The construction of bituminous surfacings requires three types of safety
measures: measures relating to the material used, to the plant, and to the
equipment. Practical recommendations are proposed for the safety of
different operations: transport, sampling, cleaning and maintenance of the
equipment, operation of plants, etc. /TRRL/ /Spanish/

Perez, AS
Alemas No. 81, Apr. 1972, pp 43-46

ACKNOWLEDGMENT: Transportation & Soil Mechanics Laboratory, Spain,
Laburatorio Central des Ponts et Chaussees, Transport and Road Research
Laboratory (IRR/D 100979)

1A 125437
ARE CONSTRUCTION CONTRACTS FAIR?
Too often, specifications and contracts are written vaguely. The contractor
has to deal with many unknowns and unpredictable factors. What can be
done to ease this situation and reduce litigation? An attorney whose firm has
represented many contractors suggests ways to reduce litigation. For
example, risks could be minimized and costly litigation avoided with more
research before a contract is written, rather than the present reliance on
"escape" clauses. A veteran contractor also gives his ideas, including his
opinion that the design engineer should do more of the tasks now left to the
contractor. For example, in tunneling, engineers should design the tempo-
rary support as well as the final lining.

Fox, GA (Grow Tunneling Corporation); Greenberg, ME ASCE Civil
Engineering Vol. 45 No. 5, May 1975, pp 56-59

1A 126128
FIFTY-YEAR DEVELOPMENT CONSTRUCTION OF STEEL
GIRDER BRIDGES
Steel girder bridge construction has evolved from standard to customized
design with curved girders, box girders, and combinations thereof becoming
more common. Refined designs require increased man-hours to maintain
quality assurance and the safety with efficiency necessary to offset addition-
costs. Errore procedures is basically remain the same with the trend toward
erection in longer and heavier sections. Procedures are illustrated by
representative structures. /ASCE/

Burchard, EA (United States Steel Corporation) ASCE Journal of the
1975, pp 467-476, 19 Fig., Photos., 3 Ref.

PURCHASE FROM: ESL Repr. PC, Microfilm

1A 126833
JOINT EFFORT TO IMPLEMENT RESTRICTED
PERFORMANCE SPECIFICATIONS IN PENNSYLVANIA
One of the key elements in the Pennsylvania Department of Transportation
programs was the implementation of statistically based restricted perfor-
nance specifications for highway construction material is concerned with the
necessary education of department and industry personnel. This paper

discusses the experiences of Pennsylvania Department of Transportation and
Pennsylvania State University in the past 2 years in their joint effort to
provide the first phase of the training required. The background information
for the series of training courses and for the development of a quality-control
manual, the guidelines that were set up for the courses, and the objectives
of each course session are discussed. The experiences and insights gained as
a result of the first 5 courses in the series are discussed by relating some of
the observations that participants made about the course itself and also about
the proposed program of implementation that Pennsylvania Department of
Transportation will follow. The objective of the paper is to share these
experiences with other state departments of transportation that are at similar
stages in the implementation of these types of specifications.

Wilellbrock, JH (Pennsylvania State University, University Park) Trans-
portation Research Record No. 529, 1975, pp 60-74, 2 Ref.

PURCHASE FROM: TRB Publications Off. Orig. PC

1A 127336
QUALITY CONTROL OF BITUMINOUS PAVING FROM THE
BEGINNING
The origin of modern controls and the resulting variability was studied in
an effort to develop a better understanding of control systems. Practices
with sheet asphalt in 1900 are mentioned and pavements built under patents
issued to F.J. Warren are described; these include Bitulithic, Warrenite,
Warrenite-Bitulithic, Topexa, and Black Bass. The quality control system
used by the Warren Brothers (illustrated by typical Bitulithic specification)
controlled aggregate gradation, bitumen content, mixing coating, workabil-
ity, overheating and compaction. Important requirements in which federal
specifications differ from Warren specifications include the following: master
ranges for aggregate gradation and asphalt content; job mix formula and
tolerances, including mix temperature delivered to the job; temperature
controls of bitumen aggregate, mixing, and mix at the plant; weather and
limitations, detailed plant requirements; machine laydown; detailed roller
and rolling requirements; and smoothness requirement. Variability by
design is considered and variability in construction is discussed. Patented
pavement, gradation and bitumen content, gradation, asphalt content and
density of modern pavements are detailed. The limitation of variability is
discussed. It is urged that controls should distinguish between satisfactory
and unsatisfactory pavements. Satisfactory control can be maintained
without excluding good construction and unnecessarily increasing costs. Controls should be tailored to accommodate the characteristics of different mixtures, the requirements of the pavement, and the conditions encountered in construction. Either the conventional process control system or the newer end result specifications can be made to function satisfactorily for modern construction.


1A 127337

ACTUAL APPLICATION OF END RESULT SPECIFICATIONS AND THE ROLE OF COMMERCIAL TESTING LABORATORIES IN APPLYING THEM

This report explains what an end result specification may consist of, how it can be applied, and what role commercial testing laboratories can play in applying it. The end result specification as applied on asphaltic concrete mixtures in Louisiana is outlined, and the duties and responsibilities of technicians is discussed. Sixteen projects were evaluated in the study of the effects of end result specifications. It was found that the standard deviation for the percentage of pay per project as based on 100 percent of contract unit price was 1.99 percent at a 95 percent confidence level. This indicates that the contractor should receive at least 95 percent pay at least 95 percent of the time. The total tons of mix evaluated was 544,349, of which 7,223 tons of mix or 1.3 percent resulted in the contractor receiving less than 95 percent of the contract unit price. There were no penalties at 50 percent or more. There was total of 724 lots involved in all of the projects, of which 64 lots resulted in penalties. Approximately 93.7 percent of the failing lots were due to deficiencies in roadway density and only 6.3 percent due to deficiencies in Marshall Stability. End result specification appear to be a satisfactory and workable means of defining the responsibilities of all persons involved, as well as ensuring a quality end product on asphaltic concrete projects.


1A 127797

THE USE OF WASTE AND LOW-GRADE MATERIALS IN ROAD CONSTRUCTION: 2 COLLIERY SHALE

The use of lower-grade and waste materials as alternatives to naturally occurring aggregates in the construction of roads helps to conserve the supplies of good quality aggregates and assists in problems arising from the disposal of unwanted materials. This report is one of a series that is aimed at bringing together the information that is available on each of the major waste products that have roadmaking potential. It deals with colliery shale and it considers the extent to which shale can be used in road construction. The report discusses the types and quantity of shale that are available, the purposes to which it can be put in the various stages of road construction and the tests needed to ensure that shales meet the required specifications.

(A) /TRRL/

Sherwood, PT (TRRL) Transport and Road Research Laboratory R&D Rept. LR 649, 1975, 18 pp. 3 Fig., 10 Tab., 16 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRD 214542)

PURCHASE FROM: Transport and Road Research Laboratory Department of the Environment, Crowthorne, Berkshire RG11 6AU, England Orig. PC

1A 127939

A DESIGNER'S VIEWS: FUNCTIONAL REQUIREMENTS AND LIMITATIONS

The standardization of tunnel equipment is discussed, the potential for saving based on actual and theoretical costs for two tunnels is briefly analyzed, and comments are made on the possibility of adapting a machine to different diameters, and the potential cost saving with regard to linings. It is desirable to standardize the components performing the various functions of the tunnel boring machines, so that they are interchangeable between systems. The effect of standard-size tunnels on projected tunnel design is discussed. Estimates indicate that the system is no clear-cut economic advantage in standardization of tunnel diameter. The possibility of adapting a machine to different diameters depends on whether it is a shield machine or a hard-rock machine. The design of tunnel linings will vary with the depth of the tunnel below ground surface and the quality of the ground. Depending on the purpose of the tunnel, similar design criteria may govern different tunnels and lead to standardization of design: metropolitan tunnels for transit systems; municipal tunnels for water supply and sewage disposal; tunnels shared by several utilities within the same conduit. In types of tunnel with no standardization potential with regard to size, economics could be effected by use of standard specifications for the operations involved in the production and installation of tunnel linings. Work schedule with the sequence from one tunnel to another would lead to savings; designers could ensure that station and ventilation shafts are scheduled. The development of a standardized tunnel lining system for the Bay Area Rapid Transit System is briefly described.


Thom, JG (Bethel Corporation) National Research Council 1975, pp 123-132

PURCHASE FROM: NTIS Repr. PC, Microfiche

1A 128098

CONSTRUCTION STAFFING MANAGEMENT STUDY

Research was planned to develop and test a project and multiple-project management system applicable to surveying, inspection, construction, supervision and documentation of rural freeway construction; and to make the research techniques, principal findings and management system available for use by state highway departments. A work plan is detailed which indicates the system approach being used to attain these objectives. Details are also given of a model construction management system to field construction employees that has been tested on three research laboratory projects. The basic elements of the system are: staffing, scheduling, reporting and controlling. The preliminary results are set forth. The implementation of the System will be completed in 3 phases: rural freeway implementation; system extension; and supporting systems.


1A 128435

SPECIFICATION PREPARATION METHODS—STATE OF THE ART

This report presents the state of the art in construction specification preparation methods. Special emphasis is given to computerized preparation systems. The report: (1) explains the approach used to identify the current preparation methods; (2) discusses the response and analysis to a Construction Specifications Institute (CSI) membership state-of-the-art survey; (3) compares computerized preparation systems; (4) presents the results from a cost analysis study; (5) summarizes the results and conclusions and makes recommendations.


1A 128662

PEAVMENT SMOOTHNESS

The opinion is expressed that rough pavements are produced because the contractors attention to smoothness has been diverted by increased rates of production, OSHA and other factors, and also because designers and specification writers have imposed requirements for administrative and other reasons that detract from the contractors capability to produce a smooth pavement. The contractors responsibilities are to provide equipment in good condition, provide competent operators, and direct management, supervisory and operating efforts to build smooth pavements. The responsibilities of the state or other agencies are listed. It is emphasized that both the contractor and the state and other agencies must think, plan and pave for smoothness.

53
Foster, CR Paving Forum Sept. 1975, p 18

1A 128800 DEMONSTRATION PROJECT NO. 34, CATHODIC PROTECTION

In an effort to acquaint field personnel with the theory of cathodic protection and assist in the design, construction and operation of a cathodic protection system, a demonstration project is being offered which will include an introductory slide presentation, assistance in development of a work plan and work schedule, assistance in locating material sources, assistance in the electronic circuitry and system design, and assistance during construction and post construction evaluation periods. Cathodic protection involves the external application of a direct current to the surface of the top mat of steel in sufficient amounts to overcome the internal current flow between the anode and cathode. A sacrificial anode is provided and allowed to corrode and the reinforcing steel becomes the cathode. Cathodic protection (CP), has been used for many years to control corrosion of buried pipe lines and structures in salt water environments, to protect piers, pilings and other underground installations. Promising results have been obtained in test installations of CP systems on bridge decks to control corrosion of the reinforcing steel.

Federal Highway Administration 2 pp

1A 129021 CONTRACTUAL RELATIONSHIPS IN CONSTRUCTION

The different types of contractual relationships prevalent in construction today are considered from the owner's, consultant's, contractor's, and legal viewpoints. The principal contractual relationships considered are general contractor, turnkey, construction manager, and independent prime contracts. /ASCE/ Presented at the April 9-13, 1973, ASCE National Structural Engineering Mtg, San Francisco, Calif.

Smith, SE (California Department of Water Resources); Wilson, WW (Metcalf and Eddy); Burns, WC (Morris and Knudsen Company); Rubino, RA (Greenbeer, Truyman, Harris, Cantor, Reiss & Blasky) ASCE Journal of the Construction Division Proceeding Vol. 101 No. C04, ASCE $811776, Dec. 1975, pp 907-921, 2 Fig., 2 Tab.

1A 129025 ROCK ANCHORS-STATE OF THE ART PART 2: CONSTRUCTION

Anchor construction techniques related to drilling, flushing, water testing, tendon preparation and installation, grouting and finally corrosion protection are discussed with emphasis on quality control and close on-site supervision. The drilling methods detailed include rotary drills and percussive drills. The choice of drilling method and drilling equipment are discussed. Drilling rates, flushing and alignment deviation are also reviewed. Water testing is described and recommendations are presented regarding waterproofing. The storage and handling of anchor tendons are discussed and recommendations are made regarding the avoidance of mechanical damage and corrosion. Comments are made with regard to the fabrication of anchors with multiflats or multiwire tendons, and the fixing and location of spacers and centralisers. Housing details are outlined.

Littlejohn, GS Bruce, JD (Aberdeen University, Scotland) Ground Engineering Vol. 8 No. 5, Sept. 1975, pp 34-45, 3 Fig., 6 Tab.

1A 129113 PLANNING UNDERGROUND CONSTRUCTION OPERATIONS

The modern under ground constructor faces economic and competitive conditions which demand exacting planning, logistics and scheduling: the most efficient operation methods and equipment known; and realistic, comprehensive, analytical risk evaluation with adequate contingencies or other protection. Planning can usually be separated into two phases: preconstruction and during construction. Preconstruction work includes a thorough review and familiarization with engineering and contract documents, site investigations, evaluating such local conditions as weather and labor supply, selection of construction methods and equipment, and preparation of detailed cost estimates. During construction, planning encompasses preparation of detailed work schedules, cost controls, and contingency plans.


1A 129453 ROAD CONSTRUCTION GUIDE [Guide de Construction Routiere]

This second edition of the Road Construction Guide offers the necessary requirements for road construction to enable it to adequately serve the road user during its design life. The fundamental principals and complete and well stated. This construction guide outlines the exact requisites in an understandable and usable fashion. It outlines the specification with respect to pavement, soils, materials and construction. /RTAC/ [French]

Tessier, GR Quebec Ministry of Transport, Canada Text Book 1973, 218 pp, 42 Fig., Tabs., 24 Phot.

ACKNOWLEDGMENT: Roads and Transportation Association of Canada PURCHASE FROM: Roads and Transportation Association of Canada 1765 St Laurent Boulevard, Ottawa, Ontario KIG 3V4, Canada Repr. PC

1A 200102 CPM IN CONSTRUCTION MANAGEMENT, SCHEDULING BY THE CRITICAL PATH METHOD

THE BASIC FUNDAMENTALS OF THE CRITICAL PATH METHOD /CPM/ AND PROGRAMME EVALUATION REVIEW TECHNIQUE /PERT/ SYSTEMS ARE PRESENTED, INCLUDING THE PREPARATION OF ARROW DIAGRAMS AND THE USE OF COMPUTER AND MANUAL CPM CALCULATION. PRACTICAL APPLICATIONS ARE DISCUSSED. /RRL/

Obrien, JJ McGraw Hill Book Company 65

ACKNOWLEDGMENT: Road Research Laboratory /UK/

1A 200117 PREQUALIFICATION REQUIREMENTS

THE PREQUALIFICATION OF CONTRACTORS BY THE ONTARIO DEPARTMENT OF HIGHWAYS STARTED IN 1956. THIS PAPER ASSESSES THE RESULTS OF THE SYSTEM AND DESCRIBES THE REVISED PREQUALIFICATION FORMULA IN USE. PREQUALIFICATION PROVIDES A PROCEDURE WHICH ENABLES GOVERNMENT DEPARTMENTS TO MAKE AN IMPAR­TIAL AND OBJECTIVE DETERMINATION, AT THE TIME TENDERS ARE CALLED ON A PROJECT, OF THE CONTRACTORS FROM WHOM BIDS WILL BE ACCEPTED. IT ALSO PROVIDES AN EFFECTIVE INSTRUMENT OF CONTROL OVER THE PERFORMANCE OF SUCCESSFUL BIDDERS. THE SYSTEM RE­QUIRES THAT THE FINANCIAL RESOURCES, INITIAL EXPERI­ENCE AND TECHNICAL ABILITY AND THE DAY-TO-DAY DEMONSTRATED EXPERIENCE AND TECHNICAL ABILITY OF A CONTRACTOR CAN BE IMPARTIALLY AND OBJECTIVELY MEASURED IN TERMS THAT CAN BE RELATED TO THE ACCEPTABILITY OF A CONTRACTORS BID. THE ONTARIO ASSESSMENT PROCEDURES AND PENALTIES ARE DESCRIBED IN THE PAPER. /CGRA/

Obrien, JJ Canadian Good Roads Association Proc P318-323, Oct. 1964

1A 200302 OPTIMAL CONSTRUCTION STAGING BY DYNAMIC PROGRAMMING

THE TECHNIQUE OF DYNAMIC PROGRAMMING IS PRE­SENTED AS A METHOD OF OPTIMIZING THE STAGING SE­QUENCE OF URBAN HIGHWAY IMPROVEMENTS. THE TECHNIQUE PROVIDES A METHOD OF DETERMINING THE OPTIMAL SEQUENCE OF HIGHWAY IMPROVEMENT FROM THE MANY SEQUENCES THAT ARE POSSIBLE AN EXAMPLE URBAN FREEWAY SYSTEM IS USED TO DEMONSTRATE THE TECH­NIQUE OF DYNAMIC PROGRAMMING. THE OPTIMAL SE­QUENCE OF STAGING DECISIONS FOR TWO DECISION SETS ARE DETERMINED. /AUTHOR/
OF A PRIVATE COMPANY WITH FULL AUTONOMY TO CONTRACTORS TO UNDERTAKE CONTROL OF THEIR OWN PROGRAMMING. J. A. LAGARDA BASIC INFORMATION NEEDED FOR SOUND CAPITAL INVESTMENT PLANNING, PHILIP M. DONNELL ACCOUNTING AND BUDGETING REQUIREMENTS FOR ADVANCE CONSTRUCTION PROGRAMS, EUGENE C. HOLSHOUSER THE CASE FOR CAPITAL BUDGETING IN THE STATE HIGHWAY DEPARTMENTS, EUGENE C. HOLSHOUSER PRIORITY ANALYSES—PROJECT SELECTION PHYSICAL AND ECONOMIC RATING METHODS FOR PRIORITY CONSIDERATIONS, M. EARL CAMPBELL BALANCING OF PHYSICAL AND ECONOMIC RATINGS WITH OTHER CONSIDERATIONS TO ESTABLISH PROJECT PRIORITIES, ARTHUR C. ENGLAND SCHEDULING LETTING DATES FOR SPECIFIC PROJECTS COORDINATING THE HIGHWAY CONSTRUCTION SCHEDULE WITH ALL AGENCIES CONCERNED, JOHN A. SWANSON THE ROLE OF TIME AND MONEY AS RELATED TO CONSTRUCTION SCHEDULES, WILLIAM B. BIDELL CONTROL AND ADJUSTMENTS OF CONSTRUCTION SCHEDULE, M. J. WALKER ADMINISTRATION AND MANAGEMENT HIGHWAY PROGRAMMING LAW, DAVID R. LEVIN ADMINISTRATIVE REQUIREMENTS FOR HIGHWAY CONSTRUCTION PROGRAMMING, W. F. BABCOCK PUBLIC RELATIONS ASPECTS OF HIGHWAY CONSTRUCTION PROGRAMMING, DONALD M. BROWN SUMMARY AND SYNTHESIS FORMULATING HIGHWAY CONSTRUCTION PROGRAMS. A CASE STUDY AND SUMMARY, CLINTON H. BURNES

Highway Research Board Special Reports 1961

1A 200420

STATISTICAL SPECIFICATIONS IN BITUMINOUS CONCRETE HIGHWAY CONSTRUCTION THE NEED FOR STATISTICALLY ORIENTED ACCEPTANCE PLANS BY HIGHWAY DEPARTMENTS, AND FOR CONTROL PROCEDURES BY CONTRACTORS IS EVIDENT IN THE INCREASED DISCUSSION GIVEN THESE MATTERS IN HIGHWAY-ORIENTED MEETINGS FROM COAST TO COAST. ALTHOUGH SOME STATISTICAL SPECIFICATIONS ARE USED IN THE HIGHWAY INDUSTRY AT PRESENT, MANY MORE ARE NEEDED. THE DELAY IN ADOPTING THESE PROCEDURES HAS STEMMED FROM A RELUCTANCE ON THE PART OF HIGHWAY AGENCIES, BOTH FEDERAL AND STATE, TO PART WITH THEIR TRADITIONAL METHODS AND THE RELUCTANCE OF CONTRACTORS TO UNDERTAKE CONTROL OF THEIR OWN PROCESSES. THE STEPS BEING TAKEN BY MOST HIGHWAY AGENCIES IN IMPLEMENTING STATISTICAL SPECIFICATIONS AS WELL AS MOST OF THE IMPORTANT ITEMS IN ASPHALTIC CONCRETE SPECIFICATIONS ARE MENTIONED. /AUTHOR/

Hughes, CS Materials Research and Standards Oct. 1970

1A 200681

A STUDY TO DEVELOP METHODS FOR IMPROVING THE TRAINING OF CONSTRUCTION AND MATERIALS INSPECTORS

THIS REPORT AND TRAINING MANUAL PROVIDE A COMPREHENSIVE TOOL FOR TRAINING AND DEVELOPING CONSTRUCTION AND MATERIALS INSPECTORS. THE REPORT WAS QUITE BRIEF BUT WAS SUPPLEMENTED BY THE COMPREHENSIVE TRAINING MANUAL. RECOMMENDATIONS WERE CONTAINED IN THE REPORT TEXT. THE TRAINING MANUAL INCLUDED SECTIONS ON SURFACE GEOLOGY, SOILS AND SOIL TESTING, COMPACTION, EARTHWORK, SUBBASES AND BASES, CONCRETE PAVEMENTS, STRUCTURES AND BITUMINOUS PAVEMENTS. /BPR/

Mississippi State Highway Department 1966

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4824442 66)

1A 200686

TRAINING OF INSPECTORS AND SUPERVISORS FOR THE CONSTRUCTION INDUSTRY


Stanners, JE Canadian Good Roads Association Proc Oct. 1964

1A 200399


Highway Research Board Special Reports 1961
DETERMINING MANPOWER NEEDS FOR CONSTRUCTION INSPECTION

A manpower management objective was adopted by the North Dakota Department of Highways to (1) relate manpower to work loads in the construction inspection and materials testing functions, (2) express those relationships in terms of standard staffing patterns for standard work activities, (3) develop ways of reducing the standard staffing complements inssofar as possible in order to increase the salary levels of the persons employed, (4) predict future manpower needs, and (5) develop manpower plans, programs, and policies based on future needs. A research project was undertaken to accomplish the manpower management objective. The study approaches used and the results obtained are discussed in this paper. /Author/

Spier, EG Bell, GL  Highway Research Record, Hwy Res Board  1969

DEVELOPING PROGRAMMED LEARNING COURSES FOR HIGHWAY CONSTRUCTION INSPECTION TRAINING

The characteristics of programmed learning and the way they lend themselves to the area of construction inspection training are described. The purposes of this paper are (1) to demonstrate the efficiency of programmed learning, (2) to describe the limits of potential of this teaching process, and (3) to show the need for management, understanding, and involvement in all stages of development. More programmed learning efforts fail during their administration than in any other stage of their development. Some efforts fail for natural reasons: a poor program. For the most part, however, the majority of the efforts fail because management could not or did not see what programming really involved. The Virginia Department of Highways has developed several programmed courses. The use of which has proven highly successful as a result of the implementation of this training device, 90-plus percent of all new construction inspector trainees receive training in mathematics, plan reading, specifications and standards, and fundamentals of leveling within 6 months of employment. /Author/

Miller, AL  Highway Research Record, Hwy Res Board  1969

DEVELOPING SUBJECT MATTER AND A DECENTRALIZED ORGANIZATION FOR HIGHWAY CONSTRUCTION INSPECTION TRAINING

Factors affecting the initiation of a formal training program for construction inspection personnel are identified. The organizational structure of a highway training system is described. Requisite characteristics of the training personnel are detailed, along with duties and responsibilities of the different job positions. A systems approach to training was adopted. The approach was based on the findings of a training needs study. Some significant findings of the training needs study that contributed to the initiation of a systems approach were the identification of the construction inspection job elements and the knowledge, skill-ability combinations needed to perform specific jobs. Problems related to the development of meaningful, accurate, and complete subject matter are described. The approach to subject matter development, with awareness of the inherent problems of the Louisiana Department of Highways, is given. This approach includes the collection of basic data from field personnel, official documents, and manuals of reference, and the review and approval of these data by an authoritative committee of department engineers. /Author/

Guilbeau, LH  Highway Research Record, Hwy Res Board  1969

EDUCATIONAL NEEDS FOR RIGID PAVEMENT

The changing picture in Portland cement concrete pavement construction practices is presented and some suggestions are offered on needed programs of continuing education and training. Communications are discussed as a tool for teaching a skill. The Portland Cement Association, National Ready Mix Concrete Association and the American Concrete Institute are working with the Department of Health, Education and Welfare to develop a 2-year curriculum and materials for training workers in concrete technology and various job classifications. The first phase of the program is intended to: (1) provide course content and teaching guides for an area of vocational education where no such training exists, (2) broaden employment opportunities in an expanding industry for non-academic post-high school youth, (3) provide new avenues of employment for persons from socially or economically disadvantaged groups, and (6) initiate vocational education training programs to fill the manpower needs of the cement and concrete industries. The second phase of the program will be a 2-year pilot program to provide through field tests the level of training for which the basic curriculum is designed. Adaptation of curriculum materials developed in the first phase for other levels of vocational education and welfare and for training programs for specific occupations will be accomplished in the third phase. It is advised that there are needs for several kinds of efforts in continuing education for better building of Portland cement concrete pavements. Suggestions are for better management at the top, better supervision, better operation of equipment, better specifications, and better inspection which can all be obtained through continuing education.


EDP ON THE JOB-BETTER INFORMATION FOR BETTER PROJECT MANAGEMENT

Successful contractors are using automatic data processing systems to provide current information on progress and costs. Computers can furnish the time status reports that are complete, accurate and up-to-date. EDP is used in estimating the contract by: (1) determining components, complexity in looking up prices, and (2) classifying and printing the final estimate. The quantity take-off from the original blueprint must still be done by an estimator, but the computer is of great help in reducing the time consumption of the process as well as simplifying the many updates. The typical estimating procedure is presented with illustrations. The critical path method is used for contract scheduling with help of EDP. The program evaluation and review technique (PERT) and CPM techniques are used in project planning and scheduling with computer programs doing the paper work. A recently introduced com-

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PUTER PROGRAM, CALLED THE PROJECT CONTROL SYSTEM (PCS), CAN ACCEPT INPUT DATA EITHER FOR PERT/CPM OR PRECEDENCE NETWORKS. THE REPORTS PRODUCED BY THE PCS PROGRAM MAY COVER THE ENTIRE PROJECT NETWORK OR ANY PORTION OF IT. LABOR AND MATERIALS CONTROL OF COMPLETED TOWERS AND THE CENTRALIZATION OF THE DATA PROCESSING CENTER, TWO-WAY TERMINALS, AND HOME OFFICE USED TODAY, CAN BE PLACED AT JOB SITES AND IS CAPABLE OF INPUT AND OUTPUT WITH PUNCH CARS OR TYPWRITERS. A VISUAL DISPLAY TERMINAL CAN PROVIDE THE MANAGER WITH DIRECT ACCESS TO THE COMPUTER TO REQUEST AN IMMEDIATE REPORT ON THE RESULTS.


1A 202518 ECONOMIC CONSIDERATIONS OF QUALITY CONTROL FOR ROAD CONSTRUCTION

This paper describes the essential features of a comprehensive scheme for the rational application of quality control in many construction companies. Methods of statistical quality control are developed to determine the optimum values from economic consideration of the sample size, and the percentage defect associated with the acceptance limit. The relation between gain and the degree of compliance is studied and the results are of interest to both the contractor and the client. The availability of the required cost data is also discussed. /Author/ TRRL/

Kuehn, SH Burton, RW Slavik, MM Civil Engineer /S Africa/ Vol. 14 No. 8 Aug. 1972, pp 261-8 15 Fig. 6 Tab. 4 Ref

Acknowledgment: Transport & Road Research Lab /UK/

1A 205310 PROGRESS REPORT ON THE ESTABLISHMENT OF TOLERANCES IN HIGHWAY CONSTRUCTION SPECIFICATIONS

Highway engineers and contractors are being criticized for deviations from specifications, even though in many instances there are sound engineering reasons for non-compliance. This problem underscores the need for tolerance on specifications. This is a progress report on the establishment of these tolerances. /Author/

Moss, JP Highway Research Record, Hwy Res Board 1965

1A 205350 A STUDY OF MISALIGNED DOWELS IN CONCRETE PAVEMENTS

A laboratory investigation was made to measure the effects of misaligned dowels (load transfer devices) on the force necessary to separate two connected slabs. Thirty-eight specimens, 3-feet wide, 3 1/2 Feet long, and 10-inches thick were cast and tested at 2 and 7 days age. Three 1 1/4 IN X 16 IN. DOWEL BARS WERE PLACED AT THE MIDDLE OF THE SPECIMEN. THE DOWELS WERE PLACED ON 1-FOOT CENTERS AND THE 2 OUTER DOWELS WERE ALIGNED PERPENDICULAR TO THE JOINT FACE. THE CENTER DOWEL WAS MISALIGNED UP TO 3 INCHES HORIZONTALLY AND UP TO 1 INCH. MOVEMENTS IN THE OTHER TWO DIRECTIONS ARE ALSO PRESENTED. THE MEASURED FORCES ARE ADJUSTED FOR DIFFERENT CONCRETE STRENGTHS AND ARE PLOTTED AGAINST THE MAGNITUDE OF THE MISALIGNMENT. IT WAS FOUND THAT (1) THE FORCE REQUIRED TO PRODUCE A SHINGLE OPENING VARIED AS A FUNCTION OF THE MISALIGNMENT, (2) VERTICAL MISALIGNMENTS ARE THE MOST CRITICAL AND HORIZONTAL THE LEAST SEVERE, (3) 1/4 INCH VERTICALLY OR 3/4 INCH HORIZONTALLY APPEAR TO BE TOLERABLE FOR A 1/2 INCH OPENING, (4) A 1 INCH VERTICAL MISALIGNMENT CAUSES SIGNIFICANT SURFACE SPALLING AT EARLY CONCRETE AGES, (5) MISALIGNMENTS CAUSE CONCRETE CRUSHING ON THE NEARING SURFACES, AND (6) THE DOWEL LUBRICANT APPEARS TO BE A SIGNIFICANT VARIABLE IN DOWEL ACTION. THE RESULTS COULD BE USED TO PROVIDE MEANINGFUL VALUES FOR TOLERANCE DOWEL MISALIGNMENTS IN CONSTRUCTION SPECIFICATIONS. /Author/

Segner, EP Cobb, JR Alabama University, Alabama State Highway Department Aug. 1967

Acknowledgment: Bureau of Public Roads /US/ (4612214 67)PB 178 224, 1C25021054

1A 205961 LOCATION AND NUMBER OF BORINGS IN SAMPLING FOR PAVEMENT CONTROL CONSTRUCTION /IN PORTUGUESE/

SAMPLING FOR THE DESIGN, CONSTRUCTION CONTROL, AND REINFORCEMENT OF PAVEMENTS IS BASED ON THE NATIONAL HIGHWAY DEPARTMENT (DNER) MANUAL ON CONSTRUCTION CONTROL OF PAVEMENTS. RANDOM NUMBERS ARE USED TO PICK SITES FOR BORINGS. AN EXAMPLE IS GIVEN, AND THE BENEFITS AND INCONVENIENCES OF THE PROPOSED METHOD ARE DISCUSSED. /RRI/

Batista, CN Road Research Institute /Brazil/ July 1971

Acknowledgment: Road Research Institute /Brazil/

1A 206454 APPLICATION OF DEFLECTIONS AND DEFLECTION BASINS TO CONSTRUCTION CONTROL, PAVEMENT DESIGN, AND MAINTENANCE REQUIREMENTS-FINAL REPORT

There is a need to define not only the magnitudes of the deflection measurements but to use also the shape of the deflection basin. For this reason, three parameters are used to describe the basin curve, the numerical value of the dfaaflct marketing first sensor, surface curvature index (SCR), the numerical between the first and second sensors, and base curvature index (BCR), the numerical difference between the fourth and fifth sensors. By observing the DMD, SCI, and BCI, a total picture is available of the structural capability of the measured pavement structure. Computer programs utilize an IBM 360 computer and CALCOMP plotter in the analysis of the deflection basin shape as well as in the temperature and layer equivalency studies. In the temperature study conducted, it was the objective to find a temperature correction factor for use in eliminating temperature as a variable in deflection measurements. Literature was reviewed, and a data collection plan conceived and implemented. It was found that the deflection-temperature relationship could not be separated from the many other variables involved. It was also indicated in the results that variables such as age and seasonal variation have large effect on the temperature-deflection curves. An overlay design procedure was established which used the measured deflection on a weak pavement and the traffic information for that road section to find the
REQUIRED OVERLAY THICKNESS. THIS THICKNESS COULD ALSO BE CONVERTED TO A REQUIRED STRUCTURAL NUMBER AND THEN BASED ON THIS NUMBER A RECOMMENDATION MADE. THE DESIGNER COULD USE THIS INFORMATION TO STRENGTHEN THE ROADWAY. IT WAS FOUND IN REGARD TO EMBANKMENT HEIGHT THAT THERE COULD BE FOUND IN AREAS OF WEAK SUBGRADE A MINIMUM EMBANKMENT FILL WHICH THE PROFILE DESIGNER COULD USE WITHOUT FEAR OF INADEQUATE SUPPORT. THE DYNASET FILL WAS FOUND TO BE INADEQUATE FOR CONSTRUCTION CONTROL. THE FACTORS, RESILIENCE, AGE OF SURFACING, SOIL SUPPORT, AND VOLUME OF TRAFFIC, WERE TREATED BRIEFLY. RESILIENCE WAS FOUND NOT TO EXHIBIT THE STATE-WIDE VARIATION WHICH WAS ANTICIPATED AT THE TIME OF THE ORIGINAL PROPOSAL. FOR THIS REASON IT WAS NOT GIVEN THE SIGNIFICANCE OF SOME OF THE OTHER FACTORS. AGE OF SURFACE, SOIL SUPPORT, AND VOLUME OF TRAFFIC ARE INCLUDED IN A FIVE YEAR STUDY IN WHICH NO DEFINITE CONCLUSIONS HAVE BEEN REACHED AT PRESENT. DENSITY WAS STUDIED QUALITATIVELY AS WAS MOISTURE. INDICATIONS THAT THESE FACTORS DO AFFECT DEFLECTION MEASUREMENTS ARE PRESENT. HOWEVER, MORE WORK IS NEEDED IN THESE AND OTHER AREAS TO FIND MORE PRACTICAL USES FOR THE DYNASET.

ACKNOWLEDGMENT: Federal Highway Administration (462102271) REPORT PENDING. 2C2602256

1A 206464
DEVELOPMENT OF A SYSTEM FOR HIGH-SPEED MEASUREMENT OF PAVEMENT ROUGHNESS /FINAL REPORT/

DETAILED DISCUSSIONS OF RESEARCH ACTIVITIES DURING THIS PAST YEAR, NOT COVERED IN PAST REPORTS, ARE PROVIDED. THESE DISCUSSIONS INCLUDE WHEEL REPLACEMENT INVESTIGATIONS, RESEARCH ACTIVITIES IN CONSTRUCTION CONTROL, SPECTRAL ANALYSIS METHODS, MAYS ROAD METER CORRELATION STUDIES, AND PSI MODEL INVESTIGATIONS. SPECIAL EMPHASIS IS PLACED ON NEW METHODS FOR USING SPECTRAL ANALYSIS FOR IDENTIFICATION OF VARIOUS ROAD PROFILE CHARACTERISTICS. EXTENSION OF THESE NEW METHODS MAY PROVIDE THE BEST APPROACH VERSUS DEVELOPMENT OF AN INEXPENSIVE REPLACEMENT ROAD PROFILE SPECIFICATIONS AND CONSTRUCTION CONTROL.

AUTHOR:

Walker, RS Hudson, WR Roberts, FL Texas University, Austin, Federal Highway Administration /US/, Texas State Department of Highways & Public Tramp Study No 73-5f

ACKNOWLEDGMENT: Federal Highway Administration (47233971)NTIS PB 204 270, 2C26022719

1A 206486
DEFLECTION ANALYSIS OF FLEXIBLE PAVEMENTS

THREE PARAMETERS ARE USED TO DESCRIBE THE DEFLECTION BASIN CURVE: (1) DYNASET MAXIMUM DEFLECTION, (2) CHARTURE INDEX, AND (3) BASE CURVATURE INDEX. MEASUREMENTS PROVIDE A MEANS OF ANALYZING THE BEHAVIOR OF THE PAVEMENT STRUCTURE. THE IBM 360 COMPUTER AND CALCOMP PLOTTER WERE USED IN THE ANALYSIS OF THE DEFLECTION BASIN SHAPE AS WELL AS IN TEMPERATURE AND LAYER EQUIVALENCY STUDIES. THE OBJECTIVE OF THE TEMPERATURE STUDY WAS TO FIND A CORRELATION BETWEEN THE INDEX NUMBER AND THE TEMPERATURE OF THE PAVEMENT. IT WAS FOUND THAT THE DEFLECTION-TEMPERATURE RELATIONSHIP COULD NOT BE SEPARATED FROM THE MANY OTHER VARIABLES INVOLVED, AND (2) THAT VARIABLES SUCH AS AGE AND SEASONAL VARIATION HAD A LARGE EFFECT ON THE TEMPERATURE-DEFLECTION CURVES. IN THE AREAS OF LAYER EQUIVALENCE, EMBANKMENT HEIGHT, OVERLAY DESIGN AND CONSTRUCTION CONTROL, A COURSE OF INEXPENSIVE USEFUL INFORMATION WAS ACCRUED. AN OVERLAY DESIGN PROCEDURE BASED ON DEFLECTION WAS ESTABLISHED. AREAS OF WEAK EMBANKMENT COULD BE DETECTED PRIOR TO INITIAL SURFACING ALLOWING CORRECTIONS TO BE MADE. ALSO, MINIMUM EMBANKMENT FILL COULD BE DETERMINED WHICH THE DESIGNER COULD USE WITHOUT APPREHENSION. USING THE DYNASET FOR CONSTRUCTION CONTROL INCORPORATED ALL LEVELS OF CONSTRUCTION. THE AIM OF THE OBJECTIVE WAS TO BE UTILIZED SATISFACTO­RILY ON EMBANKMENT MATERIALS, THE EMBANKMENT MUST BE GRADED TO A SMOOTH SURFACE TO ALLOW ACCESS TO THE TEST AREA. RESILIENCE, AGE OF SURFACING, DENSITY, MOISTURE, SOIL SUPPORT, AND VOLUME OF TRAFFIC ARE TREATED BRIEFLY. RESILIENCE WAS FOUND NOT TO EXHIBIT THE STATE-WIDE VARIATION THAT HAD BEEN ANTICIPATED FOR THIS REASON RESILIENCE WAS ELIMINATED AS A SIGNIFICANT FACTOR. AGE OF SURFACE, SOIL SUPPORT, AND VOLUME OF TRAFFIC ARE INCLUDED. /FHWA/

Peterson, G Shepherd, LW Utah State Department Highways Jan. 1972, 137 pp

ACKNOWLEDGMENT Federal Highway Administration NTIS PB 210 044, 3C26022992

1A 207038
DEVELOPMENT OF A CONSTRUCTION CONTROL PROFILOGRAPH

DUE TO AN INCREASING AWARENESS OF THE IMPORTANCE OF PAVEMENT ROUGHNESS AT THE TIME OF CONSTRUCTION, A PROFILOGRAPH FOR MEASURING CONSTRUCTION ROUGHNESS WAS DEVELOPED AND OBTAINED. THE PROFILOGRAPH UTILIZED WAS DESIGNED AND FABRICATED BY RAINHART COMPANY OF AUSTIN, TEXAS. THE PROFILOGRAPH FEATURED (1) TWELVE AVERAGING WHEELS ARRANGED IN A SYSTEMATIC METHOD, (2) EQUALLY SPACED AVERAGING WHEELS, BOTH LONGITUDINALLY AND TRANS­VERSALLY, (3) A RECORDER ESPECIALLY DESIGNED TO EMIT BOTH A GRAPhICAL PROFILE AND A DIGITAL ROUGHNESS INDEX NUMBER, AND (4) OUTRIGGER WHEELS ALLOWING THE PROFILOGRAPH TO BE TOWED TO VARIOUS TESTING LOCATIONS WITHOUT DISASSEMBLY. STUDIES OF THE INFLUENCE OF TEXTURE IN PAVEMENT ROUGHNESS WERE MADE LEADING TO A MODIFICATION IN THE PROFILOGRAPH RECORDING MECHANISM. A 0.1-INCH FILTER BAND WAS UTILIZED TO REDUCE THE INFLUENCE OF TEXTURE IN PAVEMENT ROUGHNESS MEASUREMENTS. BASED ON FIELD STUDIES WITH THE 0.1-INCH FILTER BAND A PROFILE INDEX OF 26 INCHES PER MILE WAS DETERMINED AND A SUGGESTED SPECIFICATION WAS WRITTEN EMPLOYING A MAXIMUM PROFILE INDEX AND A MAXIMUM SINGLE PEAK DEVIATION.

AUTHOR:


1A 207395
PRACTICAL USES OF SPECTRAL ANALYSIS WITH SURFACE DYNAMICS ROAD PROFILER

A BRIEF DESCRIPTION OF SPECTRAL AND COHHERENCE ANALY­SES IS PROVIDED. ALONG WITH SOME PRACTICA EXAMPLES OF THEIR USE. THE FIRST APPLICATION IS AN INVESTIGATION OF DIFFERENCES BETWEEN AN INEXPENSIVE REPLACEMENT ROAD-FOLLOWING WHEEL AND THE STANDARD WHEEL THAT COMES WITH THE PROFILOMETER. THE SECOND EXAMPLE INVOLVES CONSTRUCTION CONTROL AND IDENTIFICATION OF DIFFERENCES BETWEEN 2 METHODS FOR LAYING ASPHALTIC BASE MATERIALS. BOTH OF THESE INVESTIGA­TIONS INVOLVED STATISTIcALLY DESIGNED EXPERIMENTS SO THAT MORE RELIABLE CONCLUSIONS COULD BE OB­TAINED AND CONFIDENCE LIMITS DEFINED. SLOPE VARI­ANCE AND ROUGHNESS INDEX STATISTICS WERE EXAMINED AND COMPARED WITH THE SPECTRAL AND COH...
TERMINE THE QUALITY CHARACTERISTICS OF CURRENT CONSTRUCTION. MANY STATES HAVE BEEN MEASURING VARIATIONS IN ACCEPTED BITUMINOUS PRODUCTION. IT HAS BEEN FOUND THAT THE PRODUCTION OF HIGH QUALITY BITUMINOUS PAVEMENT REQUIRES THE DILIGENCE OF THE PRODUCER, THE CONTRACTOR AND THE CONTRACTING AGENCY. THE STATISTICALLY MEASURED VARIATIONS OF ACCEPTED CONSTRUCTION INDICATE THAT MUCH MORE VARIABILITY EXISTS THAN IS REVEALED BY THE USUAL ACCEPTANCE TESTS. VARIATIONS IN EXCESS OF THOSE NORMALLY EXPECTED FOR GOOD PRACTICE WERE PREVALENT ON ALMOST EVERY JOB STUDIED. LARGE SAMPLING AND TESTING ERRORS VIRTUALLY PREVENT A TRUE EVALUATION OF THE MATERIAL VARIATION ON A SPECIFIC JOB. IT IS DIFFICULT TO ASSESS THE DEGREE TO WHICH VARIATIONS AFFECT ACTUAL PAVEMENT PERFORMANCE. RESEARCH RESULTS INDICATE THAT MUCH IMPROVEMENT COULD BE OBTAINED AND TESTING LOAD REDUCED BY THE FOLLOWING CHANGES: (1) ADJUST TOLERANCE LIMITS ON GRADE TO CONFORM TO THE PRINCIPLE OF MOST TOLERANCE ON LARGEST RETAINED ON A SIEVE, (2) CONTROL THE UNIFORMITY OF GRADE OF THE MIXTURE BY HOT BIN SIEVE TESTS, WHEN A PRINTED RECORD OF BATCH WEIGHTS IS AVAILABLE, (3) REDUCE TO A MINIMUM THE NUMBER OF SIEVES USED FOR TESTING, (4) EXERCISE MORE DILIGENCE IN THE TRAINING AND SURVEILLANCE OF OPERATORS PERFORMING CONTROL AND ACCEPTANCE TESTS, (5) REQUIRE INSTALLATION OF AUTOMATIC FEATURES ON ASPHALT PLANTS AND FINISHERS TO REDUCE HUMAN ERROR, AND (6) USE RANDOM SAMPLING TO OBTAIN ALL TEST PORTIONS.


1A 211467 ASPHALT PAVING TECHNOLOGY-SOME CURRENT DEVELOPMENTS AND TRENDS

A BRIEF SUMMARY IS PRESENTED OF RESEARCH AND DEVELOPMENT TRENDS IN THE DESIGN, CONSTRUCTION AND PERFORMANCE OF ASPHALT PAVEMENTS. IMPROVEMENT EFFORTS HAVE INCLUDED ACTIVITIES RELATED TO: (1) DEVELOPMENT OF IMPROVED SPECIFICATIONS FOR ASPHALT, (2) MEASUREMENT OF THE RESPONSE CHARACTERISTICS OF ASPHALTS AND ASPHALT MIXTURES IN MORE FUNDAMENTAL TERMS, (3) ANALYSIS OF SYSTEMS REPRESENTATIVE OF ASPHALT PAVEMENT STRUCTURES WITH SOME APPLICATIONS TO OTHERS USED FOR CONTROL, INCLUDING THICK-LIFT ASPHALT CONCRETE, USE OF PNEUMATIC-TIRED ROLLERS, AND INCREASED MIXTURE PRODUCTION CAPABILITIES, AND (5) CONSTRUCTION CONTROL INCLUDING STATISTICAL SPECIFICATIONS AND IMPROVED CONTROL OF THE COMPACTION OPERATION THROUGH ESTABLISHMENT OF COMPACTION EFFORT BY MEANS OF SMALL TEST SECTIONS, PAVEMENT PERMEABILITY MEASUREMENTS, OR NUCLEAR MEASUREMENTS ON CONTRACTS WHICH USE AUTOMATIC FEATURES ON ASPHALT PLANTS AND FINISHERS TO REDUCE HUMAN ERROR. AN EXAMPLE IS PRESENTED TO DESCRIBE THE RESULTS OF SOME OF THESE STUDIES THAT HAVE BEEN UTILIZED TO DEVELOP A PAVEMENT DESIGN FOR A CITY-COUNTY HIGHWAY IN CALIFORNIA. TRENDS ILLUSTRATED IN THE EXAMPLE ARE THESE OF FIXED SECTIONS OF ASPHALT CONCRETE, PARTICULARLY FOR HEAVY DUTY HIGHWAYS, THE USE OF THEORY TO ASSIST IN DESIGN AND COMPACTATION, THE USE OF AUTOMATIC FEATURES ON ASPHALT PLANTS AND FINISHERS TO UTILIZE THEORY AND COMPACTATION PROCEDURES TO ACCOMPANY THICK-LIFT DESIGNS. ADDITIONAL TOOLS ARE PRESENTED AS SUPPLEMENTING EXISTING PROCEDURES TO EXTEND THE SCOPE OF ASPHALT PAVING TECHNOLOGY.

Monismith, CL Civil Engineering Asce Aug 1969

1A 211791 LOUISIANA'S EXPERIENCE WITH END RESULT SPECIFICATIONS FOR CONSTRUCTION OF ASPHALTIC CONCRETE

HISTORICAL DATA AND VERY LARGE NUMBERS OF TEST RESULTS HAVE BEEN USED IN THE DEVELOPMENT OF END SPECIFICATIONS THAT HAVE TO BE MADE BEFORE WORK CAN BEGIN ARE REVIEWED. THE BACKBONE OF THE SPECIFICATIONS IS THE FACT THAT THE CONTROLS ARE DONE BY MANUFACTURER OR THE CONTRACTOR. THE METHOD OF ACCEPTANCE HAS TO BE ESTABLISHED AND INCLUDED. A DECISION HAS TO BE MADE ON WHAT TO BE CONSIDERED "QUALITY". A PAY SCHEDULE WHERE PAYMENT TO THE CONTRACTOR IS BASED ON ADJUSTMENT IN UNIT PRICE COMMENSURATE WITH THE QUALITY FURNISHED MUST NEXT BE DEVELOPED. FIGURES ILLUSTRATE A CHART WHERE A CERTAIN MINIMUM PAY SCHEDULE IS THE BASIS OF PAYMENT, ACCEPTANCE ON A LOT BASIS (A "NORMAL DAYS PRODUCTION OR A FRACTION THEREOF") IS RECOMMENDED. ACCEPTANCE IS BASED ON THE TEST RESULTS OF THE STABILITY, ROADWAY DENSITY, AND THE SURFACE SMOOTHNESS THE PAYMENT SCALE FOR A SURFACE COURSE MIX IS PRESENTED. THE SCALE FOR MARSHALL STABILITY, THE ROADWAY DENSITY REQUIREMENTS, PAYMENT SCALE FOR SURFACE SMOOTHNESS, AND THE REQUIREMENTS FOR ASPHALT CEMENT ARE TABULATED. USEFUL INFORMATION IN VARIOUS PROJECTS IS PRESENTED. THE PROBLEM OF CERTIFICATION (WHICH REQUIRES TRAINING MATERIALS, MANUALS, AND ADOPTION OF CERTIFICATION POLICIES) IS DISCUSSED. THE ADOPTION OF END RESULT SPECIFICATIONS IS RECOMMENDED PROVIDED THEY CAN BE FULLY IMPLEMENTED. CAUTION IS URGED AGAINST UNREASONABLE REQUIREMENTS.

Adam, V Paving Forum Napa 1972, pp 7-11, 6 Fig

1A 212057 DEVELOPING AND TRIAL USE OF ACCEPTANCE PLANS FOR COMPACTED EMBANKMENTS

PREVIOUS RESEARCH INDICATED THAT PRESENTLY ACCEPTED EMBANKMENT CONSTRUCTION WAS COMPACTED TO LESS THAN 100 PERCENT CONFORMANCE TO SPECIFICATIONS. A TRIAL SPECIFICATION, DEVELOPED FROM MIL S T'D 414, STD'ED DEV. UNKNOWN AND A SAMPLE SIZE OF 5 WAS USED TO SIMULATE ACCEPTANCE ON 3 PROJECTS TO COMPARE ITS EFFECTIVENESS WITH CONVENTIONAL TESTING. RANDOM DENSITY DETERMINATIONS WERE MADE ON 70 LOTS OF ACCEPTED WORK WITH A DIRECT TRANSMISSION NUCLEAR GAGE. TWO OF 70 LOTS WOULD HAVE BEEN REJECTED HAD THE SPECIFICATION BEEN APPLIED ON A CONTRACTUAL BASIS. DATA SHOWED WHERE CORRECTIVE ACTION COULD HAVE BEEN MADE TO ADVERT ANY REJECTION. THE REPORT CONCLUDES THAT THE TRIAL SPECIFICATION WILL PROVIDE LESS CHANCE OF ACCEPTING DEFECTIVE CONSTRUCTION. /BPR/


1A 212254 METHOD FOR EARLY PREDICTION OF CONCRETE STRENGTH

AN ACCELERATED TEST TO DETERMINE THE COMPRESSIVE STRENGTH OF CONCRETE HAS BEEN MADE URGENT BY THE ADVENT OF PRESTRESSED CONCRETE. THE METHOD PROPOSED IN THIS ARTICLE REQUIRES 28 1/2 HOURS BETWEEN MOULDING AND TESTING AND PREDICTS 28 DAY STRENGTH WITH A 95% DEVIANCE OF PLUS OR MINUS 12%. THIS METHOD UTILIZES BOILING WATER AS A CURING AGENT FOR THE CYLINDERS THE 12% ACCURACY IS CONSIDERED SUFFICIENT FOR ROUTINE QUALITY CONTROL. /CGRA/

1A SYSTEM CONSTRUCTION, MANAGEMENT & QUALITY CONTROL

1A 212259
COMPUTER EVALUATION OF CONCRETE QUALITY

The highway engineer is currently faced with an increasing demand for production and construction explosion in which it has become increasingly difficult to sort out the relevant facts in time for them to be applied, especially as the work proceeds, to improve the quality of concrete. Problems and pitfalls of present specifications and procedures for control testing are discussed and it is suggested that these are in need of review to place them on a sounder statistical basis using accelerated tests. Especially for concrete in service, it is suggested that modern methods of data processing, storage and retrieval are shown to offer potential for the faster handling of information. An integrated project, at present being introduced by the Department of Highways in Ontario, is described. New reporting systems have been established to feed concrete data to a computer. The data are then processed, stored, retrieved, and evaluated as needed for the control of quality at the time of construction. The selection of concrete best suited to a particular structural design or for the study of performance. The short term benefit is in better control of concrete quality at the time of construction, especially in relation to accelerated testing. This work describes a series of tests designed to provide for each mix or change of aggregate and type of aggregate. Coefficient of variation over a wide variety of specimens average 18.8 percent and exceeded 30 percent for some groups of specimens. It is recommended that special calibrations be provided to test mix experience of aggregate, and that use of the test hammer on weak or young concrete be kept to a minimum because such testing may produce significant surface blemishes. /Author/

Smith, P Canadian Good Roads Association Proc 1966

ACKNOWLEDGMENT: Canadian Good Roads Association

1A 212426
IMPULSE METHODS FOR CONTROLLING THE CONSTRUCTION SPEED OF PRESTRESSED CONCRETE BRIDGES

This paper describes a series of tests designed to determine the reliability of results, the feasibility of use, and the practical applications of the test hammer in construction control. Test results are compared to the published findings of other investigators and the reliability of calibration curves under various test conditions is carefully documented. Indicated strengths are significantly affected by specimen size, restraint or clamping in the testing machine, surface texture, mix proportions, and type of aggregate. Coefficient of variation over a wide variety of specimens average 18.8 percent and exceeded 30 percent for some groups of specimens. It is recommended that special calibrations be provided to test mix experience of aggregate, and that use of the test hammer on weak or young concrete be kept to a minimum because such testing may produce significant surface blemishes. /Author/

Javor, T Am Concrete Inst Journal & Proceedings May 1967

1A 213194
INVESTIGATION OF THE IMPACT-TYPE CONCRETE TEST HAMMER

This work describes a series of tests designed to determine the reliability of results, the feasibility of use, and the practical applications of the test hammer in construction control. Test results are compared to the published findings of other investigators and the reliability of calibration curves under various test conditions is carefully documented. Indicated strengths are significantly affected by specimen size, restraint or clamping in the testing machine, surface texture, mix proportions, and type of aggregate. Coefficient of variation over a wide variety of specimens average 18.8 percent and exceeded 30 percent for some groups of specimens. It is recommended that special calibrations be provided to test mix experience of aggregate, and that use of the test hammer on weak or young concrete be kept to a minimum because such testing may produce significant surface blemishes. /Author/


1A 213384
SIGNIFICANCE OF ACCELERATED DURABILITY TESTS ON CONCRETE

The procedures are reviewed that are applied to concrete to evaluate its durability in future service with particular regard to its resistance to freezing and thawing and deleterious cement-aggregate reactions. Other exposure conditions are noted, such as attack by aggressive solutions and other media, abrasion and cavitation and ion temperature. An accelerated test particularly well suited to evaluating the durability of concrete is needed that evaluates durability rapidly, in either absolute or relative terms. The ability of the material to withstand a specified exposure, application of such procedure requires the following steps: (1) establishing the qualities that control the rate of disintegration of the concrete, (2) developing practical procedures by providing for accelerated evaluation of the measured, (3) establishing the accuracy and precision of the procedures in predicting the rate of disintegration of the concrete, and (4) specifying quality assurance programs in the selection of concrete, making materials, manufacture of the concrete, and construction procedures that will guarantee that the concrete in place possesses the required properties. A brief summary is presented of the essential phenomena by which concrete can be damaged by freezing and thawing, the conditions that must be accommodated so that an accelerated test will afford a realistic measure of the resistance of a given concrete to freezing during service. (1) Rate of freezing, (2) minimum temperature attained, (3) duration of freezing, (4) freezeable water content of the cement paste and aggregate, (5) air void volume available for accommodation of the water expelled from the freezing zones, and (6) particle size, pore characteristics, and properties of the aggregate particles. The following procedures are reviewed which have been developed to provide for accelerated evaluation of the resistance of hardened concrete to freezing and thawing: (1) ASTM methods of test, (2) powers' test, and (3) scaling tests. The following accelerated testing methods are reviewed: (1) heating-cooling and wet-drying exposure of concrete, (2) the alkali-silica reaction in concrete, (3) expansive reaction in calcium sulfoaluminate concrete, (4) resistance of concrete to attack by aggressive media, (5) evaluation of aggressive media from internal sources, (6) abrasion resistance of concrete, and (7) high-temperature exposure of concrete. The value of any accelerated test lies in the degree to which the service condition is simulated and the extent to which the physical, chemical, and mechanical responses of the concrete in the service condition are reproduced in the method of test.

Miletz, RC Highway Research Record, Hwy Res Board 1969

1A 214124
ADVANCES IN NONDESTRUCTIVE TESTING OF CONCRETE

This paper reviews recent advances in the following nondestructive methods of testing concrete: ultrasonic, resonance, radioactive, electrical, initial surface absorption, chemical analysis, and hardness. A brief review is given of the research work being conducted at the University of Mines and Technology. There is a great potential in the concrete industry for nondestructive methods of testing concrete. Two major fields where these methods could prove to be superior to traditional methods are quality control in the construction
OF STRUCTURAL MEMBERS, BOTH PRECAST AND CAST-IN-PLACE, AND MONITORING STRENGTH DEVELOPMENT TO DETERMINE ACCEPTABLE TIMES FOR THE REMOVAL OF FORM WORK OR TRANSFER OF PRESTRESSING FORCE TO CONCRETE. /AUTHOR/

Li, S Ramakrishnan, V Russell, JE Highway Research Record, Hwy Res Board No. 378, 1972, pp 1-11, 37 Ref

1A 214424
DEVELOPMENT OF GUIDELINES FOR PRACTICAL AND REALISTIC CONSTRUCTION SPECIFICATIONS

CURRENT SPECIFICATIONS ARE SURVEYED AND GUIDELINES ARE DEVELOPED FOR DESIGNING PRACTICAL AND REALISTIC CONSTRUCTION SPECIFICATIONS WITH DUE CONSIDERATION BEING GIVEN TO PURPOSE, FORMAT, LANGUAGE, OBJECTIVITY, COMPREHENSIVENESS IN SCOPE AND DESIGN, AND APPLICATION OF SUCH CONCEPTS AS VALUE ENGINEERING, STATISTICAL ANALYSIS, AND THE THEORY OF INHERENT RISKS ASSOCIATED WITH MAKING DECISIONS BASED ON ACCEPTANCE SAMPLES. GRADATION REQUIREMENTS FOR AGGREGATES AND MIXTURES OF AGGREGATES WITH OTHER MATERIALS ARE BASED ON THE CONTROL OF SIZE AND QUANTITY OF voids, AS DETERMINED BY THE GIVEN THEORETICAL METHOD, MODIFIED TO INCLUDE VARIATIONS TO BE EXPECTED UNDER NORMAL CONSTRUCTION CONDITIONS. PAVEMENT SMOOTHNESS REQUIREMENTS ARE BASED ON BOTH THE DEVIATIONS FROM A STRAIGHTEDGE, AND THEIR RATIO IN ACCORDANCE WITH SLOPE-VARIANCE CRITERIA DEVELOPED AT THE AASHO ROAD TEST. TOLERANCES AND PENALTIES FOR DEFICIENCY OF THICKNESS OF PAVEMENT COURSES SHOULD BE RELATED TO REDUCTION IN SERVICE LIFE IN TERMS OF DAILY TRAFFIC. THEORETICAL LOSS OF PERFORMANCE IS TWICE THE COST, ON A FRACTIONAL-INCH BASIS, FOR FLEXIBLE PAVEMENTS AND FIVE TIMES THE COST FOR RIGID PAVEMENTS.

Highway Research Board Nchrp Reports 1965

1A 214427
SYMPOSIUM-THICKNESS VARIATION OF ASPHALT CONCRETE-PART 1- IMPORTANCE OF THICKNESS CONTROL-HOW WELL CAN WE EXPECT TO CONTROL THICKNESS

THE AASHO ROAD TEST WAS A RESEARCH PROJECT, THEREFORE UNIFORMITY IN CONSTRUCTION CONTROL WAS EXTREMELY IMPORTANT. TO SECURE THE REQUIRED UNIFORMITY IN THICKNESS THE EMBANKMENT SOIL SUBBASE AND BASE WERE SUBGRADED BY MECHANICAL SUBGRADERS RIDING ON SIDE FORMS EACH SUBGRADED LAYER WAS REQUIRED TO BE WITHIN PLUS OR MINUS 1/8 IN. OF ESTABLISHED GRADE AND THE BASE AND SUBBASE WERE NOT PERMITTED TO DEViate MORE THAN PLUS OR MINUS 1/2 IN. FROM PLAN THICKNESS. THE ASPHALT CONCRETE SURFACING WAS REQUIRED TO BE WITHIN 1/3 IN. OF ESTABLISHED GRADE WHEN CHECKED BY A 10 FT. STRAIGHT EDGE. THE TOTAL THICKNESS OF THE COMPLETED MAT/SURFACE PLUS BINDER WAS TO BE WITHIN PLUS OR MINUS 1/4 IN. OF THE DESIGN THICKNESS. GUIDE WIRES FOR THE PAVER AND ROD AND LEVEL MEASUREMENTS WERE USED TO SECURE THE REQUIRED CONTROL. A QUESTION PERTINENT TO THE SUBJECT OF THIS SYMPOSIUM IS, HOW WELL DID WE CONTROL THICKNESS ON THE AASHO ROAD TEST? REFERENCE TO THICKNESS MEASUREMENTS REPORTED IN THE AASHO ROAD TEST, REPORT 2, MATERIALS AND CONSTRUCTION 1/1, AND TO INDEPENDENT ANALYSES OF THE DATA WILL BE MADE IN DISCUSSING THIS QUESTION. /NAPA/


ACKNOWLEDGMENT: National Asphalt Pavement AssociationNAPA4085, 3C33017018

1A 214433
REPORT ON THE EVALUATION OF A CORING RIG FOR THE PURPOSE OF REDUCING THE TIME INVOLVED TO DIG A UNIFORM DENSITY HOLE

A SUITABLE CORRELATION HAS BEEN MADE OF DUPLICATE DENSITY TESTS MADE BY A NUCLEAR GAGE AND A WATER-BALLOON APPARATUS IN HOLES DRILLED WITH A PORTABLE CORING RIG. THE DRILLED HOLES ARE COMPLETED IN ABOUT ONE-HALF THE TIME NEEDED WHEN USING CONVENTIONAL METHODS IN LIMEROCK BASE COURSES. THE CORING RIG METHOD IS NOW USED FOR ROUTINE CONSTRUCTION CONTROL TESTING.

Todor, PC Florida State Road Department Hpr, Oct. 1965

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4722884 66)

1A 214437
STATISTICAL QUALITY CONTROL

THIS PROJECT WAS TYPE I, SPECIAL A ASPHALTIC CONCRETE SURFACING 3 INCHES THICK AND 24 FEET WIDE WITH A TOTAL LENGTH OF 12 MILES. A CONTINUOUS BATCH PLANT WAS EMPLOYED USING CRUSHED SAND-GRAVEL AND CRUSHED LIMESTONE ROCK WITH THE ASPHALT AT A DESIGN VALUE OF 4.9%. RANDOM SAMPLES WERE OBTAINED TO DETERMINE TEMPERATURE, THICKNESS AND DENSITY IN THE FIELD, AND TO DETERMINE VALUES OF STABILITY, GRADUATION, VOIDS AND ASPHALT CONTENT IN THE LABORATORY. FIELD AND LABORATORY DATA SHEETS ARE PRESENTED. STATISTICAL PARAMETERS INCLUDE STANDARD DEVIATION, VARIANCE DUE TO MATERIAL SAMPLING AND TESTING, AND THE OVERALL COEFFICIENT OF VARIATION. THESE PARAMETERS DISCLOSE ANY WEAKNESS OF UNIFORMITY OF MATERIAL. SAMPLING OR TESTING FOR THE PROJECT THE DATA WILL SUPPLEMENT THE PUBLIC ROADS RESERVOIR OF SIMILAR DATA FOR USE IN FUTURE SPECIFICATIONS AND CONSTRUCTION CONTROL. THE STATE OFFERS NO CONCLUSIONS OR RECOMMENDATIONS AT THIS TIME ON THIS TYPE OF CONSTRUCTION. /BPR/

Nebraska Department Roads

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4721263 66)PB 173 931, 1C33020523

1A 214441
COMPACT CONTROL OF A MAJOR CONSTRUCTION PROJECT WITH THE MICHIGAN NUCLEAR GAGE

DURING THE 1965 FIELD TESTS THE MICHIGAN COMBINATION-TYPE NUCLEAR MOISTURE-DENSITY GAUGE PROVED TO BE A SATISFACTORY MEANS OF EMBANKMENT COMPACT CONTROL FOR ALL SOIL AND AGGREGATE MATERIALS TESTED. THE TESTING TIME USING THE NUCLEAR GAUGE WAS ABOUT ONE-HALF THAT REQUIRED WITH CONVENTIONAL METHODS. THE CONVENTIONAL RAINHART CHECK TEST INDICATED PROPER JOB CONTROL WITH THE NUCLEAR METHOD. NORMAL JOB SAMPLING PROCEDURES WERE COMPARED WITH STATISTICALLY RANDOM SAMPLING WITH PROMISING RESULTS. FURTHER EXPERIMENTATION IS PLANNED DURING CY 1966 OPERATIONS ON THIS PROJECT DURING WHICH TIME MORE CAREFUL AND COMPLETE EVALUATION OF THE STATISTICAL RANDOM SAMPLING TECHNIQUES WILL BE PERFORMED. /AUTHOR/

Defoe, JH Mainfort, RC Michigan Dept State Highways Sept. 1966

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4722102 66)PB 173 553, 1C33020629

1A 214442
QUALITY CONTROL ANALYSIS, PART III, CONCRETE AND CONCRETE AGGREGATES

THIS IS THE THIRD AND LAST REPORT ON THE QUALITY CONTROL ANALYSIS OF HIGHWAY CONSTRUCTION MATERIALS.
1A SYSTEM CONSTRUCTION, MANAGEMENT & QUALITY CONTROL

AS IT DEALS WITH THE STATISTICAL EVALUATION OF DATA FROM SEVERAL CONSTRUCTION PROJECTS TO DETERMINE VARIABILITY OF SLUMP AND OF AGGREGATES. THE ANALYSIS INDICATED /1/ THAT THE FREQUENCY DISTRIBUTION OF MOST OF THE DATA TEND TO FOLLOW NORMAL DISTRIBUTION, /2/ THAT THERE IS CONSIDERABLE VARIATION IN CONCRETE PRODUCTION FROM BATCH TO BATCH, /3/ THAT FOR FINE AGGREGATE, THE STOCKPILE COMPONENT OF VARIANCE CONTRIBUTES MORE TO THE OVERALL VARIANCE THAN SAMPLES WITHIN STOCKPILE COMPONENT, AND /4/ THAT IN THE CASE OF COARSE AGGREGATES THE SAMPLE WITHIN STOCKPILE COMPONENTS SHOW LARGER VARIANCE THAN BETWEEN STOCKPILE COMPONENTS. THE STUDY REVEALED HOW CONTROL CHARTS CAN BE USED FOR CONTROL AND ACCEPTANCE OF P.C. CONCRETE. THE REPORT INCLUDES AN ANALYSIS OF THICKNESS OF PAVEMENT AND ANALYSIS OF BITUMINOUS HOT MIX DENSITY AND TEMPERATURE. /BPR/

Louisiana Department Highways Sept. 1966

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4721183 66)PB 173 822, IC 202 0484, 3C330 8225, 1C330 0631, 3C330 21718

1A 214444

THE COMPACTION OF SOIL AND ROCK MATERIALS FOR HIGHWAY PURPOSES


Walsh, HE Fisher, CP Lungfelder, LJ

RESPONSIBLE INDIVIDUAL: McMahon, TF
Contract CPR-11-0954

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (3723992 66) PB 227 913/AS

1A 214445

PREPLANTING A CONTROLLED BLASTING TECHNIQUE FOR ROCK CUTS

RESEARCH WAS CONDUCTED ON CONSTRUCTION METHODS OF IMPROVED QUALITY AND LOWER COSTS IN THE HIGHWAY BUILDING OPERATIONS. THE EFFICACY AND ECONOMIC FEASIBILITY OF PREPLANTING WORK IN HIGHWAY CUT SECTIONS WERE INVESTIGATED, AS WERE DEVELOPMENTS IN BLASTING, SUCH AS DRILL HOLE PATTERNS, DELAY CAPS, CONTROL OF SHOCK WAVE, SMOOTH WALL EXCAVATION TECHNIQUES, NEW TYPES OF EXPLOSIVES AND RESULTS ACHIEVED ON ROAD STOCKPILE. A COLLECTION OF CONSTRUCTION SPECIFICATIONS IN USE AND A SERIES OF PHOTOGRAPHS ILLUSTRATING RESULTS ACHIEVED ON SPECIFIC PROJECT APPLICATIONS ARE PRESENTED. THE FINDINGS DEMONSTRATE THAT SIGNIFICANT ADVANTAGES IN QUALITY OF CONSTRUCTION, SAFETY AND MAINTENANCE ARE ATTAINABLE THROUGH APPROPRIATE USE OF CONTROLLED BLASTING TECHNIQUES.

State Highway Departments Feb. 1967

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (2723013 67)

1A 214447

CONSTRUCTION CONTROL PROFILOGRAPH PRINCIPLES


Hankins, KD
Texas State Department of Highways & Public Transp Jan. 1967

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4723403 67) CFSTI PB 177 470, HRIS 26 021175, 1C330 20821

1A 214450

AN INVESTIGATION OF COMPACTNESS VARIABILITY FOR SELECTED HIGHWAY PROJECTS IN INDIANA

THE AREA OF STUDY CHOSEN FOR THIS PROJECT WAS COMPACTNESS VARIABILITY OF BASE AND SUBGRADE ELEMENTS AS USED UNDER RIGID PAVEMENTS. THREE PROJECTS OF EACH WERE SELECTED FOR INVESTIGATION IN INDIANA. THE OBJECTIVE WAS /1/ TO GATHER DATA TO DETERMINE WHAT LEVEL OF COMPACTNESS WAS ACTUALLY BEING ACHIEVED UNDER PRESENT CONSTRUCTION PRACTICES BY STUDYING THE VARIABILITY IN COMPACTNESS AND THE FACTORS CAUSING THE VARIABILITY, AND /2/ TO DETERMINE HOW A STATISTICAL QUALITY CONTROL MIGHT BE DEVELOPED FROM THESE DATA, TO ASSURE A REALISTIC ESTIMATE OF THE TRUE LEVEL OF COMPACTNESS, ONE HUNDRED FIELD DENSITY TESTS WERE PERFORMED FOR EACH PROJECT BY SELECTING TEN UNITS OF CONSTRUCTION OF EQUAL SIZE AND MAKING FIVE RANDOMLY REPLICATED DENSITY TESTS IN EACH. REFERENCE VALUES FOR PERCENT COMPACTNESS WAS THE USE OF ONE-POINT FIELD COMPACTNESS TEST IN CONJUNCTION WITH A FAMILY OF TYPICAL CURVES. RESULTS OBTAINED INDICATED AN OVERALL LEVEL OF COMPACTNESS LOWER THAN THAT SPECIFIED. VARIABILITY IN COMPACTNESS WAS LARGE DATA INDICATED GREATER VARIABILITY IN THE SUBGRADE COMPACTNESS THAN IN THE SUBBASES. THE STATISTICAL ANALYSIS INDICATED MORE TESTS FOR A UNIT WERE REQUIRED TO INSURE UNIFORM COMPACTNESS. A MAIN PROBLEM IS TO INSURE THAT TESTS ARE PROPERLY PERFORMED, /AUTHOR/

Williamson, TG Yoder, EJ
Purdue & Ind State Hwy Comm Key Jan. 1967

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4601163 67) PB 177 453, 1C33020857

1A 214459

THE STATISTICAL APPROACH TO QUALITY CONTROL IN HIGHWAY CONSTRUCTION

THIS PUBLICATION IS INTENDED TO ASSIST STATE HIGHWAY DEPARTMENTS IN PLANNING RESEARCH PROGRAMS TO ENSURE ADEQUATE QUALITY CONTROL OF HIGHWAY MATERIALS AND PROCESSES. THE REPORT RECOMMENDS THE USE OF STATISTICAL METHODS TO DETERMINE THE FEASIBILITY AND EFFICACY OF COMPACTNESS CONTROL IN HIGHWAY CONSTRUCTION.
CEPTS TO QUALITY CONTROL IN HIGHWAY CONSTRUCTION.

This publication includes background information concerning the development of an overall plan for application of the statistical approach to quality control in highway construction. To avoid mis-understanding, it must be emphasized that the relatively large amount of sampling and testing required in this research program to establish significant parameters involved will not be required when specifications are based on statistical concepts. The methods of application of statistical principles to specific control problems in highway construction have not, as yet, been selected. In certain cases, it is likely that present control practices will be continued whereas, in other cases, a different system of control employing considerably reduced number of tests may be adequate. However, a new concept of interpretation of test results then will be necessary.

Bureau of Public Roads /US/ Apr. 1965

Acknowledgment: Bureau of Public Roads /US/PB 176 059, 1C33021018

1A 214461

QUALITY ASSURANCE THROUGH PROCESS CONTROL AND ACCEPTANCE SAMPLING

This pamphlet expresses the philosophy behind the research effort of the Quality Assurance Group of the office of Research and Development, Bureau of Public Roads. It presents many of the statistical concepts and methods employed in the process of quality assurance that are used for highways. This report contains the answer to: (1) How do we order what we need to perform the service required; and (2) How do we know we are getting what we ordered? Specifications must recognize variabilities and be written on a probability rather than an absolute basis. The necessary level of quality must be considered statistically. Statistical approach to materials specifications must provide for a clear understanding of how measurements will be made. Sampling plans are designated and corresponding tolerances documented. This report is a guide to instrumenting such a program with references to prior studies on this newer concept of evaluating and accepting highway materials and construction processes.

Analysis of variances of characteristics and attributes disclose areas needing corrective action thus providing economical satisfaction for both the buyer and seller.


Acknowledgment: Bureau of Public Roads /US/(2601012 67)/PB 176 335, 2C33084583, 1C33021088

1A 214466

APPLICATION OF STATISTICAL SPECIFICATIONS FOR HIGHWAY CONSTRUCTION

A brief summary is presented of the study titled "Application of Statistical Quality Control Methods in the Form of a Paper for Presentation at a Technical Conference, Outlining the Application of Statistical Quality Control Methods for Analysis of Data on Determination of Penetration Tests of Asphalt, Gradation of Aggregate, Compaction of Embankments and the Use of Control Charts of Moving Averages." The report does not attempt to specify the type of sampling nor define the lot of material, the state is working towards the goal of developing more enforceable specifications.

Watkins, RO


Acknowledgment: Bureau of Public Roads /US/(4601413 68)

1A 214458

THE STATISTICAL APPROACH TO QUALITY CONTROL IN HIGHWAY CONSTRUCTION, PHASE I, MEASURING THE VARIABILITY, PART A- COMPACTED EMBANKMENTS

The work reports on measurements of variability of recent compacted embankments. The results include testing and acceptance sampling, mix temperature at plant and paver, stability fromlab mixes and pavement cores, conventional and flush and air gap nuclear density, pavement thickness, volume of voids, test results include testing, sampling and material variance.

Jorgenson, JL

North Dakota State University, North Dakota State Highway Dept.

Acknowledgment: Bureau of Public Roads /US/ PB 182 286, HRIS 33021344, HRIS 021947, 1C33021315

1A 214471

THE STATISTICAL APPROACH TO QUALITY CONTROL IN HIGHWAY CONSTRUCTION, PHASE I, MEASURING THE VARIABILITY, PART B- ASPHALT CONSTRUCTION MATERIALS ARE REPORTED AND VARIATIONS OF BITUMINOUS CONCRETE OVER DIFFERENT PERIODS TO TEST MEASUREMENTS VARIATIONS REPORTED ON INCLUDE: HOT BIN GRADATION, EXTRACTED GRADATION, ASPHALT CONTENT, ACTUAL ASPHALT USED, MIX TEMPERATURE AT PLANT AND PAVER, STABILITY FROM LAB MIXES AND PAVEMENT CORES, CONVENTIONAL AND FLUSH AND AIR GAP NUCLEAR DENSITY, PAVEMENT THICKNESS, VOLUME OF VOIDS, TEST RESULTS INCLUDE TESTING, SAMPLING AND MATERIAL VARIANCE.

Jorgenson, JL

North Dakota State University, North Dakota State Highway Dept.

Acknowledgment: Bureau of Public Roads /US/ (460143 68)/CFSTI PB 182 286, 1C33021115, 1C33021947, 1C33021344

1A 214474

STATISTICAL QUALITY CONTROL OF HIGHWAY CONSTRUCTION MATERIAL

A summary of the findings of several interim reports on statistical quality control of highway construction material is presented. The advantages and limitations of the present control procedures are discussed. The work done to date indicates that statistical specification can be used to the advantage of the highway engineer. During the study some of the problems identified that need additional attention were: personnel training, reproducibility of tests, preservation of engineering judgment, and cost of administration. Possible solutions to these problems are discussed including determining the precision of test method and procedures for assuring that a laboratory is in operational control. One specific procedure, quality control by the moving average using control chart procedures is adopted that this procedure will provide control without increasing cost while at the same time supplying management information in the form of charts and graphs.

Sherman, GB

Watkins, RO


Acknowledgment: Bureau of Public Roads /US/(4601123 68)/PB 180260, 3C33021382

65
1A  SYSTEM CONSTRUCTION, MANAGEMENT & QUALITY CONTROL

1A 214477
DETERMINATION OF STATISTICAL PARAMETERS FOR HIGHWAY CONSTRUCTION

ACKNOWLEDGMENT Bureau of Public Roads /US/ (4601463 68) PB 182 328, IC33021426

1A 214485
STATISTICAL QUALITY CONTROL STUDIES AND FINDINGS RELATIVE TO HIGHWAY CONSTRUCTION: AN ANNOTATED BIBLIOGRAPHY
THE REPORT PRESENTS A BRIEF HISTORY OF STATISTICAL QUALITY CONTROL, A DIGEST OF PERTINENT ACTIVITIES WITH RESPECT TO S.Q.C. IN HIGHWAY CONSTRUCTION AND A BRIEF SECTION ON THE MANAGEMENT OF THE SQC FUNCTION. IT CONSISTS MAINLY OF AN ANNOTATED BIBLIOGRAPHY. /BPR/

Darrach, JG
Texas Transportation Institute, Texas State Department of Highways & Public Transp, Bureau of Public Roads /US/
PB 182 624, 3B33021570

1A 214495
INVESTIGATION INTO THE USES OF STATISTICAL PROCEDURES IN SPECIFICATION WRITING AND QUALITY CONTROL
THE APPLICATION OF SEVERAL METHODS AND TECHNIQUES OF STATISTICAL ANALYSIS TO ACCEPTED TESTS OF HIGHWAY CONSTRUCTION MATERIALS WAS DEMONSTRATED. THE RESULTS VARY RATHER WIDELY IN NUMERICAL VALUES. SOME TECHNIQUES COULD AND HAVE BEEN PUT IN ROUTINE USE AS A RESULT OF THE STUDY. OTHER TECHNIQUES ON CERTAIN MATERIALS YIELDED SUCH EXTREME VALUES THAT THE AUTHORS QUESTIONED THEM AS BEING IN ERROR OR THE METHOD BEING INAPPROPRIATE. THE AUTHORS CONCLUDED THAT THERE ARE AREAS WHERE STATISTICAL CONTROL TECHNIQUES ARE SUITABLE FOR USE AND OTHER AREAS EXIST WHERE THERE IS A NEED FOR CHANGE IN STATISTICAL CONCEPTS OR TEST METHODS, OR BOTH BEFORE THE S.R.C. PROCEEDS WITH WRITING AND ENFORCEMENT OF STATISTICALLY ORIENTED SPECIFICATIONS. /AUTHOR/

Smith, NL Parrish, AS
ACKNOWLEDGMENT Bureau of Public Roads /US/ (4601203 69)

1A 214499
PROCEEDINGS STATISTICAL QUALITY ASSURANCE WORKSHOP
APPROXIMATELY 125 STATE AND BUREAU OF PUBLIC ROADS ENGINEERS ATTENDED THE WORKSHOP IN WASHINGTON, D. C., OCTOBER 22-23 AND 24, 1968, TO DISCUSS RESEARCH, DEVELOPMENT AND IMPLEMENTATION OF STATISTICAL QUALITY ASSURANCE IN HIGHWAY CONSTRUCTION. THE PROCEEDINGS CONTAIN A DIGEST OF THE TALKS, DISCUSSIONS, PAPERS, AND SUMMARIES OF THE MEETINGS TO CONSIDER THE QUALITY CONTROL OF BITUMINOUS MIXTURES, PORTLAND CEMENT CONCRETE, EMBANKMENT AND BASES AS MANUFACTURED MATERIALS SUCH AS PAINTS AND STEEL. PROCEDURES FOR SAMPLING AND TESTING TO ASCERTAIN THE UNIFORMITY OF QUALITY ARE GIVEN FOR WATER PROPORTIONAL REDUCED PRICE. /AUTHOR/

Research & Development Hpr, Oct. 1968
ACKNOWLEDGMENT Bureau of Public Roads /US/ (2601012 69)

1A 214504
DEVELOPING AND TRIAL USE OF ACCEPTANCE SAMPLING PLANS FOR ASPHALT CONSTRUCTION
PREVIOUS RESEARCH INDICATED THAT PRESENT ACCEPTED BITUMINOUS PAVING CONSTRUCTION DOES NOT MEET SPECIFIED REQUIREMENTS. ALSO ON PROJECTS RESEARCHED EACH CONTRACTOR WAS PAID 100 PERCENT OF BID PRICE EVEN THOUGH THERE WAS A WIDE RANGE OF BELOW SPECIFICATION CONSTRUCTION BETWEEN JOBS. A SPECIFICATION DEVELOPED WILL ACCEPT CONSTRUCTION ON THE BASIS OF THE AVERAGE OF 5 TEST RESULTS PER LOT FOR (1) NOMINAL LARGEST SIEVE, #4 SIEVE, #30 SIEVE, #200 SCREEN AC CONTENT, COMPACTION AND THICKNESS. ADJUSTMENT PRICE SCHEDULES ARE PROVIDED FOR THE ACCEPTANCE OF BELOW STANDARD CONSTRUCTION. A NUCLEAR GAGE CORRELATION WITH DENSITIES OBTAINED FROM CORES IS INCLUDED. /BPR/

Jorgenson, JL
North Dakota State University, North Dakota State Highway Dept, Bureau of Public Roads /US/
PB 182 624, 3B33021570
ACKNOWLEDGMENT Bureau of Public Roads /US/ REPORT PENDING, IC33021315, IC33021344, IC33021947

1A 214506
DETERMINATION OF STATISTICAL PARAMETERS FOR HIGHWAY CONSTRUCTION (CONTINUATION III). INTERIM REPORT FOR PERIOD APRIL 1968 TO APRIL 1970
THIS REPORT PRESENTS IN PART I, THE DETERMINATION OF ADDITIONAL STATISTICAL PARAMETERS FOR WEST VIRGINIA HIGHWAY CONSTRUCTION AND COMPARES THESE VALUES WITH THOSE PREVIOUSLY DETERMINED, AND INCLUDES FINDINGS OF DESIGNED EXPERIMENTS PERFORMED TO DETERMINE THE PATTERN OF VARIATION OF DENSITY OF BITUMINOUS CONCRETE PAVEMENTS, SUBGRADES AND EMBANKMENTS. PART II REPORTS THE RESULTS OF A SERIES OF DESIGNED LABORATORY EXPERIMENTS THAT INVESTIGATED THE RELIABILITY OF PREDICTING THE POTENTIAL STRENGTH OF CONCRETE. A SERIES OF DENSITY MEASUREMENTS CONFIRMED THE LARGE VARIATION OF DENSITY ACROSS THE WIDTH OF BITUMINOUS PAVING LANES AND REVEALED THAT THE PATTERN OF VARIATION IS CHANGED BY THE EFFECT OF TRAFFIC, THE DENSITY IS FAIRLY UNIFORM WITH SMALL AREAS BUT VARIES FROM AREA TO AREA. WHEREAS THE OPPOSITE PATTERN WAS FOUND IN DENSITY OF EMBANKMENT. THE DENSITY FOR A SUBGRADE WAS FOUND TO BE ESSENTIALLY RANDOM. TESTS ON PORTLAND CEMENT CONCRETE MATERIALS CONFIRMED THE LARGE VARIATION INDICATED AN AVERAGE LEVEL OF COMPRRESSIVE STRENGTH BUT ONE PROJECT HAD EXCESSIVE VARIATION. WITHIN TEST VARIABLE OR TESTING ERROR WAS HIGHER THAN SHOULD BE EXPECTED. TESTS WITH THE KELLY BALL AND CHASE AIR METER COMPARED TO SLUMP CONE AND ROLL-A-METER REVEALED SOME ANOMALIES. /AUTHOR/

Research & Development Hpr, Oct. 1968
THE ECONOMIC FEASIBILITY OF THE APPLICATION OF STATISTICAL CONCEPTS AND METHODS TO THE CONTROL AND ACCEPTANCE OF HIGHWAY MATERIALS AND CONSTRUCTION

Statistical quality control is not generally practiced in the highway industry; the probable costs of such a system were estimated by projection of current costs of contractor or producer who are currently maintaining voluntary testing programs. Estimates based on data obtained from 49 concerns in 15 states indicate that the cost of an acceptable degree of quality control of highway materials or construction by the contractor or producer would average about four percent of contract price. Available information indicates that the current total engineering expenditures by state agencies on federal aid projects is in the order of 10 percent of contract price. Comparisons of relative costs based on these numbers and on different proportions of quality control effort shared by the contractor and the state agency indicate that a statistical quality assurance system would be quality control by the contractor with acceptance testing by the state agency. The dollar cost of such a system is estimated to be about 20 percent less than that of current procedures. A related activity was a study of the relative size of buyer's and seller's risks using current acceptance procedures as compared to those which would be associated with a system of coordinated quality control, revised specifications, and statistical sampling plans. This study indicated that the lowest risks for the same level of testing effort would be realized when a state of statistical control of production and construction processes was obtained. /AUTHOR/


ACKNOWLEDGMENT: Federal Highway Administration (3601143 71) REPORT PENDING, 1C33022387

NUCLEAR TEST EQUIPMENT

The conclusions are: (1) no radiation hazard exists when the nuclear gauges are properly handled; (2) before using nuclear testing equipment an operator should receive instructions on theory, radiation, health safety, maintenance, testing procedures, and calibration; (3) statistical analysis of the data indicates that the variance in count rate is better defined as the length of test is increased. (4) correlation curves developed during this study do not agree with those supplied by the manufacturer, and the degree of correlation is improved when a curve is developed for each type of material tested. (5) the standard error of estimate for the nuclear test compares favorably with that for the volumemasure test if at least a four minute count rate is used and (6) nuclear testing is an acceptable means of construction control. However, present specifications should be revised to coincide with this concept of testing. /AUTHOR/

Ramsey, WJ
Nebraska Department Roads, Federal Highway Administration /US/ Study No 64-5

ACKNOWLEDGMENT: Federal Highway Administration (4723094 71) REPORT PENDING, 2C33022599

ECONOMIC FEASIBILITY OF APPLICATION OF STATISTICAL CONCEPTS AND METHODS TO THE CONTROL AND ACCEPTANCE OF HIGHWAY MATERIALS AND CONSTRUCTION

The probable cost of a statistical quality control system was estimated by projection of current costs of contractor or producer who are currently maintaining voluntary testing programs. Estimates based on data obtained indicate that the cost of an acceptable degree of quality control of highway materials or construction by the contractor or producer would average about 4 percent of contract price. Comparisons of relative costs indicate that the optimum quality assurance system would be quality control by the contractor with acceptance testing by the state agency. The dollar cost of such a system is estimated to be about 20 percent less than that of current procedures. The economic benefits in terms of the degree of quality assurance obtained by this system as compared to the existing system are estimated to be even more favorable. A study of the size of buyer's and seller's risks was compared to those which would be associated with revised specifications and statistical sampling plans. The lowest risks for the same level of testing effort would be realized when a state of statistical control of production and construction processes was obtained. /AUTHOR/

Hudson, SB Bowery, FJ
Materials Research & Development, Federal Highway Administration /US/ Fb-11-7277

ACKNOWLEDGEMENT: Federal Highway Administration (3601143 72) REPORT PENDING, 3C33022772

CONTROL STRIP STUDY

This report is concerned with the application of the "control strip" technique using nuclear devices for compaction control of certain base courses and asphaltic concrete surface courses. The technique, evaluated here, consists of applying increased amounts of heavy machinery to the test section of the material to establish the optimum rolling pattern for that material. Nuclear testing was used to determine both the maximum density and desired roller pattern in the "control strip." The ensuing compaction was then tested in segments (200 feet) by nuclear means to check for conformance to a certain percentage of the "control strip" density. The data collected and the field experience gained indicated (1) that the "control strip" technique using nuclear devices offered a quick and flexible approach to the compaction control of base and asphaltic concrete surface courses; (2) that the variability of data using these procedures was normally within the magnitude of variation experienced with the conventional methods of density determinations; (3) the variation in the level of compaction from one section to another was much more pronounced for cement stabilized base courses than unstabilized bases. /AUTHOR/

Shaw, SC Melanson, JL Hirschmann, JJ
Louisiana Department Highways, Federal Highway Administration /US/ Study No 69-2s

ACKNOWLEDGEMENT: Federal Highway Administration REPORT PENDING, 3C33022849
1A SYSTEM CONSTRUCTION, MANAGEMENT & QUALITY CONTROL

1A 214427
HIGHWAY QUALITY CONTROL PROGRAM
THE OVERALL ACCEPTANCE TESTING PROGRAM FOR MATERIALS AND CONSTRUCTION was reviewed for purposes of developing practical and meaningful specification limits and controls for improved acceptance sampling. Special emphasis was given to modulus of rupture concrete flexural tests, preformed neuroflectors, and a blanket material and 22A aggregate gradation. /FHWA/

Church, CD Copple, F Zepata, CA
Michigan Dept State Highways, Federal Highway Administration /US/

ACKNOWLEDGMENT: Federal Highway Administration REPORT PENDING, 3C3022555

1A 214459
MODERN CONCEPTS FOR DENSITY CONTROL PHASE I: BITUMINOUS WEARING COURSES
DURING 1969, 1970 and 1971 DENSITY DATA were obtained on bituminous wearing courses that were being constructed on several Minnesota trunk highways. Data were collected and analyzed from randomly selected locations on five bituminous surfacing projects. A statistical analysis was also performed on results from eleven other bituminous projects and on laboratory test results. Variation was determined from these data by computing the mean and standard deviation to reveal existing variation in acceptable density with the procedures that were applied. The results were used to evaluate present specifications and to develop a new acceptance sampling plan. The plan is based on statistical concepts that will define the degree of acceptable variation upon which decisions can be made with an established degree of confidence. Proposed statistical specifications are presented.

Wolters, RO
Minnesota Department of Highways Final Rep. 1973

ACKNOWLEDGMENT: Federal Highway Administration, Minnesota Department of Highways/FHWA P-0041, NTIS PB 228 752/AS. 1C33023586

1A 214460
CONSTRUCTION CONTROL OF RIGID PAVEMENT ROUGHNESS
PAYING PROCEDURES were monitored and performance surveyed for 5 years on 100 Portland cement concrete pavement projects to determine the factors affecting as-built surface roughness. The California profilograph was reported earlier in this investigation to be a fast, accurate, and reproducible method of measuring roughness within a few hours after paving. By contrast, conscientious inspection with a 10-ft straight edge and correction of out-of-tolerance bumps during construction do not assure smooth-riding pavement. Slip-form paving generally produces a much smoother surface than paving with conventional fixed side-forms. Although good results can be achieved by either method, neither assures smoothness among the factors found to affect the results for side-form pavement are paving machine backup, pan floats, number of screeds, night joints, paving equipment condition, and pavement alignment and cross-slope. The effect of slip-form paving is the most important condition of the fine grade and subgrade. Mesh placement, night joints, and changes in concrete slump. The Clary screed also shows promise as a means of reducing pavement roughness with slip-form paving. General requirements for a specification to assure construction of smooth pavement are also discussed.

Kerr, BT Henault, GG
Canadian Good Roads Association Proc Oct. 1964

1A 214461
QUALITY CONTROL IN AUTOROUTE CONSTRUCTION
THE QUALITY CONTROL PROCEDURES employed by the Quebec Autoroute Authority in the construction of toll roads is described. The standards for materials and construction are indicated as well as allowable deviations. The application of quality control charts is illustrated. These procedures are applied to subgrade construction, rigid pavement construction, flexible pavement construction, concrete mixes, asphalt mixes, aggregate gradation, the authority pays consultants a lump sum for quality control inspection which amounts to between 2 and 2.5 percent of the total value of the contract. /CGRA/

Trudeau, RT Canadian Good Roads Association Proc Oct. 1964

1A 214469
THE STATISTICAL BASIS OF QUALITY CONTROL CHARTS
THE STATISTICAL PRINCIPLES and assumptions that form the basis of quality control charts are reviewed and the procedure for constructing these control charts is illustrated with an example. Special emphasis is placed on the processing of highway paving materials. The summary and conclusions of the paper indicate the application and limitations of the method in construction control and specification interpretation.

Hutchinson, BG Canadian Good Roads Association Proc Oct. 1964

1A 214470
SIGNIFICANCE OF QUALITY CONTROL

Kerr, BT Henault, GG Canadian Good Roads Association Proc P233-38, Oct. 1964

1A 214462
QUALITY CONTROL OF ASPHALT PAVEMENT CONSTRUCTION
BECAUSE OF THE LIMITED INFORMATION AVAILABLE IN THE FIELD OF QUALITY CONTROL OF ASPHALT PAVEMENTS, AN INTENSIVE STUDY was made of hundreds of test results from actual paving projects to determine the actual variations which do occur in control tests. The mean values and standard deviation values were calculated and histograms showing variations were plotted for asphalt penetration, asphalt content, aggregate gradation, surface density, air voids, Marshall Stability and Flow, asphalt surface thickness variations. The test results were compared to design values and specifications. The results indicate the percentage of test results which can be expected to fall outside of specification limits and indicate the usefulness of quality control charts in interpreting data. /CGRA/
SOIL COMPACTION FOR HIGHWAY CONSTRUCTION

This is a panel discussion on compaction control. A brief outline of the importance of compaction and its effects as well as factors influencing compaction is given. Compaction of subgrade affects pavement durability and compaction requirements for all agencies should be fairly uniform. /CO/

Keyser, JH, Central and Research Laboratory Montreal /Can/ Reid, GD, Department of Public Works Ottawa /Can/
Canadian Construction Association Proc Jan. 1965

CONSTRUCTION OF A FULL-SCALE ROAD EXPERIMENT AS PART OF A UNIT-PRICE CONTRACT

An experimental pavement comprising 36 test sections was constructed, as part of a unit-price highway contract, between May and September, 1965. Special provisions were introduced into the contract documents dealing with the special construction sequences, tolerances, testing, and the control of traffic during construction. Construction control and contract specifications are described and the degree of uniformity of materials, compaction, moisture contents, layer thicknesses, etc., achieved within the framework of the contract is reported. The special provisions are mentioned in this report and the degree of compliance, as measured by a comprehensive series of tests during construction, is described. It is concluded that a generally acceptable standard of control was achieved and the experimental pavement was constructed in a very short time. /AUTHOR/

Schonfeld, R Canadian Good Roads Association Proc 1967

ACKNOWLEDGMENT: Canadian Good Roads Association

CANADIAN CONSTRUCTION ASSOCIATION PROCEEDINGS OF THE 49TH ANNUAL MEETING


Canadian Construction Association Proc Jan. 1967

ACKNOWLEDGMENT: Canadian Good Roads Association

1A 214678

THE USE OF A NUCLEAR METER FOR THE CONTROL OF MOISTURE AND DENSITY IN PAVEMENT CONSTRUCTION

THREE YEARS EXPERIENCE WITH USE OF A NUCLEAR METER FOR QUALITY CONTROL OF SUCH ELEMENTS AS PAVEMENT CONSTRUCTION AND EARTHWORKS AND FOR CALIBRATION OF COMPACTION EQUIPMENT WAS DESCRIBED. CLOSE CORRELATION BETWEEN RESULTS WITH THE METER WHICH THE METER HAS LARGELY REPLACED, WAS ILLUSTRATED BY RESULTS FROM FIELD CONSTRUCTION. OPERATING PROCEDURES AND SOURCES OF ERRORS WERE DISCUSSED IN DETAIL.


ACKNOWLEDGMENT: Highway Res Abstracts Hwy Res Board

1A 214687

AN INSPECTION RATIONALE

Inspection of concrete construction suggests a number of functions that should be covered by concrete inspection: 1/ Inspection and approval of batching and mixing facilities, 2/ Control of the proportioning of concrete mixes, 3/ Inspecting in the batch plant where size of job or type of concrete warrants it, 4/ Inspection, testing, and approval of materials, 5/ Inspection of forms and falsework, embedded items, reinforcing steel, and other items related to the preliminaries before actual placement of the concrete, 6/ Inspection of concrete handling and placing equipment such as buckets, chutes, hoppers, vibrators, and pumps, 7/ Inspection of the actual placing and handling of the concrete, including consolidation, finishing, curing, protection, and repair, 8/ Inspection of reinforcement of forms and shores, 9/ Preparing and testing concrete strength specimens, 10/ Inspection at precasting plants for prestressed concrete and special precast units, and 11/ Preparing reports covering all of these inspections and tests. The arrangement of these inspection procedures is a very complicated and difficult timing problem. #:

Waddell, JJ Concrete Construction Oct. 1966

1A 214704

HANDBOOK OF HEAVY CONSTRUCTION

Advice is given on all phases of construction, from equipment costs to erection, planning to field operation. Answers are given to a wide range of construction problems. Experts outline the best current practices in their field, show where difficulties may arise and eliminate need for costly trial and error. Case histories are included.

Stubbs, FW Handbook of Heavy Construction 1040 pp

1A 214724

HOW TO SAVE A MILLION /THEORETICALLY/

The cost of weather conditions to contractors can be alleviated by several aids provided by the U.S. weather bureau and weather consultants. Basic reading for construction contractors is the booklet, Weather and the Construction Industry, produced by the U.S. department of commerce, local climatological data, distributed from the national weather records center in Asheville, North Carolina. Tells the contractor quite accurately such things as: 1/ How many lost days to expect...
FROM RAIN, SNOW AND OTHER SEVERE WEATHER CONDITIONS. /2/ WHEN CONCRETE CAN BE POURED AND CURED PROPERLY, /3/ WHEN HE CAN EXPECT STOPPAGES DUE TO UNION CHILL FEATURE CAUSES, AND /4/ HOW MANY DAYS WILL BE REQUIRED TO COMPLETE THE JOB. FROM THESE DATA, MONTHLY SCHEDULES MAY BE PROJECTED INTO A ROUGH DAILY SCHEDULE FOR CONSTRUCTION ECONOMICS.

Constructor Jan. 1967

1A 214731 EVALUATION OF CONSTRUCTION CONTROL PROCEDURES-INTERIM REPORT

VARIATIONS INHERENT IN AGGREGATE GRADATIONS IN WIDELY DIFFERENT GEOGRAPHICAL LOCATIONS WERE EVALUATED. STATISTICAL TECHNIQUES WERE USED FOR DETERMINING THE RELATIVE EFFECT OF TESTING ACCURACY, SAMPLING METHODS, AND SEGREGATION, WITH RELATION TO THE EVALUATION AND ACCEPTANCE OF COARSE AGGREGATE USED FOR HIGHWAY CONSTRUCTION. A PRECISION STATEMENT WAS DEVELOPED FOR THE AGGREGATE GRADATION TEST, AND A METHOD OF DRAFTING A REALISTIC AND ADEQUATE ACCEPTANCE GRADATION SPECIFICATION FOR COARSE AGGREGATES. THE STANDARD DEVIATION FOR THE REPEATABILITY OF THE GRADATION TEST FOR ROA AGGREGATES UNDER AGRADATION CONDITIONS, IS APPROXIMATELY 4 PERCENT. RECOMMENDED METHODS OF INCORPORATING THE RESULTS OF THIS STUDY INTO HIGHWAY CONSTRUCTION SPECIFICATIONS AND PROCEDURES ARE PRESENTED IN THE FORM OF A COMPLETE MODEL SPECIFICATION FOR GRADED COARSE AGGREGATE.

Highway Research Board Nchrp Reports 1967

1A 214737 RESPONSIBILITY FOR QUALITY IN HIGHWAY CONSTRUCTION

THE PROBLEMS OF RESPONSIBLE CONTROL FOR QUALITY IN HIGHWAY CONSTRUCTION ARE DISCUSSED. PERFORMANCE DEPENDS ON THE DESIGN OF THE PAVEMENT STRUCTURE AT LEAST AS MUCH AS ON THE QUALITY OF MATERIALS AND CONSTRUCTION USED. THE ULTIMATE CONCEPT IN RESPONSIBILITY WOULD BE HAVING THE CONTRACTOR OR GOVERNMENT AGENCY REQUIRED TO DESIGN, BUILD AND GUARANTEE THE PERFORMANCE OF THE HIGHWAY. HOWEVER, INITIATIVE IN USING NEW CONSTRUCTION METHODS MUST NOT BE HAMPERED, CONSTRUCTION CONTROL TOLERANCES AND THE RESPONSIBILITY FOR QUALITY CONTROL TESTING ARE DISCUSSED.


1A 214740 RECOMMENDED PRACTICE FOR CONCRETE FORMWORK PRESENTS BRIEF INTRODUCTORY STATEMENT ON THE NEED FOR FORMWORK STANDARDS BASED ON THE FACT THAT 35 TO 60 PERCENT OF THE TOTAL COST OF THE CONCRETE WORK IN A PROJECT IN THE UNITED STATES IS IN THE FORMWORK. A SECTION IS GIVEN ON ENGINEER-ARCHITECT SPECIFICATION NOTING THE KIND AND AMOUNT OF SPECIFICATION THE ENGINEER OR ARCHITECT SHOULD PROVIDE THE CONTRACTOR. SINCE THE COMMITTEE CONCLUDES THAT FORMWORK AND OTHER UNDERTAKEN CONSTRUCTION, MUST BE THE RESPONSIBILITY OF THE CONTRACTOR, THE RECOMMENDATIONS CONTAINED IN THE REPORT ARE DIRECTED TO THAT GROUP. HOWEVER, AN UNDERSTANDING OF THE RECOMMENDATIONS BY ENGINEERS AND ARCHITECTS WILL AID THESE GROUPS IN THEIR SPECIFICATION FUNCTIONS. THE REPORT IS DIVIDED INTO FIVE CHAPTERS: 1. DESIGN, 2. CONSTRUCTION, 3. MATERIALS FOR FORMWORK, 4. FORMS FOR SPECIAL STRUCTURES, AND 5. FORMWORK FOR SPECIAL METHODS OF CONSTRUCTION.

/author/

Am Concrete Inst Journal & Proceedings July 1967
CANNOT BE REMEDIED, THE OWNER IS ENTITLED TO RECOVER THE DIFFERENCE BETWEEN THE VALUE OF THE BUILDING AS CONSTRUCTED AND THE VALUE IT WOULD HAVE HAD IF IT HAD BEEN BUILT UNDER CORRECT PLANS AND SPECIFICATIONS. AGAINST THE PROFESSIONAL DESIGNER AND CONTRACTOR, THIS PROFESSIONAL IS BEING CHARGED WITH LIABILITY BEYOND HIS CONTROL. THERE IS QUESTION IN SOME JURISDICTIONS WHETHER OR NOT A HOLD HARMLESS PROVISION IN A CONTRACT IS VALID AT ALL, SINCE IT CAN BE REGARDED AS A VIOLATION OF PUBLIC POLICY TO CONTRACT AWAY ONE'S LEGAL RESPONSIBILITY FOR HIS OWN FAULT. THE HOLD HARMLESS SOLUTION TO LEGAL EXPOSURE SEEMS TO BE AN APPLICATION OF TOO BROAD A BRUSH TO A VERY COMPLEX SUBJECT. IT IS OF DOUBTFUL LEGALITY IN MANY JURISDICTIONS AND IMPractical FROM A COST STANDPOINT IN ALMOST ALL AREAS. ASSERTED LIABILITY FOR A DEFICIENTLY DESIGNED STRUCTURE PRESENTLY HAS NOT LIMITED LEGAL LIMITATION OF LIABILITY AGAINST THE INEVITABLE RISKS OF DESIGN AND SUPERVISION SIMPLY MEANS SOME OTHER PART OF THE INDUSTRY WILL ASSUME THOSE RISKS.

Davidson, DM Civil Engineering Asce Nov. 1967

1A 214768 NATIONAL CONFERENCE ON STATISTICAL QUALITY CONTROL METHODOLOGY IN HIGHWAY AND AIRFIELD CONSTRUCTION


Virginia University Proceedings 664 pp. Nov. 1966

1A 214781 MICROFILM MOVES INTO CONSTRUCTION MICROFILM IS BEING USED BY SOME CONTRACTING COMPANIES IN TAKE-OFF OPERATIONS. THE 35-MM. MICROFILM COPIES OF THE COMPLETE BID DOCUMENTS ARE MAILED TO THE CONTRACTOR AT THE TIME THEY ARE RELEASED FOR BID. A PROJECTION TYPE MICROFILM READER-SCREEN IS USED. IT PERMITS PLANS AND SPECS TO BE PROJECTED TO A DIMENSIONALLY ACCURATE SIZE OF 30 X 42 INCHES. BY HAVING THE MICROFILM IN THE OFFICE, OFFICIALS OF THE COMPANY CLAIM, THE TIME, MONEY AND EFFORT SPENT BY ESTIMATORS IN GETTING TO AND FROM A SET OF ARCHITECTURAL PLANS AND SPECS CAN BE ELIMINATED. HAVING THE COMPLETE BID DOCUMENT IN THE OFFICE THROUGHOUT THE OUT-FOR-BID PERIOD, THE ESTIMATOR CAN CHECK AND RE-CHECK HIS WORK WITHOUT HAVING TO RETURN TO THE PLAN ROOM. A NUMBER OF PEOPLE CAN LOOK AT THE PLANS OF A DIFFICULT JOB AT THE SAME TIME AND DISCUSS WAYS IN WHICH TO HANDLE THE PROJECT.

Concrete Construction Nov. 1967

1A 214789 EARTHQUAKE RESISTANCE FOR PRESTRESSED CONCRETE STRUCTURES THE ELEMENTS OF DESIGN AND CONSTRUCTION CONNECTED WITH PRESTRESSED CONCRETE ARE IMPORTANT IN PLANNING AN EARTHQUAKE RESISTANT STRUCTURE. SEISMIC FORCES AND SEISMIC ANALYSIS PRESENT STRUCTURAL DESIGN CRITERIA FOR THESE TYPES OF STRUCTURES. ENERGY ABSORPTION CAPACITY AND RESILIENCE OF PRESTRESSED CONCRETE, COUPLED WITH PROPER DESIGN, ADEQUATE DETAILS, SOUND CONSTRUCTION AND COMPETENT OBSERVANCE AND INSPECTION CAN PROVIDE THE STRUCTURE WITH THE ABILITY TO WITHSTAND EARTHQUAKES.

Galewski, S Concrete Construction July 1967

1A 214791 BRITISH STANDARD FOR CORROSION PROTECTION THE RECENT PUBLICATION OF A BRITISH STANDARD CODE OF PRACTICE FOR THE PROTECTION OF IRON AND STEEL STRUCTURES FROM CORROSION IS REVIEWED. THE CODE STARTS WITH THREE SECTIONS SETTING OUT THE BASIC PRINCIPLES GOVERNING THE CORROSION OF BARE FERROUS METALS, CORROSION PREVENTION AND CATHODIC PROTECTION. THESE ARE SUPPLEMENTED BY A SHORT BIBLIOGRAPHY TO THE STATISTICAL METHODS, DEALING WITH PROTECTIVE PRACTICES FOR NEW STRUCTURES GENERALLY: STRUCTURES AND CORROSION PROTECTION NEED OF MEASURES FOR WHICH SPECIAL MEASURES ARE NEEDED, MAINTENANCE IN SERVICE, AND METHODS OF ORGANIZATION, INSPECTION AND CONTROL.
1A SYSTEM CONSTRUCTION, MANAGEMENT & QUALITY CONTROL

Corrosion Prevention & Control /UK/ Feb. 1967

1A 214799
HOW TO INSPECT CONSTRUCTION
GOOD INSPECTION OF CONSTRUCTION STARTS WITH GOOD DESIGN AND ADEQUATE PLANS AND SPECIFICATIONS. THESE THE INSPECTOR MUST FULLY UNDERSTAND AND FAIRLY INTERPRET. INADEQUATE OR CORRECT DETAILS SHOULD BE CLARIFIED BY THE ENGINEER OR ARCHITECT. THE INSPECTOR HAS NO RIGHT TO ASK THE CONTRACTOR OR SUPPLIER FOR MORE THAN THE CONTRACT SPECIFICALLY REQUIRES, AND HE HAS ONLY LIMITED AUTHORITY TO PERMIT LESS. THE CONTRACTOR MAY HAVE A CRITICAL-PATH SCHEDULE STUDIED THOROUGHLY ON A COMPUTER. IF THIS IS AVAILABLE, LOOK FOR OMISSIONS OR DISCREPANCIES THAT MIGHT AFFECT JOB PROGRESS. RESIDENCE AND SMALL STRUCTURES CAN BE HANDLED BY THE USUAL CITY INSPECTORS, WHO MAY HAVE ONLY A CRAFTSMAN'S BACKGROUND. ALL ENGINEERED CONSTRUCTION SHOULD HAVE A PROFESSIONAL ENGINEER AT THE SITE TO HANDLE INSPECTION AND LIAISON WITH THE DESIGNER AND OWNER. THESE JOB FORCES SHOULD BE SUPPORTED WITH ADEQUATE AUTHORITY AND WITH PAY SUFFICIENT TO KEEP THEM IN THIS WORK. IN ADDITION TO TECHNICAL COMPETENCE, THE ENGINEER WHO REPRESENTS THE OWNER IN THE FIELD MUST POSSESS THE QUALITIES OF AN IMPARTIAL ARBITER.

Cohen, BP Civil Engineering Asce Oct. 1965

1A 214800
QUALITY CONTROLS FOR STEEL CONSTRUCTION
DEVELOPMENTS IN THE STEEL INDUSTRY PERMITTING THE USE OF A WIDE VARIETY OF STRUCTURAL STEELS, THE EVER-INCREASING USE OF WELDED DESIGNS, AND THE RAPID RISE OF TODAY'S CONSTRUCTION ARE PLACING GREAT RESPONSIBILITY ON THE INSPECTION PHASE OF STRUCTURAL-STEEL PRODUCTION, FABRICATION AND ERECTION. BETTER AND MORE CLOSELY SUPERVISED INSPECTION OF STEEL IS REQUIRED FROM ROLLING MILL THROUGH FABRICATION PLANT TO ERECTION AND FINAL PAINTING. THE SUPPLIER FACES THE CONFLICTING INTERESTS OF LOWED COST VS. A QUALITY PRODUCT-WITH THE FIRST OF MAJOR IMPORTANCE TO HIS PRODUCTION STAFF. THE OWNER MUST BE CONVINCED THAT HE CAN ECONOMICALLY AFFORD THE BEST INSPECTION AND THAT THE INSPECTION AGENCY SHOULD BE SELECTED BY NEGOTIATION RATHER THAN COMPETITIVE BIDDING. THE ENGINEER MUST KEEP IN CLOSE CONTACT WITH THE INSPECTOR AND MUST BACK HIM UP FULLY IN THE MILL, IN THE FABRICATION SHOP AND AT THE ERECTION SITE. PROPER APPLICATION OF FAINT IS MOST IMPORTANT IN REDUCING MAINTENANCE. THE CURRENT PRACTICE OF ARCHITECTS HAVING FIELD INSPECTION OF CONSTRUCTION ITEMS OF ACCEPTABLE QUALITY. TO PREVENT FLAT BIAS A NON-SUBJECTIVE MEANS OF SAMPLE SELECTION SHOULD BE USED, SPECIFICALLY TABLES OF RANDOM NUMBERS. ASSUMING REALISTIC SPECIFICATION TOLERANCES STATISTICALLY BASED SAMPLING, MEANINGFUL TEST METHODS, AND ACCURATE TESTING, IT IS THE TEST RESULTS WHICH ARE THE PRIMARY INDICATION OF THE QUALITY OF MATERIAL PRODUCED OR OF THE COMPLETE ITEM OF CONSTRUCTION. SUFFICIENT MAJOR RESEARCH WORK HAS BEEN COMPLETED TO INDICATE BOTH THE PRACTICABILITY AND THE ECONOMIC NECESSITY OF THE USE OF STATISTICAL TOOLS IN MANY MAJOR ITEMS IN HIGHWAY SPECIFICATIONS. IT WILL STILL BE NECESSARY TO FOLLOW GOOD CONSTRUCTION PRACTICE, TO HAVE INSPECTORS AT ALL CRITICAL POINTS, AND TO EXERCISE GOOD INSPECTION PRACTICES AND TO CONDUCT EVALUATION TESTS. STATISTICS WILL NOT TELL AN INDIVIDUAL WHAT CORRECTIVE ACTION TO TAKE, BUT WILL HELP TO SHOW WHERE CORRECTIVE ACTION IS NEEDED.


1A 214811
EXPERIENCE OF WEST VIRGINIA STATE ROAD COMMISSION IN DEVELOPING STATISTICAL SPECIFICATIONS.
SOME RESULTS ARE DISCUSSED FROM A FOUR YEAR PROGRAM OF SAMPLING AND TESTING ON THE VARIATIONS OF THE CHARACTERISTICS OF MATERIALS. AGGREGATE TEST RESULTS SHOWED THE LEVEL OF QUALITY WAS SUCH THAT REQUIREMENTS FOR LOS ANGELES ABRASION AND SODIUM SULPHATE SOUNDNESS WERE BEING CONSISTENTLY MET. THE ACCURACY OF CURRENT METHODS OF DETERMINING ASPHALT CONTENT LEAVES MUCH TO BE DESIRED. A NEW RAPID METHOD OF TESTING PAVING MIXTURES FOR ASPHALT CONTENT IS BEING DEVELOPED. THE METHOD OF SIMULATION IS USED TO INVESTIGATE THE EFFECT OF USING NEWLY DERIVED STATISTICAL SPECIFICATIONS. A SERIES OF RANDOM SAMPLES INDEPENDENT OF ROUTINE CONTROL SAMPLES IS TAKEN OF MATERIALS FROM ACTUAL CONSTRUCTION PROJECTS. STATISTICAL ACCEPTANCE CRITERIA ARE APPLIED TO THE RESULTS OF TESTS ON THESE SAMPLES AND THE PERCENTAGE OF MATERIAL WITHIN LIMITS COMPUTED ALONG WITH ANY INDICATED INCENTIVE ADJUSTMENTS IN UNIT COST. ESSENTIAL STEPS IN THE DEVELOPMENT OF PRACTICAL AND REALISTIC STATISTICAL SPECIFICATIONS ARE: (1) SELECT PROJECTS THAT WILL USE THE SPECIFICATIONS; (2) SELECT MATERIAL OF CONSTRUCTION AND PRODUCE THE SOURCES OF VARIABILITY DATA IS NEEDED WHICH DEFINES THE AVERAGE LEVEL, THE OVERALL VARIABILITY, AND THE SOURCES OF VARIABILITY OF THE SELECTIVE CHARACTERISTICS OF MATERIALS AND CONSTRUCTION ITEMS OF ACCEPTABLE QUALITY. TO PREVENT FLAT BIAS A NON-SUBJECTIVE MEANS OF SAMPLE SELECTION SHOULD BE USED, SPECIFICALLY TABLES OF RANDOM NUMBERS. ASSUMING REALISTIC SPECIFICATION TOLERANCES STATISTICALLY BASED SAMPLING, MEANINGFUL TEST METHODS, AND ACCURATE TESTING, IT IS THE TEST RESULTS WHICH ARE THE PRIMARY INDICATION OF THE QUALITY OF MATERIAL PRODUCED OR OF THE COMPLETE ITEM OF CONSTRUCTION. SUFFICIENT MAJOR RESEARCH WORK HAS BEEN COMPLETED TO INDICATE BOTH THE PRACTICABILITY AND THE ECONOMIC NECESSITY OF THE USE OF STATISTICAL TOOLS IN MANY MAJOR ITEMS IN HIGHWAY SPECIFICATIONS. IT WILL STILL BE NECESSARY TO FOLLOW GOOD CONSTRUCTION PRACTICE, TO HAVE INSPECTORS AT ALL CRITICAL POINTS, AND TO EXERCISE GOOD INSPECTION PRACTICES AND TO CONDUCT EVALUATION TESTS. STATISTICS WILL NOT TELL AN INDIVIDUAL WHAT CORRECTIVE ACTION TO TAKE, BUT WILL HELP TO SHOW WHERE CORRECTIVE ACTION IS NEEDED.

Steele, WG Assoc Asphalt Paving Technol Proc Feb. 1968

1A 214810
PROBLEMS FACED BY STATE HIGHWAY DEPARTMENTS IN DEVELOPING STATISTICAL SPECIFICATIONS
PROBLEMS WHICH MUST BE FACED BY STATE HIGHWAY AGENCIES IN APPLYING STATISTICAL PRINCIPLES TO HIGHWAY SPECIFICATIONS ARE DISCUSSED. THREE OF THE MAJOR ENGINEERING PROBLEMS IN WHICH STATISTICAL TOOLS CAN BE HELPFUL ARE: (1) ESTABLISHING NUMERICAL SPECIFICATION LIMITS, (2) PROVIDING GUIDELINES FOR PROPER SAMPLING, AND (3) ANALYZING TEST RESULTS. THE BASIC OBJECTIVE OF HIGHWAY SPECIFICATIONS IS TO ASSURE SATISFACTORY PERFORMANCE AT MINIMUM COST. UNBIASED DATA IS NEEDED WHICH DEFINES THE AVERAGE LEVEL, THE OVERALL VARIABILITY, AND THE SOURCES OF VARIABILITY OF THE SELECTIVE CHARACTERISTICS OF MATERIALS AND CONSTRUCTION ITEMS OF ACCEPTABLE QUALITY. TO PREVENT FLAT BIAS A NON-SUBJECTIVE MEANS OF SAMPLE SELECTION SHOULD BE USED, SPECIFICALLY TABLES OF RANDOM NUMBERS. ASSUMING REALISTIC SPECIFICATION TOLERANCES STATISTICALLY BASED SAMPLING, MEANINGFUL TEST METHODS, AND ACCURATE TESTING, IT IS THE TEST RESULTS WHICH ARE THE PRIMARY INDICATION OF THE QUALITY OF MATERIAL PRODUCED OR OF THE COMPLETE ITEM OF CONSTRUCTION. SUFFICIENT MAJOR RESEARCH WORK HAS BEEN COMPLETED TO INDICATE BOTH THE PRACTICABILITY AND THE ECONOMIC NECESSITY OF THE USE OF STATISTICAL TOOLS IN MANY MAJOR ITEMS IN HIGHWAY SPECIFICATIONS. IT WILL STILL BE NECESSARY TO FOLLOW GOOD CONSTRUCTION PRACTICE, TO HAVE INSPECTORS AT ALL CRITICAL POINTS, AND TO EXERCISE GOOD INSPECTION PRACTICES AND TO CONDUCT EVALUATION TESTS. STATISTICS WILL NOT TELL AN INDIVIDUAL WHAT CORRECTIVE ACTION TO TAKE, BUT WILL HELP TO SHOW WHERE CORRECTIVE ACTION IS NEEDED.

Steele, WG Assoc Asphalt Paving Technol Proc Feb. 1968

Bruner, M Stahl, F Civil Engineering Asce Oct. 1965
QUALITY CONTROL OF ASPHALT PAVEMENT CONSTRUCTION

Data were collected from nine asphalt pavement construction projects to determine the variations in gradation, road densities, air voids, Marshall stability and flow values, pavement thickness, and asphalt cement penetration. Standard deviations for each are presented in graphs. The design of a quality control chart is presented as the establishment of the probable limits of random fluctuation. The number of defects found per unit volume represented by a series of samples. The technique is introduced as a natural follow-through in the study variation in physical properties used to describe the quality of pavement mixtures. The use of quality control charts should prove to be a valuable tool in pavement production besides an invaluable historical account of quality characteristics.

Huculak, NA
Canadian Department Public Works Feb. 1968

VARIABILITY IN ASPHALT PAVING MATERIALS

Selection of statistical procedures which would fit present practices and specifications were made to be applied individually to the construction project test data. An electronic data processing routine was established to summarize information from individual construction projects and to calculate the mean and standard deviation of the methods and test results. The statistical procedures selected are a matching set of variables sampling plans based on known standard deviation, unknown standard deviation and average range which all guarantee essentially the same protection. The data processing program was designed to calculate the number of samples, mean value, standard deviation, coefficient of variation, and quality index for each series of test results on each project. Also provided was an additional sort of the above data for each individual type of test with respect to type of asphaltic mix. An auxiliary program was designed to calculate state-wide pooled standard deviations for each of these listings to represent state-wide production. A statistical analysis is presented of data from basic construction with two types of hot-mixed asphaltic materials. It is concluded that procedures developed in this program provide a practical way to handle variations in construction test values from normal specification limits.

Deyoung, CE
Iowa State Highway Commission Feb. 1968

STATISTICAL QUALITY CONTROL IN HIGHWAY CONSTRUCTION

Canada’s experience in making a statistical study of its quality specifications for highway and bridge construction materials is described. Four years of research on sampling and testing of materials such as compacted embankment, plastic concrete, cement treated base, structural concrete aggregate, untreated base material and aggregate, subbase material and aggregate, base material and aggregate, and those inherent in the materials themselves. Suggested in place of traditional methods is statistical quality control (SQC). The use of SQC could shift the quality control responsibility to the contractor with the buyer basing his purchase on a statistically sound end point evaluation. Problems arising in the use of SQC may be met by training in the technology of statistical control, recognition of the fact that there is no need to supply statistical specifications to every construction item, the establishment of new specification limits, and a revision of testing procedures. /Author /

Beaton, JL
Am Soc Civil Engr J Construction Div Jan. 1968

QUALITY CONTROL OF CONSTRUCTION BY STATISTICAL TOLERANCES

Two years work and study are reported in the field of statistical control of construction tolerances by the Alabama highway department. Three construction projects were examined in detail: (1) a grading project, (2) a base and bituminous pavement project, and (3) a base and portland cement concrete pavement project. The projects were examined in detail and strict compliance with the recommendations contained in the statistical approach to quality control and highway construction published as a research guide by the Bureau of Public Roads in April, 1965. The computer program for the analysis of variance used is based on the proposition that the variance of the material, plus the variance of the sampling, plus the variance of the testing is equal to the overall variance of the end result. The asphalt concrete used in the project included in the study was placed in three layers. Tables are presented on the analysis of variance of a black base, binder course and wearing course. An examination of these three tables indicates that the variance due to the three components is reasonable. There is no indication of particular corrective action which should be taken. It is noted that where the variance tends to become large the quantities are small. The material performed very well with the construction specifications. Compresive strength tests results were noted to vary scandalously in the analysis of variance of portland cement concrete paving. The results are used from approved sources. The average, or arithmetic mean, taken and test made, generally come very close to the specification requirements. Research sampling and testing and acceptance sampling and testing were performed using the same sampling and testing techniques and often both procedures were performed by the same personnel. Statistical results do show a tendency for a small number of results to fall outside of the contract specifications.

David, JH
Alabama State Highway Department May 1967

CONTROL TESTS IN ROAD CONSTRUCTION

The amount of road testing which responsible engineers from various European countries consider desirable for work in their particular countries is set out in tabular form. The amount of testing considered necessary is shown in the number of tests that should be carried out per unit of volume or area of work done, or per day of week in which the work is done. The report does not discuss the design possibilities of the types of tests used for control purposes, nor does it cover those tests used for design purpose as distinct from control purposes, but the pros and cons of end-product specification versus method specification are presented. Special sections are included as appendices on radio-isotopes.
USED IN CONTROLLED TESTING OF ROAD MATERIALS AND VIBRATIONAL TESTING OF ROADS FOR CONTROL PURPOSES.

Perret Int Assoc Road Congresses Proc 1957

1A 214843

BACKFILL GUIDE

FIELD INVESTIGATIONS HAVE SHOWN THAT IMPROPERLY PLACED AND COMPACTED BACKFILL IS COMMONLY ASSOCIATED WITH PAVEMENT SETTLEMENT AND THE MOVEMENT OF RETAINING STRUCTURES. THIS GUIDE IS PRESENTED TO DEMONSTRATE THE IMPORTANCE OF THE BACKFILL, TO POINT OUT THE REASONS FOR SPECIFIED BACKFILLING PROCEDURES, AND TO SHOW SOME CONSTRUCTION PRACTICES THAT SHOULD BE AVOIDED. THE NECESSITY OF COMPLYING WITH BACKFILL SPECIFICATIONS IS EMPHASIZED.

BACKFILL MATERIALS AND CONSTRUCTION PRACTICES ARE DISCUSSED.

Peck, RB Ireland, HO Am Soc Civil Eng J Structural Div July 1957

1A 214851

FORCE ACCOUNT VS. CONTRACT CONSTRUCTION

THIS REPORT PRESENTS THE RESULTS OF COMPREHENSIVE JOB COST STUDIES MADE ON THREE CONTRACT AND TWO FORCE ACCOUNT SECONDARY ROAD PROJECTS IN NORTH CAROLINA DURING 1952 AND 1953. THE PURPOSE OF THESE STUDIES WAS TO DEVELOP FACTS ON THE COMPARATIVE COSTS OF THE TWO METHODS OF DOING WORK. IT WAS GENERALLY ACCEPTED THAT THE USEFULNESS OF THE STUDY RESULTS WOULD BE PRINCIPALLY IN FURNISHING CERTAIN FACTUAL BACKGROUND ON EACH METHOD, IN MINIMIZING UNSUBSTANTIATED CLAIMS AS TO EXCESSIVE ECONOMIES OF ONE METHOD OVER THE OTHER, AND IN KEEPING THE MAIN ISSUES INVOLVED FROM BEING COMPLICATED BY MINOR UNRESOLVED DETAILS. RESULTS PRESENTED INCLUDE QUANTITIES OF WORK, TAX AND WAGE RATE DIFFERENTIALS, MATERIALS PROCUREMENT PRACTICES, AND OTHER VARIABLES OF RECORD PERTINENT TO THE COMPARISON. THE FINDINGS TENDED TO FAVOR THE CONTRACT METHOD. /AUTHOR/


1A 214872

SUPERVISION OF CONTROL TESTS AT FERRY FRYSTON ESTATE, CASTLEFORD, U.D.C.

THIS REPORT GIVES AN ACCOUNT OF THE WORK UNDERTAKEN BY THE ASSOCIATION TO ASSIST WITH THE CONSTRUCTION OF SOIL-CEMENT BASES FOR HOUSING ESTATE ROADS AT FERRY FRYSTON, CASTLEFORD. DETAILS ARE GIVEN OF THE METHOD OF CONSTRUCTION EMPLOYED, TOGETHER WITH THE RESULTS OF FIELD TESTS ON A PRELIMINARY AREA OF APPROXIMATELY 1,350 SQ. YARDS EXTRACTS FROM THE SPECIFICATION ARE INCLUDED.


ACKNOWLEGMENT: Highway Research Board Bibliography

1A 214974

A SPECIFICATION FOR THE CONSTRUCTION OF SOIL-CEMENT BASES BY MIX-IN-PLACE AND STATIONARY PLANT METHODS


Blake, LS Cement & Concrete Association Res Repts Feb. 1958

ACKNOWLEDGMENT: Highway Research Board Bibliography

1A 214875

STANDARD SPECIFICATIONS FOR CONSTRUCTION OF AIRPORTS

DIVISION II ON PAVING CONSTRUCTION DETAILS MENTIONS: SUBBASE COURSE, CRUSHED AGGREGATE BASE COURSE, SOIL CEMENT BASE COURSE, CEMENT TREATED BASE COURSE, PORTLAND CEMENT CONCRETE PAVEMENT.

Federal Aviation Administration /US/ 1964

ACKNOWLEDGMENT: Portland Cement Association

1A 214940

CONTROL OF PAVEMENT CONSTRUCTION BY MEANS OF THE LA CROIX-LPC DEFLECTOGRAPH (IN FRENCH)

THE LA CROIX-PPC DEFLECTOGRAPH IS MAINLY USED FOR STUDYING THE STRENGTHENING OF EXISTING PAVEMENTS; THIS ARTICLE RELATES ITS UTILIZATION FOR CONTROLLING THE CONSTRUCTION OF TWO MOTORWAY STRETCHES A RIGID SECTION AND A FLEXIBLE SECTION WITH GRANULATED SLAG-TREATED LAYERS. IN THE CASE OF THE FLEXIBLE PAVEMENT IT ENABLED A SMALL BADLY DRAINED ZONE TO BE LOCATED AND SUBSEQUENTLY TREATED; IN THE CASE OF THE RIGID PAVEMENT, DIFFICULT WEATHER CONDITIONS (RAIN AND LOW TEMPERATURE IN LATE AUTUMN) INTERFERED WITH THE MEASUREMENTS CARRIED OUT ON PAVEMENT LAYERS. HOWEVER, IT WAS POSSIBLE TO OBSERVE A SYSTEMATIC DEFECT IN COMPACTION OF THE RIGID SECTION, DIFFICULT WEATHER CONDITIONS INTERFERED WITH THE MEASUREMENTS CARRIED OUT ON PAVEMENT LAYERS. HOWEVER, IT WAS POSSIBLE TO OBSERVE A SYSTEMATIC DEFECT IN COMPACTION IN THE VICINITY OF ENGINEERING STRUCTURES, AND TO FOLLOW THE EVOLUTION IN THE SETTING OF GRANULATED SLAG-TREATED LAYERS. THESE RESULTS SHOW THE POSSIBLE USES OF THE DEFLECTOGRAPH FOR THE SURVEILLANCE AND OVERALL CONTROL OF PAVEMENT CONSTRUCTION, OR CONTROL OF EACH LAYER, ASSUMING THAT THE PAVEMENT COURSES ARE SUFFICIENTLY STABLE. /A/LPC/RRL/

Champion, M Gourdon, JL De. LA SEIGLIERE P Bull Liaison Lab Reuniers /France/ Dec. 1968

ACKNOWLEDGMENT: Road Research Laboratory /UK/

1A 214960

PAVING MATERIALS

DURING THE LAST DECADE, NEW ENGINEERING PROCEDURES FOR THE CONSTRUCTION OF THE ASPHALT PAVEMENTS AND NEW METHODS FOR QUALITY CONTROL HAVE BEEN DEVELOPED. AMONG THE NEW METHODS WHICH ARE COMMANDING ATTENTION ARE: (1) AUTOMATION FOR CONTROL OF BITUMINOUS CONCRETE PLANTS, (2) ELECTRONIC SENSING DEVICES FOR GRADE CONTROL OF THE LAY-DOWN MACHINES, (3) NUCLEAR DEVICE FOR FAST ON-THE-SPOT MEASUREMENTS OF PAVEMENT DENSITY, (4) LOAD/DEFLECTION DEVICES FOR ON-THE-SHOT SURVEYS OF PAVEMENT STRUCTURAL STRENGTH, AND (5) FULL WIDTH AND DEEP LIFT PAVEMENT COURSES. EACH OF THESE NEW USES AND NEW METHODS OF APPLICATION IN THE USE OF ASPHALT IN PAVEMENT STRUCTURES IS DESCRIBED. /RRL/A/

Izatti, JE World Petroleum Congress Proc 1967

ACKNOWLEDGMENT: Road Research Laboratory /UK/

1A 214973

MATHEMATICAL-STATISTICAL EVALUATION OF MEASURING RESULTS, AND ITS APPLICATION TO THE QUALITY CONTROL OF CONCRETE OR BITUMINOUS MIXTURES IN ROAD CONSTRUCTION (IN GERMAN)

THE IMPORTANCE OF ACCURATE EVALUATION OF TEST RESULTS FOR RELIABLE QUALITY CONTROL OF BITUMINOUS MIXTURES AND CONCRETE DURING ROAD CONSTRUCTION IS DISCUSSED. THE PRINCIPLES OF THE MATHEMATICAL-STATISTICAL METHOD OF EVALUATION ARE DESCRIBED IN DETAIL. TOGETHER WITH THE ANALYTICAL AND GRAPHIC PROCESSES INVOLVED, DETAILS OF SAMPLING ARE GIVEN. /FG/RRL/

74
PRACTICAL ASPECTS OF AND RESEARCH INTO FLEXIBLE ROAD CONSTRUCTION /IN GERMAN/


Acknowledgment: Road Research Laboratory /UK/

1A 215068

THE APPLICATION OF THE "LINE OF BALANCE" TECHNIQUE TO THE CONSTRUCTION INDUSTRY BECAUSE OF THE INCREASING COMPLEXITY OF CONSTRUCTION PLANNING, SCHEDULING, PROGRAMMING AND CONTROL OF NUMBER OF PLANNING AND CONTROL METHODS HAVE BEEN INTRODUCED RECENTLY. SIMPLE AND EFFECTIVE MEANS OF CONTROL IS THE "LINE OF BALANCE" TECHNIQUE, WHICH CAN BE APPLIED TO A WIDE VARIETY OF CONSTRUCTION PROGRAMS. THE LOB TECHNIQUE IS DESCRIBED BRIEFLY WITH SPECIAL REFERENCE TO THE CONSTRUCTION INDUSTRY, AND IS ILLUSTRATED WITH PRACTICAL EXAMPLES DRAWN FROM THE FIELD. /RRL/

Khisty, CJ Indian Concrete Journal July 1970

Acknowledgment: Road Research Laboratory /UK/

1A 215079

THE SIXTH INTERNATIONAL CONFERENCE ON PREFABRICATED CONCRETE (BIBM/969) /IN FRENCH/ THE FIRST 4 SESSIONS OF THIS CONFERENCE ARE CONCERNED WITH QUALITY CONTROL, STANDARDIZATION, MECHANIZATION, AUTOMATION, LIGHTWEIGHT STRUCTURAL CONCRETE, AND NEW PRODUCTS AND TECHNIQUES WITH EXAMPLES OF APPLICATION. THE FIFTH SESSION IS DEVOTED TO THE CONSTRUCTION OF BRIDGES BUILT WITH PRECAST CONCRETE UNITS. THE REPORTS PRESENTED WERE AS FOLLOWS: ATTEMPT AT STANDARDIZING HORIZONTAL CONSTRUCTION ELEMENTS FOR BRIDGES (UNDERPASSES AND OVERPASSES), PARKING STRUCTURES AND OTHERS; BRIDGE CONSTRUCTION WITH PRECAST CONCRETE UNITS; SOME PRECAST CONCRETE BRIDGES IN SWEDEN; CONSTRUCTION OF PRECAST CONCRETE BRIDGES IN SPAIN. DETAILS ARE GIVEN OF BRIDGE CONSTRUCTION METHODS USING PRECAST REINFORCED OR PRESTRESSED CONCRETE ELEMENTS. /LCPC/RRL/

Venuat, M Rev Matl Constr & Trav Publics /Fr/ Aug. 1969

Acknowledgment: Road Research Laboratory /UK/

1A 215091

AUTOMATED SPECIFICATIONS-A RESEARCH SURVEY A STATE-OF-THE-ART SURVEY WAS CONDUCTED OF ORGANIZATIONS USING APPLICATIONS OF AUTOMATION IN THE SPECIFICATIONS PROCESS TO MAKE RECOMMENDATIONS FOR FURTHER STUDY. THE STUDY IS BASED ON THE THESIS THAT THE SPECIFICATION IS A PART OF A LARGER COMMUNICATION PROCESS IN ENGINEERING DESIGN AND CONSTRUCTION. ECONOMIC BENEFITS RESULTING FROM AUTOMATION PERMIT THE EMPHASIS TO BE PLACED ON DEVELOPING GOOD MASTER SPECIFICATIONS. A TWO-PHASE SYSTEM IS ANALYZED WHICH ESTABLISHES THE MASTER SPECIFICATION, OR DATA BANK, AND STORES IT IN A FORM THAT PERMITS RETRIEVAL IN A PRINTABLE FORM BY AUTOMATED TECHNIQUES. THE SECOND PHASE PERMITS ANY TRAINED PROFESSIONAL TO USE THE DATA BANK, AND TO PREPARE A BETTER THAN AVERAGE SPECIFICATION. A HIGHER-LEVEL SYSTEM IS USED AS A COMPUTER SYSTEM TO PERFORM LOGICAL PREDETERMINED OPERATIONS ASSISTED BY HUMAN INTERVENTION. PROJECTS MODCON AND ICES, UNDER DEVELOPMENT AT PENNSYLVANIA STATE UNIVERSITY AND MASSACHUSETTS INSTITUTE OF TECHNOLOGY, RESPECTIVELY, ARE REVIEWED. UNDER EITHER SYSTEM THE DATA SPECIFICATION OR DATA ITEMS REQUIRED FOR WEARABILITY, STRENGTH, REFLECTANCE, AND HEAT LOSS OR GAIN ALLOWABLE. AFTER THE CRITERIA HAVE BEEN ESTABLISHED HE ENTERS A DATA BANK ON AVAILABLE MATERIALS, AND IS ABLE TO SEE ALL THE SELECTIONS THAT WILL MEET HIS CRITERIA.

Engineering News-record 1968, 1 Pp-123

1A 215119

INSPECTION AND QUALITY CONTROL OF CONCRETE A SYMPOSIUM OF SEVEN BRIEF PAPERS BASED ON A SESSION SPONSORED BY ACI COMMITTEE 311, INSPECTION OF CONCRETE, AT THE 1967 ACI FALL MEETING IN DES MOINES ARE PRESENTED. THE ESSENTIALS OF SPECIFICATION PREPARATION ARE DISCUSSED. AN ENGINEER DISCUSSES THE ENGINEER'S ROLE IN CONSTRUCTION INSPECTION, AND A CONTRACTOR PRESENTS THE VIEW THAT THE MAJOR RESPONSIBILITY FOR INSPECTION SHOULD BE THE CONTRACTOR'S. SOME PROBLEMS ENCOUNTERED IN INSPECTION ARE NOTED AND A PROCEDURE TO SOLVE THEM OFFERED. THE ADVANTAGES OR QUALITY CONTROL ARE LOOKED AT AND THE MEANS BY WHICH INSPECTION IS ACTUALLY BEING PROVIDED ARE REVIEWED. THE FINAL PAPER DISCUSSES WAYS IN WHICH PRIVATE ORGANIZATIONS CAN HELP TRAIN INSPECTORS. /AUTHOR/

Am Concrete Inst Journal & Proceedings Aug. 1968

1A 215120

CRITERIA FOR PRESENT DAY CONCRETE PAVEMENT CONSTRUCTION THE CRITERIA ARE PRESENTED WHICH SHOULD BE USED IN PREPARING PLANS AND SPECIFICATIONS FOR THE CONTROL OF MODERN CONCRETE PAVEMENT CONSTRUCTION. THESE CRITERIA ARE DEVELOPED FROM THREE BASIC CONCEPTS: (1) THE OBJECTIVES OF THE OWNER, REPRESENTED BY THE ENGINEER, SHOULD BE, INDENTICAL. (2) A CONCRETE PAVEMENT CONSTRUCTION OPERATION IS IN REALITY AN OUTDOOR MASS PRODUCTION ASSEMBLY LINE AND AS SUCH IS SUBJECT TO THE SAME RULES OF OPERATIONAL PROCEDURE AS ANY MASS PRODUCTION ASSEMBLY LINE. (3) AN ACCURATELY
ADJUSTED AND PROPERLY OPERATED MACHINE, DESIGNED TO PERFORM A SPECIFIC OPERATION IN THE LINE, WILL DO A BETTER JOB THAN A MAN OR A GROUP OF MEN. EACH OF THESE BASIC RULES IS ANALYZED IN SOME DETAIL WITH RESPECT TO THEIR APPLICATION IN THE PREPARATION OF PLANS AND SPECIFICATIONS FOR CONTROL OF CONCRETE PAVEMENT CONSTRUCTION AND THE ACHIEVEMENT OF PRINCIPAL OBJECTIVES OF SUCH CONSTRUCTION WORK. CRITERIA ARE INDICATED FOR CONTROL OF EACH OF THE FOUR PRINCIPAL AREAS OF OPERATION IN PAVEMENT CONSTRUCTION: (1) ASSEMBLING BATCHING AND HAULING MATERIALS, (2) SUBGRADING AND FORMING, (3) MIXING AND PLACING, AND (4) FINISHING AND CURING. /AUTHOR/

Peyton, R.L. Highway Research Bulletin 1957

1A 215124

CONSTRUCTION SAFETY STANDARDS

"CONSTRUCTION SAFETY STANDARDS" IS DEDICATED TO THE IMPROVEMENT OF THE SAFETY RECORD IN THE CONSTRUCTION INDUSTRY. SAFETY STANDARDS HAVE BEEN INCORPORATED IN THE BUREAU OF RECLAMATION CONTRACT SPECIFICATIONS FOR REMARKABLE SETTING THAT SAFE WORKING CONDITIONS ARE MAINTAINED AND THAT SAFE OPERATIONS ARE FOLLOWED IN ALL CONTRACT OPERATIONS. NUMEROUS LIVES ARE LOST EVERY YEAR DUE TO FAULTY GROUND ELECTRICAL EQUIPMENT, FAILURE TO CONSTRUCT AND SAFELY MAINTAIN ADEQUATE SCAFFOLDING, ABSENCE OF TRENCH SHORING, INADEQUATE MAINTENANCE AND UNSAFE OPERATION OF HEAVY EQUIPMENT, AND LACK OF SAFETY SUPERVISION AND EMPLOYEE SAFETY EDUCATION. EFFECTIVE ACCIDENT PREVENTION CAN BE ADVANCED BY KNOWING AND OBSERVING THE SAFETY STANDARDS APPLICABLE TO EACH OPERATION OR ACTIVITY. SAFETY TECHNIQUES AND STANDARDS MUST CHANGE AND IMPROVE IN ORDER TO KEEP AHEAD OF THE INNOVATIONS AND CHANGES TAKING PLACE IN THE CONSTRUCTION INDUSTRY. FOR EXAMPLE, CONSTRUCTION SAFETY STANDARDS CURRENTLY CONTAINS PROVISIONS FOR EQUIPPING HIGH-SPEED OFF-HIGHWAY EARTHMOVING EQUIPMENT WITH ROLL-OFF PROTECTION AND EMERGENCY BRAKING SYSTEMS. THESE STANDARDS COVER THE RESPONSIBILITY OF THE CONTRACTOR, THE INDOCTRINATION OF THE EMPLOYEES, CARE AND HANDLING OF MATERIALS AND TRAFFIC CONTROL ON THE CONSTRUCTION SITES. /AUTHOR/


1A 215125

THE AASHO ROAD TEST: REPORT 2-MATERIALS AND CONSTRUCTION

CONTENTS: INTRODUCTION EMBANKMENT SUBBASE-FLEXIBLE AND RIGID PAVEMENTS BASE COURSE-FLEXIBLE PAVEMENT SURFACING-FLEXIBLE PAVEMENT SURFACING-RIGID PAVEMENT TEST BRIDGES APPENDIX A. STATISTICAL ANALYSIS OF COMPACTED DATA FOR CONSTRUCTION CONTROL APPENDIX B. ONE-POINT METHOD FOR DETERMINING MAXIMUM DRY DENSITY APPENDIX C. COOPERATIVE MATERIALS TEST PROGRAM APPENDIX D. TESTS ON ROAD TEST MATERIALS BY THE BUREAU OF PUBLIC ROADS APPENDIX E. RESIDUAL STRESS AND STATIC YIELD POINT OF STRUCTURAL STEEL FOR TEST BRIDGES APPENDIX F. COMMITTEES, ADVISORY PANELS, AND PROJECT PERSONNEL. /AUTHOR/

Highway Research Board Special Reports 1962

1A 215129

QUALITY CONCRETE FOR HIGHWAY CONSTRUCTION WITH CENTRAL MIXING PLANT

CENTRAL MIXED CONCRETE, DELIVERED TO JOB BY NEW AGITATED TRUCK BODIES, OFFERS GREAT OPPORTUNITY FOR FAST PLACEMENT, NEW METHODS OF QUALITY CONTROL, AND VERSATILITY IN RESPECT TO PLACING CONCRETE IN BRIDGES AND THE NUMEROUS OTHER STRUCTURES AS WELL AS THE SLAB ITSELF. THE METHOD IS FUNDAMENTALLY OLD. FIGURES WILL SHOW WORK IN OHIO DURING 1921. THE FIRST LARGE SCALE OPERATION ALONG MODERN LINES WAS THE CONCRETING ON ONE SECTION OF THE OHIO TURNPIKE IN 1954. THERE WERE TWO LARGE SCALE OPERATIONS IN 1955 AND NUMEROUS SMALLER OPERATIONS WHERE ONLY PART OF THE CONCRETE WAS MIXED. IMPROVED METHODS AND APPARATUS OF MIXING AND PLACING, AND NEW STATIONARY PAVERS PERMITTED THE USE OF EQUIPMENT ALREADY AVAILABLE. THIS WAS AFFECTED ON THE GARDEN STATE PARKWAY WIDENING, JUNE 1955, AND ODD PARTS OF US 14 IN OHIO NEAR RAVENNA, SUCH AS BRIDGE APPROACHES, INTERSECTIONS, AND THE LIKE. THE NEED IS SHOWN FOR NEW EQUIPMENT INCLUDING A SPREADER TO CONVEY AND DEPOSIT THE CONCRETE EVENLY ACROSS A FULL 25 FOOT WIDTH OF PAVEMENT, PORTABLE, OR SEMI-PORTABLE. CONCRETE MIXING PLANTS ARE ALSO NEEDED WHICH CAN BE TRANSPORTED IN PARTS FOR RAPID TRAVEL AND ERECTION. THESE PLANTS SHOULD INCORPORATE COMPLETE FACTORIES FOR AUTOMATIC WEIGHING, RECORDING AND TESTING. IT IS PROPOSED THAT THE HEAVY MEDIA METHOD OF TESTING FOR CEMENT CONTENT BE ENLARGED TO TEST THE FIRST, MIDDLE, AND LAST PARTS OF THE CONCRETE AS DISCHARGED FROM THE CENTRAL MIXING PLANTS TO MEASURE UNIFORMITY OF MIXING. IN RESPECT TO PLACING CONCRETE IN THE SLAB A DEVICE SHOULD BE TRIED FOR CONSOLIDATING BY USING BOTH PRESSURE AND VIBRATION IN ORDER TO SUCCESSFULLY PLACE CONCRETE OF ONE INCH OR LESS SLUMP WITH THE ADDED FLEXIBILITY AND SPEED. CENTRAL MIXED CONCRETE MAY WELL IMPROVE QUALITY AND REDUCE COST OF CONCRETE IN THE COUNTRY'S NEW HIGHWAY PROGRAM. /AUTHOR/

Maxon, G. Highway Research Board Bulletin 1956

1A 215145

STATISTICAL EVALUATION OF HIGHWAY MATERIALS SPECIFICATIONS

A STATISTICAL EVALUATION OF SOME OF THE MAJOR HIGHWAY MATERIALS SPECIFICATIONS IS REPORTED. THE DATA FOR ANALYSIS AND EVALUATION WERE OBTAINED FROM HISTORICAL SOURCES, WITH LIMITED AMOUNTS FROM RESEARCH SOURCES FOR ASPHALTIC CONCRETE, BASE COURSE, AND CONCRETE CHARACTERISTICS. THE DATA WERE ANALYZED BY COMPUTER AND STANDARD STATISTICAL PROCEDURES. THE ANALYSIS INDICATES THAT (A) MOST OF THE HISTORICAL DATA TEND TO FOLLOW NORMAL DISTRIBUTION, (B) IN GENERAL, THERE IS CONSIDERABLE VARIATION IN PRODUCTION AND CONSTRUCTION CONTROL FOR DIFFERENT CONTRACTORS, AND (C) FURTHERMORE, THERE IS A LACK OF COMPATIBILITY BETWEEN CURRENTLY USED SPECIFICATION LIMITS AND STATISTICAL PARAMETERS. THE REPORT DESCRIBES THE VARIOUS SINGLE-SAMPLING PLANS FOR LOT ACCEPTANCE, THE USE OF CONTROL CHARTS FOR CONTROL AND ACCEPTANCE OF PORTLAND CEMENT AND ASPHALTIC CONCRETE IS ALSO DEMONSTRATED. /AUTHOR/

Shah, SC Adam, V Highway Research Record, Hwy Res Board 1968

1A 215155

RESEARCH NEEDS

RESEARCH PROPOSALS BY THE CONSTRUCTION DIVISION OF THE DEPARTMENT OF MATERIALS AND CONSTRUCTION ARE PRESENTED. THE PROBLEM STATEMENTS ARE DIRECTED TOWARDS OFFERING INDIVIDUAL SOLUTIONS TO BOTH RIDING PAVEMENT SURFACE THE STATEMENTS INCLUDE OBJECTIVES, REFERENCES, AND PROJECT URGENCY. THEY CONCERN (1) JOINTS IN CONCRETE PAVEMENTS, (2) SMOOTH RIDING CONCRETE PAVEMENTS, (3) THE DEVELOPMENT OF IMPROVED METHODS OF MEASURING MIXING EFFICIENCY OF HOT MIX BITUMINOUS MATERIALS, (4) CONSTRUCTION QUALITY CONTROL, (5) COST OF OPERATION OF EARTH MOVING EQUIPMENT, (6) RAPID MEASUREMENT OF AGGR-
SYSTEM CONSTRUCTION, MANAGEMENT & QUALITY CONTROL 1A

GATE QUANTITIES, (1) SAMPLING PROCEDURE FOR AGGREGATES, AND (8) EVALUATION OF FINE BEARING CAPACITIES.

Highway Ret Circular, Hwy Ret Board Oct. 1966

1A 215167
QUALITY ASSURANCE IN HIGHWAY CONSTRUCTION, PART I- INTRODUCTION AND CONCEPTS

THIS ARTICLE IS THE FIRST OF A CONTINUING SIX-PART SERIES SUMMARIZING A RESEARCH EFFORT INITIATED TO IMPROVE QUALITY ASSURANCE METHODS IN HIGHWAY CONSTRUCTION. IN ADDITION TO THIS REPORT THE PRESENTATION WILL CONTAIN THE FOLLOWING: (1) QUALITY ASSURANCE OF EMBANKMENTS AND BASE COURSES, QUALITY ASSURANCE OF PORTLAND CEMENT CONCRETE (2) VARIATIONS OF BITUMINOUS CONSTRUCTION (3) SUMMARY OF RESEARCH FOR QUALITY ASSURANCE OF AGGREGATES, (4) AND CONTROL CHARTS. STATISTICALLY BASED QUALITY-CONTROL METHODS HAVE BEEN USED SUCCESSFULLY IN INDUSTRY FOR MANY YEARS. ACCORDING TO RESEARCH RESULTS, STATISTICAL QUALITY-ASSURANCE METHODS ALSO SHOULD BE ADAPTABLE TO HIGHWAY CONSTRUCTION, PROVIDED THAT GOVERNING SPECIFICATIONS ARE PROPERLY WRITTEN AND SAMPLING AND TESTING VARIATIONS ESTABLISHED TO CONFORM TO THE CONDITIONS OF THE LOCALITY IN WHICH THEY WILL BE APPLIED. /AUTHOR/

McMahon, TF Halstead, WJ Us Bureau Public Roads Feb. 1969

1A 215174
STATISTICAL CONCEPTS ON THE HIGHWAY

THE STATUS IS DISCUSSED OF THE CURRINT DISTINCTION BETWEEN NEEDS FOR ACCEPTANCE PROCEDURES BY THE HIGHWAY DEPARTMENT AND METHODS OF PRODUCT CONTROL BY THE CONTRACTOR. EMPHASIS HAS BEEN PLACED ON ESTABLISHING REALISTIC VARIANCES FOR EACH PROCESS SO THAT STATISTICAL TOLERANCES CAN REPLACE THE INTUITION THAT IS NOW BEING USED. CONTRACTORS MUST REALIZE THE NECESSITY FOR STATISTICAL CONTROL PROCEDURES. THE CASE HISTORIES IN VIRGINIA ARE REVIEWED ON A NON-DESTRUCTIVE TESTING PROCEDURE THAT EMPLOYS PORTABLE NUCLEAR TESTING EQUIPMENT. USING THE SMALL NUCLEAR PORTABLE GAUGE WHICH WAS DEVELOPED, A DENSITY TEST CAN BE PERFORMED ON HOT ASPHALTIC CONCRETE IN ONE MINUTE. THE METHOD INCORPORATES A RELATIVE COMPACTION PROCEDURE IN THE FIELD, USING A FIELD-ESTABLISHED STANDARD THAT ELIMINATES THE LABORATORY-TO-FIELD VARIANCE SPECIFICATION LIMITS WERE ESTABLISHED FOR A REALISTIC ACCEPTANCE PLAN USING RANDOM TESTING. THEY SPECIFY THE NUMBER OF TESTS TO BE MADE FOR LOT AS WELL AS LOT SIZE AND PROVIDE REQUIREMENTS BASED ON REALISTIC VARIANCES. CONVENTIONAL TEST RESULTS ARE COMPARED TO THE NUCLEAR TEST RESULTS. THIS COMPARISON SHOWS THE CONVENTIONAL VALUES ARE TWO TO THREE TIMES AS LARGE AS THE NUCLEAR VALUES, INDICATING THAT WITH THE SAME NUMBER OF TESTS WITH BOTH METHODS, THE NUCLEAR METHOD WILL PREDICT LOT AVERAGES MORE ACCURATELY.

Hughes, CS Quality Progress Feb. 1969

1A 215189
APPLICATION OF STATISTICS IN SPECIFICATIONS, QUALITY CONTROL, AND ACCEPTANCE PLANS FOR MATERIALS

AUTHORIZATION OF THE CONSTRUCTION OF THE NATIONAL SYSTEM OF INTERSTATE AND DEFENSE HIGHWAYS PRODUCED A NEED FOR SPECIFICATIONS, INSPECTION POLICIES IN HIGHWAY CONSTRUCTION WHICH LED TO VARIOUS REACTIONS BY THE PARTIES CONCERNED. A CONCEPT OF QUALITY CONTROL BY A STATISTICAL MEANS IS RECOMMENDED TO FURNISH A SOLUTION TO THE DIFFICULTY IN WHICH THE CONSTRUCTION INDUSTRY FINDS ITSELF. THE BUREAU OF PUBLIC ROADS HAS BEEN PARTICULARLY INTERESTED IN INTRODUCING A SYSTEM OF QUALITY CONTROL BY STATISTICAL MEANS. THE ALABAMA HIGHWAY DEPARTMENT UNDERSTOOD STATISTICAL QUALITY CONTROL BY STATISTICAL MEANS. THE ALABAMA HIGHWAY DEPARTMENT UNDERSTOOD STATISTICAL QUALITY CONTROL BY STATISTICAL MEANS. TO QUANTITY AND QUALITY, (2) THE STATE IS RESPONSIBLE FOR SUPPLYING THE MATERIAL AND CONSTRUCTION SPECIFICATIONS WHEREVER POSSIBLE. THE FOLLOWING GROUND RULES ARE BEING FOLLOWED: (1) THE CONTRACTOR IS RESPONSIBLE FOR SUPPLYING THE MATERIAL AND CONSTRUCTION SPECIFICATIONS IN THE CONTRACT, BOTH AS TO QUANTITY AND QUALITY, (2) THE STATE IS RESPONSIBLE FOR EVALUATING THE CONTRACTOR COMPLIANCE TO THE SPECIFICATIONS, (3) OBSERVATION BY A STATE INSPECTOR IS A MAJOR DETERRENT TO SLOPPY AND OBVIOUSLY DEFECTIVE WORK, (4) EACH ITEM OF MATERIAL OR CONSTRUCTION IS TO BE ADEQUATELY DESCRIBED IN STATISTICAL TERMS WHERE POSSIBLE, (5) A SAMPLING PLAN IS TO BE SPECIFIED FOR EACH ITEM TO BE SAMPLED AND (6) THE ACCEPTANCE OR REJECTION ACTION TO BE TAKEN, BASED ON THE ANALYSIS OF THE RESULT OF THE PRESCRIPTIONS OF THE DESIRED QUALITY OF MATERIALS OR CONSTRUCTION CAN BE QUITE VERSATILE. THE LEVEL OF QUALITY CAN BE STATED AS THE TARGET VALUE. THE ALLOWABLE VARIATION OF THE AVERAGE QUALITY OR THE VARIATION OF THE INDIVIDUAL TEST RESULTS ABOUT THE AVERAGE CAN BE EXPRESSED EXPLICITLY. THE PERCENT COMPLIANCE CAN BE COMPUTED FROM THE TEST RESULTS WHERE A PERCENT COMPLIANCE IS SPECIFIED AS BEING REQUIRED. THE SAMPLING PLAN DEFINES THE SAMPLING AND TESTING PROCEDURES TO BE USED, THE POINT OF SAMPLING, AND THE NUMBER OF SAMPLES TO BE TAKEN AND TESTED. THE FOLLOWING VARIOUS ACCEPTANCE CONSIDERATIONS ARE POSSIBLE: (1) ACCEPT THE LOT, (2) REJECT THE LOT, (3) ACCEPT AT A REDUCED PRICE, (4) ACCEPT AT A BONUS PRICE, AND (5) REWORK AND RETEST WITH THE RETEST COST TO BE BORNE BY THE CONTRACTOR. DATA HAVE BEEN COLLECTED ON

David, JR Southeast Assoc St Hwy Officials Nov. 1967

1A 215190
UTILIZATION OF STATISTICAL SPECIFICATIONS AND INCENTIVE PROVISIONS IN QUALITY ASSURANCE PROGRAM

1A SYSTEM CONSTRUCTION, MANAGEMENT & QUALITY CONTROL

Many research projects new realistic, enforceable performance-type specifications and new test methods are being developed which will measure the quality of materials and construction in terms of performance, thereby allowing a scientific approach to the establishment of design requirements and procedures.

McMahon, TF  Southeast Assoc St Hwy Officials Nov. 1967

1A 215192
QUALITY ASSURANCE IN HIGHWAY CONSTRUCTION PART 3-QUALITY ASSURANCE OF PORTLAND CEMENT CONCRETE

This is the third part of an interpretative summary of the progress in public roads research program for the statistical approach to quality assurance in highway construction. Part 1-introduction and concepts, and part 2-quality assurance of embankments and base courses, were presented in previous issues of public roads. The remaining parts, to be presented in succeeding issues, are 4-variations of bituminous construction, 5-summary of research for quality assurance of aggregate, and 6-control charts. [Author]

Baker, WM  McMahon, TF  Public Roads, Us Bureau Public Roads June 1969

1A 215193
QUALITY ASSURANCE IN HIGHWAY CONSTRUCTION: QUALITY ASSURANCE OF EMBANKMENTS AND BASE COURSES-PART II

Proper compaction is essential to the performance properties of soil and rock material. The control of the compaction process is one of the most important aspects in base and embankment construction. It has been demonstrated that nuclear density measurements produce more precise data than can be obtained by conventional methods. Valid measurements of the actual quality of the compaction can be made only if the sample is a true representation of the total compacted material. The use of statistical concepts to establish the requirements of specifications and to aid in the analysis of test data provides needed improvement. Uniformity must be controlled as well as degree of compaction. Several states have developed specifications for embankment or base construction that are improvements over present methods and are based partly on statistics. Virginia is using a control strip technique for control of the compaction of aggregate base. They used the nuclear field density testing device. The speed of which permits determination to be made for each section of material. Research is showing that overall standard deviation, a measure of variability, is not in itself a true indication of contractor-performance variability. The variation in density of accepted embankments and bases has been found to be much greater than expected by the Bureau of public roads research program. It is concluded that test results on base and embankment materials exhibit a great variation. These variations can be attributed to material variance, sampling variance, and to testing variance. State highway departments should take steps to implement random sampling in the control and acceptance of base and embankment construction.

McMahon, TF  Public Roads, Us Bureau Public Roads Apr. 1969

1A 215206
CONTROL AND ADJUSTMENTS OF CONSTRUCTION SCHEDULE

A five-year construction program was outlined in Michigan in 1957. The complete program was made public, with letting dates on each project, in advance, and schedules with target dates were set up for each division to meet in order that the entire schedule for the divisions could meet the predetermined letting dates. A central system of reporting to top management was set up for a program performance control. The central reporting procedure is laid out in the following steps: (1) preparation of bar charts, by districts, on every project showing the work schedules and target dates necessary for each division and section to meet, (2) preparation of reporting forms to be used by each division for reporting current information on the status of every project, (3) the development of a program performance chart giving information on every project, from the selection of the corridor, to the final disposal of any excess property that may have been acquired in connection with right-of-way purchase, and (4) preparation of program route reports on all interstate and arterial highways to give top management a comprehensive picture of each project. Central reporting can be successful with the full cooperation between top management, the divisions, and the districts.

Walker, MJ  Highway Research Board Special Reports 1961
RATHER THAN ON THE RESULTS OF INDIVIDUAL TESTS. THE USE OF USUAL SAMPLING TOOLS DOES NOT SEEM TO SERI­OUSLY BIAS THE RESULTS. THE MATHEMATICAL STUDY CONFIRMED THAT THE EFFECTIVE SIZE OF TEST PORTIONS DEPENDS ON BOTH THE MAXIMUM PARTICLE SIZE AND THE GRADATION OF THE AGGREGATE.

Hudson, SB Waller, HF Highway Research Board Nchpr Reports 1969

1A 215221 EMBANKMENT COMPACTION VARIABILITY-CONTROL TECHNIQUES AND STATISTICAL IMPLICATIONS

THE DEVELOPMENT OF A MORE EFFECTIVE METHOD FOR FIELD CONTROL OF EMBANKMENT COMPACTION MUST BE BASED ON KNOWLEDGE OF THE RESULTS BEING ACHIEVED USING CURRENT INSPECTION PROCEDURES. THIS WORK IS TO DETERMINE THE EXTENT OF COMPAC­TION VARIABILITY PRESENT IN FULL CONSTRUCTION FOR TYPICAL INDIANA CONSTRUCTION PROJECTS AND TO IDENTIFY THE VARIOUS FACTORS THAT LEAD TO THIS VARIATION. DIFFERENT TECHNIQUES FOR MEASURING IN-PLACE DENSITY, INCLUDING THE SAND CONE REPLACEMENT METHOD, THE WATER-FILLED BALLON VOLUME-MEASURING DEVICE, AND THE SURFACE BACKSCATTER NUCLEAR GAGE, WERE STUDIED TO PROVE VARIANCE ESTIMATES FOR USE IN THE FINAL STATISTICAL ANALYSIS. THE RESULTS INDICATE THAT WIDESPREAD COMPACTION VARIABILITY IS PRESENT IN ALL FIELD CONSTRUCTION REGARDLESS OF TESTING METHOD, AND THAT IT IS CAUSED BY A COMBINATION OF MANY INTERRELATED FACTORS. THIS OBSERVED SPREAD IN COMPACTION RESULTS INDICATES THAT CURRENT CONTROL PROCEDURES DO NOT ACCOUNT FOR VARIABILITY, AND THEREFORE AN INSPECTION PROGRAM USING STATIS­ICAL QUALITY CONTROL PROCEDURES DEVELOPED FOR THESE DATA IS PRESENTED. THE PROPOSED TECHNIQUE IS THAT OF USING A HYPOTHESIS DECISION THEORY THAT ACCOUNTS FOR THE COMPACtion VARIABILITY BY USING STATISTICAL PARAMETERS BASED ON RANDOM SAMPLING TO MAKE DECISIONS AS TO OVERALL COMPACTION QUALITY.

Williamson, TG Highway Research Record, Hwy Res Board 1969

IA 215224 STATISTICAL STUDY OF THE COMPLIANCE WITH SPECIFICATION OF CONCRETE SUPPLIED FOR HIGHWAY STRUCTURES IN THE UNITED KINGDOM

A STUDY HAS BEEN MADE OF THE STATISTICAL IMPLIC­ATIONS OF A UNITED KINGDOM SPECIFICATION FOR STRENGTH OF CONCRETE FOR HIGHWAY STRUCTURES AND THE QUALITY OF MATERIALS SUPPLIED TO AND ACCEPTED UNDER THE SPECIFICATION TO SEE IN WHAT WAY THE SPECIFICATION MIGHT BE IMPROVED. THE DISTRIBUTION OF RESULTS FROM STRENGTH TESTS IS NORMAL AND THE PROPORTION OF CONCRETE DEFECTIVE AT ANY SPECIFIED STRENGTH MAY BE ESTIMATED ONCE THE STATISTICAL PARAMETERS OF THE CONSTRUCTION HAS BEEN DETERMINED. THE PROPORTION DEFECTIVE PROVIDES A USEFUL MEASURE OF EQUALITY THAT CAN BE USED TO STUDY THE EFFECT OF PARTICULAR SPECIFICATION REQUIREMENTS ON THE QUALITY OF CONCRETE SUPPLIED IF THE OPERATING CHARACTERISTIC (OC) CURVE (RELATING THE PROPORTION DEFECTIVE AND THE PROBABILITY OF ACCEPTANCE OF THAT QUALITY) IS COMPUTED OVER A RANGE OF QUALITIES. THE CONCLUSIONS REACHED FROM EXAMINATION OF THE OC CURVE ARE COMPARED WITH THE RESULTS OF A STATIS­tical EXAMINATION OF THE ACTUAL QUALITY OF CON­CRETE SUPPLIED TO 186 JOBS WHERE 8,400 TEST RESULTS WERE OBTAINED. METHODS OF IMPROVING SPECIFICATIONS ARE BRIEFLY CONSIDERED IN THE LIGHT OF THE RISKS TO THE PRODUCER OF CONCRETE AND TO THE CONSUMER, THE OBJECT OF ANY SPECIFICATION BEING TO PROVIDE A FAIR APPORTIONMENT OF THE RISKS OF REJECTION OF 'GOOD' MATERIAL AND ACCEPTANCE OF 'POOR' MATERIAL BETWEEN PRODUCER AND CONSUMER.

Mathews, DH Metcalf, IB Highway Research Record, Hwy Res Board 1969

IA 215234 BENKELMAN BEAM DEFLECTIONS USED AS A CONTROL FOR HIGHWAY CONSTRUCTION

RECENT WORK IN VARIOUS PARTS OF THE WORLD HAS YIELDED MUCH INFORMATION AS TO WHAT IS A SATISFACTORY DEFLECTION LEVEL ON A PARTICULAR PAVEMENT TYPE SUBJECTED TO PARTICULAR TRAFFIC LOADINGS. THE VALUE OF DEFLECTION ON A FINISHED SURFACE IS RELATED IN SOME WAY TO THE DEFLECTION AT LOWER LEVEL PAVING OPERATIONS USING THESE FACTS, THIS PAPER DESCRIBES A METHOD OF CONSTRUCTION CONTROL USING DEFLECTIONS TAKEN AT DIFFERENT HORIZONS. THE JOBS ARE MULTI-LANE SECTIONS OF URBAN CONSTRUCTION, SUBJECTED TO HEAVY TRAFFIC, AND CONSTRUCTED OVER FORMER MAN­GROVE SWAMPS AND RECLAIMED LAND. TEST SECTIONS WERE ALSO CHOSEN ON THE FINISHED PAVEMENT AND SERVICEABILITY STUDIES ARE CONTINUING.

Kneipp, HH Australian Road Research Board Proc 1968

IA 215235 APPLICATION OF CONSTRUCTION MANAGEMENT TO THE PAVING PROCESS

THE APPLICATION OF CONSTRUCTION MANAGEMENT TO THE PAVING PROCESS BY THE CONTRACTOR CONSISTS OF THE FOLLOWING OPERATIONS: INTERPRETING THE SPECIFICATIONS, OBTAINING, ORGANIZING AND CONTROLLING MAN, EQUIPMENT, AND MATERIALS TO CONSTRUCT A PAVE­MENT AT THE RIGHT COST. EVERY STEP OF THE PAVING PROCESS MUST BE PLANNED FROM THE MOMENT OF AWARD UNTIL ACCEPTANCE BY THE AWARDING AGENCY. A PAVING OPERATION SCHEDULE SHOULD BE DETAILED AND EXACT TO THE LAST MINUTE DETAIL. A SAFETY PROGRAM MUST BE DESIGNED TO PREVENT ACCIDENTS AND AVOID INJURIES, AND MUST BE CONSISTENTLY EMPLOYED AND ENFORCED IN EVERY PHASE OF THE PAVING PROCESS. SUPERVISION MUST BE PROVIDED THAT HAS EXPERIENCE, DRIVE, DETERMINATION, & THE ABILITY TO COMMUNICATE, TO INTERPRET SPECIFICATIONS, CARRY OUT THE PAVING PROCESS, STAY ON SCHEDULE, AND MAINTAIN A SAFE OPERATION.

Porter, RL Sixth Paving Conference Proc pp 107-113, 1968

IA 215236 CALENDAR-DAY CPM

1A SYSTEM CONSTRUCTION, MANAGEMENT & QUALITY CONTROL

INTEGRATION IN PLANNING AND SCHEDULING REQUIRED TO OBTAIN REALISTIC PLANS AND SCHEDULES OF CONSTRUCTION PROJECTS.

Shaffer, J.R. Civil Engineering Asce Aug. 1969

1A 215250
VALUE ENGINEERING IN FEDERAL CONSTRUCTION AGENCIES

CONTENTS: INTRODUCTION CONCLUSIONS AND OBSERVATIONS, BASIC CONCEPTS OF VALUE ENGINEERING PROGRAMS, PROBLEMS IN IMPLEMENTING PROGRAMS THE FUTURE OF VALUE ENGINEERING PROGRAMS KEYNOTE, GEORGE B. BEGG VALUE ENGINEERING PROGRAMS IN FEDERAL CONSTRUCTION AGENCIES (PREPARED PAPERS) VALUE ENGINEERING IN THE CORPS OF ENGINEERS, WILLIAM S. ALLREDGE VALUE ENGINEERING IN THE BUREAU OF RECLAMATION, HAROLD G. ARTHUR VALUE ENGINEERING IN THE NAVAL FACILITIES ENGINEERING COMMAND, LAURENCE SCHUMAN VALUE ENGINEERING IN THE VETERANS ADMINISTRATION, SIVIDN J. HELENE VALUE ENGINEERING IN THE POST OFFICE DEPARTMENT, RILEY A. MURRAY VALUE ENGINEERING IN AIR FORCE CIVIL ENGINEERING, LIEUTENANT COLONEL ANTHONY D. RYNTIES, USAF VALUE ENGINEERING PROGRAMS IN PUBLIC BUILDINGS SERVICE. FORREST ANDREWS AN ANALYTICAL SUMMATION, HENRY A. BORGER AN ANALYSIS OF SPECIFIC PROBLEM AREAS IN VALUE ENGINEERING (PREPARED PAPERS) PRINCIPLES OF ORGANIZATIONAL ARRANGEMENTS FOR VALUE ENGINEERING, WILLIAM S. ALLREDGE COST REDUCTION AND VALUE ENGINEERING, LAURENCE SCHUMAN THE POSITION OF VALUE ENGINEERING IN MANAGEMENT, SIVIDN J. HELENE CONTRACT INCENTIVE CLAUSES, LIEUTENANT COLONEL ANTHONY D. RYNTIES, USAF VALUE ENGINEERING PROJECT SELECTION AND INITIATION, FORREST ANDREWS CONFIGURATION MANAGEMENT AND THE FUTURE OF VALUE ENGINEERING, RILEY A. MURRAY EMPHASIS-TECHNIQUES OR PROCEDURES? HAROLD G. ARTHUR INNOVATIONS AND MANAGEMENT SUPPORT, GEORGE B. BEGG.

Building Res Advisory Board Nas nec 1969

1A 215254
CRITICAL PATH EVALUATIONS OF CONSTRUCTION WORK CHANGES AND DELAYS

AFTER DISCUSSING THE GENERAL PROBLEM OF REALISTIC DETERMINATIONS OF THE EFFECTS OF WORK CHANGES AND DELAYS IN CONSTRUCTION CONTRACTS UNDER CURRENT GENERAL CONDITIONS, THIS PAPER PRESENTS A NEW AND PRACTICAL METHOD FOR THEIR EQUITABLE EVALUATION AND PROPER APPORTIONMENT, BOTH AS TO TIME AND COST, BASED UPON CRITICAL PATH NETWORK ANALYSIS. THIS METHOD ENVISAGES THAT THE CONTRACT SCHEDULE INCLUDES SEPARATE ITEMS FOR INDIRECT PROJECT COSTS, AND THAT THE CONTRACTOR'S WORKS PROGRAM (UPON WHICH HIS PRICE WAS BASED) FORMS PART OF THE CONTRACT. ESSENTIAL FEATURES OF THE CONCEPT INCLUDE PROGRESSIVE DOCUMENTATION OF ACTIVITY STATUS AS AFFECTED BY CHANGES, ORDERS AND DELAYS (HOWEVER ARISING) THROUGHOUT THE CONSTRUCTION PERIOD AND PROGRESSIVE PLOTTING OF TIME-SCALED "FACTUAL" NETWORKS AS THE WORK IS EXECUTED. IT HAS BEEN SUCCESSFULLY APPLIED TO FOUR MAJOR PROJECTS NOW COMPLETED. BY THIS TECHNIQUE THE OVERALL EFFECTS OF ALL WORK CHANGES AND DELAYS CAN BE EVALUATED IN DETAIL, AND PROPERLY APPORTIONED BETWEEN THE PARTIES IN ACCORDANCE WITH THE TERMS OF A CONTRACT.

/Author/

Antill, J.M. Jst Engs Civil Eng Trans /Australia/ Apr. 1969

1A 215264
METHODS FOR EXTENDING THE RANGE OF NON-COMPUTER CRITICAL PATH APPLICATIONS

A CONTINUATION OF THE RESEARCH IN AN EARLIER REPORT ENTITLED "A NON-COMPUTER APPROACH TO THE CRITICAL PATH METHOD FOR THE CONSTRUCTION INDUSTRY." ITS PURPOSE IS TO PRESENT IMPROVEMENTS TO SEVERAL OF THE PROCEDURES PREVIOUSLY DEVELOPED AND TO OFFER ADDITIONAL METHODS THAT WILL EXTEND THE RANGE OF THE NON-COMPUTER APPROACH. THE FOLLOWING CATEGORY IS CONSIDERED BY SOME TO BE "NON-STANDARD," IS DISCUSSED AT LENGTH IN CHAPTER II. THIS IS A BASIC MATTER SINCE THE DETAIL OF THE PROCEDURES TO BE PRESENTED IS DISCUSSED ON THE BASIS OF THE NETWORK DIAGRAM ADOPTED. THE DECIDING FACTOR IS THAT OF SIMPLICITY. IN CHAPTER III, THE BASIC NETWORK ELEMENTS AND THE MECHANICS BY WHICH CHANGES ARE TRANSMITTED THROUGH THE NETWORK ARE EXAMINED. THREE APPROACHES ARE PROPOSED FOR INCREASING THE SIZE OF NETWORK WHICH CAN FEASIBLY BE UPDATED BY NON-COMPUTER PROCEDURES. THIS ABILITY TO UPDATE DATA IS NOT ONLY IMPORTANT AS A FUNCTION BY ITSELF, BUT IT IS A KEY STEP IN SEVERAL OTHER TECHNIQUES, SUCH AS TIME-COST TRADE-OFFS AND RESOURCE ALLOCATION. THEREFORE, THESE APPROACHES ARE SIGNIFICANT IN ACCOMPLISHING THE OBJECTIVES OF THE REPORT. THEY ARE: (1) GREATER SELECTIVITY IN DATA REQUIREMENT; (2) EFFICIENT METHODS FOR UPDATING ONLY THAT DATA AFFECTED BY A CHANGE; AND (3) NETWORK BREAKDOWN THAT PERMITS LARGE NETWORKS TO BE REDUCED TO SMALLER SUBNETS WITHOUT SACRIFICING ESSENTIAL PROPERTIES OF THE OVERALL DIAGRAM. CHAPTER IV CONCERNS THE GENERAL PROBLEM OF REALISTIC DETERMINATIONS OF THE EFFECTS OF WORK CHANGES AND DELAYS IN CONSTRUCTION CONTRACTS UNDER CURRENT GENERAL CONDITIONS. THIS PAPER PRESENTS A NEW AND PRACTICAL METHOD FOR THEIR EQUITABLE EVALUATION AND PROPER APPORTIONMENT, BOTH AS TO TIME AND COST, BASED UPON CRITICAL PATH NETWORK ANALYSIS. THIS METHOD ENVISAGES THAT THE CONTRACT SCHEDULE INCLUDES SEPARATE ITEMS FOR INDIRECT PROJECT COSTS, AND THAT THE CONTRACTOR'S WORKS PROGRAM (UPON WHICH HIS PRICE WAS BASED) FORMS PART OF THE CONTRACT. ESSENTIAL FEATURES OF THE CONCEPT INCLUDE PROGRESSIVE DOCUMENTATION OF ACTIVITY STATUS AS AFFECTED BY CHANGES, ORDERS AND DELAYS (HOWEVER ARISING) THROUGHOUT THE CONSTRUCTION PERIOD AND PROGRESSIVE PLOTTING OF TIME-SCALED "FACTUAL" NETWORKS AS THE WORK IS EXECUTED. IT HAS BEEN SUCCESSFULLY APPLIED TO FOUR MAJOR PROJECTS NOW COMPLETED. BY THIS TECHNIQUE THE OVERALL EFFECTS OF ALL WORK CHANGES AND DELAYS CAN BE EVALUATED IN DETAIL, AND PROPERLY APPORTIONED BETWEEN THE PARTIES IN ACCORDANCE WITH THE TERMS OF A CONTRACT.

/AUTHOR/

Fondahl, J.W. Stanford University

1A 215264
METHODS IMPROVEMENT TECHNIQUES FOR CONSTRUCTION AND PUBLIC WORKS MANAGERS

THE RESULTS ARE PRESENTED OF SEVERAL YEARS OF INVESTIGATION BY THE CIVIL ENGINEERING-CONSTRUCTION GROUP AT STANFORD UNIVERSITY ON THE GENERAL SUBJECT OF METHODS AND TECHNIQUES FOR EFFICIENT MANAGEMENT OF CONSTRUCTION OPERATIONS. THE METHODS AND TECHNIQUES FOR MEASURING THE EFFICIENCY OF RESOURCE USE ARE ANALYZED. DEVELOPMENT OF A NEW METHOD BY MEANS OF METHODS IMPROVEMENT TECHNIQUES IS A FOUR-STEP PROCEDURE: (1) RECORD THE JOB AS IT IS BEING DONE, (2) ANALYZE EVERY DETAIL OF THE PRESENT METHOD, (3) DEVISE NEW METHODS, AND (4) IMPL-
SPOTS OF IMPLEMENTING A PLAN? WHAT TROUBLES ARE THERE? WHO DOES THE PLANNING? WHAT ARE THE TROUBLES?

SOPHISTICATED PRACTICES. THE NEED FOR SUCH A STEP: CONSTRUCTION EXPEDITING CREW BALANCE CHART, AND METHODS OF ACTIVITY CALCULATIONS AND POSSIBLE ERRORS, IS A VALUABLE STEP TOWARD WHICH THIS REPORT IS AIMED. THE THIRD IS TO OFFER THE READER AN OPPORTUNITY TO UNDERSTAND THE DETAILS OF THE METHOD AND THE ASSUMPTIONS UPON WHICH IT IS BASED, BY DISCUSSING THEM AND PRESENTING A COMPLETE SOLUTION TO AN ILLUSTRATIVE PROBLEM. THE SOLUTIONS OF A COMPLEX PROBLEM BY COMPUTER METHODS, ELIMINATING TEDIOUS CALCULATIONS AND POSSIBLE ERRORS, IS A VALUABLE STEP FORWARD. THIS REPORT IS NOT INTENDED TO OPPOSE SUCH METHODS, BUT, RATHER, TO OFFER A STEPPING STONE BETWEEN CONVENTIONAL PROCEDURES AND THESE MORE SOPHISTICATED PRACTICES. THE NEED FOR SUCH A STEP IS JUSTIFIED ON TWO BASES. FIRST, MANY POTENTIAL USERS FIND IT INCONVENIENT TO USE ELECTRONIC COMPUTERS OR ARE NOT YET "COMPUTER CONSCIOUS." SECOND, THE COMPUTER APPROACHES ARE NOT COMPLETELY SATISFACTORY IN ALL RESPECTS. IT IS ANTICIPATED THAT A BROADER AWARENESS WILL BE ACQUIRED AS THE ENVIRONMENT FOR GAMING INCLUDING IS AN EXPLANATION OF THE SELECTION OF BUILDING CONSTRUCTION PLANNING AND MANAGEMENT AS GAME MODELS. THE BASIC FEATURES IN BOTH CONSTRUCTION PLANNING GAMES AND CONSTRUCTION MANAGEMENT GAMES ARE DESCRIBED. /ASCE/

Au, T Parti, EW Am Soc Civil Engr J Construction Div June 1969

1A 215323
PROJECT PLANNING GAME FOR FOUNDATION EXCAVATION A COMPUTERIZED GAME USED TO SIMULATE THE COMPETITION AMONG SEVERAL SUBCONTRACTORS BIDDING AND PLANNING FOR THE FOUNDATION OF A BUILDING CONSTRUCTION PROJECT SUBJECTED TO THE IMPOSED CONSTRAINTS OF THE ENVIRONMENT DESCRIBED. THE ENTIRE PROCESS INCLUDES THREE PERIODS REPRESENTING THREE DIFFERENT TYPES OF DECISIONS, NAMELY: (1) CONTRACT BARGAINING; (2) PRELIMINARY ENGINEERING INVESTIGATIONS; AND (3) PLANNING AND SCHEDULING. THE GAME WILL BE PLAYED ACCORDING TO COMPUTERIZED PROCEDURE COMPOSED OF A COLLECTION OF SUBROUTINES WHICH HAS A PRESCRIBED SEQUENCE OF ACCESS. THE PERFORMANCE OF THE PLAYERS IS EVALUATED ON THE BASIS OF A SCORING SYSTEM REFLECTING THE CONSEQUENCE OF THE DECISIONS MADE BY THE PLAYERS. /ASCE/

Au, T Parti, EW Am Soc Civil Engr J Construction Div July 1969

1A 215324
CONSTRUCTION MANAGEMENT GAME-DETERMINISTIC MODEL A CONSTRUCTION MANAGEMENT GAME IN WHICH THE MARKET DEMANDS ARE PREDETERMINED IS PRESENTED. THE GAME IS PROGRAMMED FOR COMPUTERS TO SIMULATE THE COMPETITION FOR THE MARKET BY FIVE GENERAL CONTRACTORS WHO ARE REQUIRED TO MAKE MANAGERIAL DECISIONS AT 12 SUCCESSIVE TIME PERIODS FOR A TOTAL SIMULATED OF 3 YEARS. THE DECISIONS INCLUDE THE EVALUATION OF AVAILABLE INFORMATION, CHOICE OF JOBS TO BID, SELECTION OF SUBCONTRACTORS, THE DETERMINA-

Fondahl, JW Stanford University 1962

1A 215293
CONSTRUCTION EXPEDITING EXPEDITING CONSTRUCTION PROJECTS IS MORE THAN PREPARING BAR CHARTS OR NETWORKS. IT REQUIRES PERSONNEL THAT POSSESS CERTAIN INTELLIGENCE, SPECIAL EXPERIENCE, AND UNIQUE PERSONALITY TRAITS. IN ADDITION, WHO DOES THE PLANNING? WHAT ARE THE TROUBLE SPOTS OF IMPLEMENTING A PLAN? WHAT MAKES A GOOD EXPEDITER? THESE ARE EXAMINED. THE EXPEDITING PROCEDURE IS PERHAPS THE MOST IMPORTANT SINGLE PHASE OF THE CONSTRUCTION PROGRAM. CONSTRUCTORS WERE SURVEYED FOR THEIR VIEWS OF EXISTING PRACTICES. THE RESULTS SUGGESTED TWO AREAS OF FURTHER STUDY IN ADDITION TO POINTING OUT SOME EXISTING PROBLEMS. /AUTHOR/

Monsey, A Am Soc Civil Engr J Construction Div June 1970

1A 215117
INSTRUCTIONS FOR THE EXECUTION OF CONCRETE PAVEMENTS BY MECHANICAL METHODS THE PRESENT INSTRUCTIONS ARE EXAMINED BY STUDYING THE "TECHNICAL CONTROL" BY MEANS OF STATISTICAL ANALYSIS AND THE "RECEIVING CONDITIONS" WITH APPLICATION OF REDUCTION OF THE PRICES IN THE STRETCHES WHERE THE CONTRACTS CONDITIONS WERE NOT MET. THE WORK INCLUDES THE USUAL ITEMS OF INSTRUCTIONS FOR PAYING. /RRI/

Vieira, JC Belotti, G Lerner, JG Pinto, HM Road Research Institute /Brazil/

ACKNOWLEDGMENT: Road Research Institute /Brazil/

1A 215322
BUILDING CONSTRUCTION GAMES-GENERAL DESCRIPTION THE USE IS PROPOSED OF COMPUTERIZED HEURISTIC GAMES PORTRAYING SOCIAL, ECONOMIC, AND TECHNOCAL DECISIONS FOR THE EDUCATION OF ENGINEERS AND PLANNERS WHO ARE ENGAGED IN WORKS DIRECTLY OR INDIRECTLY RELATED TO THE CONSTRUCTION INDUSTRY. IT ANALYZES THE VALIDITY OF SUCH GAMES BY EXAMINING THE CHARACTERISTICS OF THE CONSTRUCTION INDUSTRY WHICH CAN SUITABLY BE USED AS THE ENVIRONMENT FOR GAMING INCLUDED IS AN EXPLANATION OF THE SELECTION OF BUILDING CONSTRUCTION PLANNING AND MANAGEMENT AS GAME MODELS. THE BASIC FEATURES IN BOTH CONSTRUCTION PLANNING GAMES AND CONSTRUCTION MANAGEMENT GAMES ARE DESCRIBED. /ASCE/

Au, T Parti, EW Am Soc Civil Engr J Construction Div July 1969

1A 215324
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Monsey, A Am Soc Civil Engr J Construction Div June 1970

1A 215117
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Au, T Parti, EW Am Soc Civil Engr J Construction Div July 1969

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1A SYSTEM CONSTRUCTION, MANAGEMENT & QUALITY CONTROL


Au, T. Bottelman, RL Parti, EW Am Soc Civil Engr J Construction Div
July 1969

1A 215330
COMPUTER SPEEDS MONITORING OF FILL AND BASE CONSTRUCTION

EARTHWORK AND BASE CONSTRUCTION IS MONITORED IN MINNESOTA BY THE COMPUTER. THE NEW COMPUTER PROGRAM BY ITS SPEED, IS HELPING TOWARD COMPLIANCE WITH MOISTURE, DENSITY, AND GRADATION SPECIFICATIONS AND TESTING RATES. FIELD DATA ARE COLLECTED ON EMBOSSED PLASTIC CARDS WITH BASIC PREPunched DATA AND OPTICAL MARKER IN INPUT FORM. THE INPUT FORMS ARE MARKED IN THE FIELD AND SUBMITTED TO THE CENTRAL OFFICE ONCE A WEEK. THE NOW FULLY FIELD TEST DATA AND APPLICABLE SPECIFICATIONS, THEY ARE SCANNED BY AN OPTICAL MARKED PAGE READER WHICH READS INPUT FORM AND PUNCHES A CODED CARD FOR EACH TEST. THE Punched CARDS ARE THEN INSERTED INTO THE COMPUTER WHICH SortS THE DATA, COMPARES THE TEST RESULTS TO THE SPECIFICATIONS AND PRINTS A REPORT. DATA AS WELL STORED ON A MASTER TAPE FOR FUTURE REFERENCE. DURING THE 1966 CONSTRUCTION SEASON, THE PROGRAM WAS TRIED ON AN EXPERIMENTAL BASIS ON SEVERAL SELECTED PROJECTS TO DETERMINE THE FEASIBILITY OF USING THE SYSTEM STATE-WIDE. BY THE END OF 1966 THE SYSTEM WAS READY TO GO STATE-WIDE BUT IT WAS INITIATED GRADUALLY BECAUSE OF THE PROBLEM INVOLVED IN TRAINING PERSONNEL ABOUT THREE FOURTHS OF ALL THE STATE CONSTRUCTION PROJECTS ARE NOW INCLUDED IN THE PROGRAM. THE PROGRAM HAS RESULTED IN A LARGE SAVINGS IN MAN HOURS IN THE MATERIALS OFFICE. IT HAS BEEN DETERMINED THAT: (1) THE PROGRAM IS FEASIBLE, (2) THE IMPLEMENTATION OF THE PROGRAM SUBSTANTIALLY REDUCED THE COST OF MONITORING FIELD CONSTRUCTION, PREPARING MATERIALS CERTIFICATES AND HAS RELEASED ENGINEERING PERSONNEL FOR MORE MEANINGFUL WORK, (3) THE PROGRAM MADE IT POSSIBLE TO CERTIFY EMBANKMENT AND BASE ITEMS ALMOST IMMEDIATELY UPON THE COMPLETION OF THE WORK, AND (4) THE BASIC PROGRAM CAN BE ADAPTED TO OTHER AREAS SUCH AS BITUMINOUS CONSTRUCTION, CONCRETE CONSTRUCTION AND LABORATORY TESTING TO PROVIDE DATA FOR THE DEVELOPMENT OF STATISTICAL SPECIFICATIONS AND TO DETERMINE THEIR FEASIBILITY.

Roads and Streets Apr. 1969

1A 215346
THE COMPUTER AS A CONSTRUCTION TOOL

THE REAL POTENTIAL OF THE COMPUTER IN CONSTRUCTION LIES IN ITS ABILITY TO COMMUNICATE: TO RECORD, RECALL, CALCULATE AND SELECTIVELY DISSEMINATE INFORMATION AS THE FIRST STEP IN EFFECTIVELY COMMUNICATING WITHIN THE LIMITATIONS OF AVAILABLE DATA PROCESSING EQUIPMENT. IT IS NECESSARY TO ESTABLISH A COMPREHENSIVE DATA BASE IN WHICH ALL COMPONENTS OF CONSTRUCTION ARE DEFINED AND BROKEN Down INTO THEIR FUNDAMENTAL WORK-ITEMS UNITS. THE PROBLEMS OF DETAILED QUANTITY SURVEYING DECAY ACKNOWLEDGED AT THE BEGINNING OF THE PROJECT AND A TECHNIQUE DUCED WHICH WOULD MAKE IT PRACTICAL TO TAKE OFF PROJECT REQUIREMENTS AT ANY STAGE OF THE DESIGN/CONSTRUCTION CYCLE. ONCE DESIGN DECISIONS ARE RECORDED AND STORED Within THE MEMORY OF THE COMPUTER, ALMOST ANY DESIRED TYPES OF OUTPUTS ARE AVAILABLE. CONCLUSIONS OF THE STUDY INDICATE THAT THE DEVELOPMENT OF A CONSTRUCTION MANAGEMENT INFORMATION SYSTEM IS NOT ONLY FEASIBLE, BUT ALSO POTENTIALLY VERY SIGNIFICANT TO THE TOTAL CONSTRUCTION PROCESS. THE IMPROVEMENT IN COMMUNICATIONS AND INCREASED CONTROL DURING DESIGN AND CONSTRUCTION, WHICH THIS SYSTEM MAKES POSSIBLE WILL ASSIST THE CONSTRUCTION ENGINEER TO TURN OUT BETTER PROJECTS AT LESS COST.

Early, WC Military Engineer Sept. 1970

1A 215348
CONSTRUCTION CONTROL OF RIGID PAVEMENT ROUGHNESS

RESULTS OF A 2-YEAR STUDY OF CAUSE-EFFECT RELATIONSHIPS INVOLVED IN ROUGHNESS OF CONCRETE PAVEMENTS ARE REPORTED. DATA WERE DERIVED BOTH FROM ANALOG AND DIGITAL DATA IN EACH WHEELPATH W/pIN HOURS AFTER CONCRETE PLACEMENT ON RANDOMLY SELECTED PAVEMENTS AND FROM QUALITATIVE OBSERVATIONS OF PAVING MACHINES. SAMPLED CONSTRUCTION CONSISTED OF 184 SECTIONS OF 1-AND 2-LANE PAVEMENT BUILT UNDER 62 DIFFERENT CONTRACTS WITH 8 DIFFERENT FORM-TYPE FINISHING MACHINES AND 3 DIFFERENT SLIPFORM PAVERS STATISTICAL ANALYSIS WAS HELD TO A MINIMUM BY UNCONTROLLED INTERACTIONS, BUT 5 FACTORS WERE FOUND TO BE COMMON AND OUTSTANDINGLY SIGNIFICANT IN RELATION TO ROUGHNESS THROUGHOUT THE CONTRACTS STUDIED: (A) BACKING UP OF THE LAST FINISHING MACHINE, (B) ABSENCE OF A FLOAT, (C) USE OF LESS THAN 3 SCREEDS, (D) USE OF A CROWN SECTION AS COMPARED TO A UNIFORMLY SLOPING SECTION, AND (E) LANE-ATTIME PAVING. NINE OTHER CONSTRUCTION PHENOMENA PRODUCING ROUGHNESS, COMMON TO MANY PROJECTS BUT FOUND LESS FREQUENTLY THAT THESE FIVE, ARE ALSO COVERED IN SOME DETAIL. /AUTHOR/

Haviland, JE Rider, RW Highway Research Record, Hwy Res Board 1970

ACKNOWLEDGMENT

1A 215357
RAPID TEST METHODS FOR FIELD CONTROL OF HIGHWAY CONSTRUCTION

RESEARCH WAS CONDUCTED TO DETERMINE THE STATE OF THE ART IN THE DEVELOPMENT, NEED, AND USE OF RAPID TEST METHODS. THE FIRST PHASE COMPRISSES A LITERATURE SURVEY OF CURRENT PRACTICES IN QUALITY CONTROL AND ACCEPTANCE TESTING, ALONG WITH A STUDY USING STATISTICAL METHODS TO ASSESS THE TIME LIMITS FOR RAPID TESTS. THE SECOND PHASE IS CONCERNED WITH THE DEVELOPMENT AND EVALUATION OF NEW RAPID TEST METHODS OR PRINCIPLES TO SELECT THOSE WORTHY OF FURTHER INVESTIGATION. THIRTY-EIGHT STATE HIGHWAY DEPARTMENTS PARTICIPATED IN THE STUDY, AND INTERVIEWS WERE CONDUCTED WHEN APPROPRIATE. THE SECOND PHASE OF THE STUDY APPLIED TO RAPID TEST METHODS FOR ASPHALT CONTENT DETERMINATION, COMPACTION CONTROL, GRADATION OF SEVERAL TYPES OF AGGREGATE, DENSITY OF BASE COURSE MATERIALS AND SOILS, AND MOISTURE CONTENT. THE RESULTS OF ALL TESTS ARE APPENDED. IN ADDITION TO 226 TEXTUAL REFERENCES, THE REPORT CONTAINS AN ANNOTATED BIBLIOGRAPHY OF 105 REPORTS AND ARTICLES ON RAPID TEST METHODS. /AUTHOR/

SYSTEM CONSTRUCTION, MANAGEMENT & QUALITY CONTROL

1A 215363
RESEARCH NEEDS IN CONCRETE PAVEMENT CONSTRUCTION


1A 215371
STATISTICAL QUALITY CONTROL OF HIGHWAY CONSTRUCTION AND MATERIALS
EXISTING LOCAL PRACTICES USED IN ESTABLISHING AND ENFORCING HIGHWAY SPECIFICATIONS AND CONSTRUCTION REQUIREMENTS AND PROCEDURES BASED ON STATISTICAL QUALITY CONTROL CONCEPTS. IN ORDER THAT STATISTICAL QUALITY CONTROL CONCEPTS MAY BE PROPERLY USED WHERE APPLICABLE, THE FIRST PART OF THIS REPORT CONSIDERS THE GENERAL THEORY UNDERLYING THE USE OF STATISTICAL CONTROL METHODS AND THE DEVELOPMENT OF DIFFERENT TYPES OF ACCEPTANCE PLANS WHICH MAY BE USED IN THE HIGHWAY CONSTRUCTION INDUSTRY. THE SECOND PORTION OF THE REPORT IS CONCERNED WITH ANALYZING AND COMPARING KENTUCKY'S CURRENT SPECIFICATION REQUIREMENTS WITH TYPICAL QUALITY CONTROL REQUIREMENTS ESTABLISHED USING BASIC STATISTICAL THEORY. SPECIFICATIONS USED BY SOME OTHER AGENCIES WHICH ARE BASED ON STATISTICAL PRINCIPLES ARE PRESENTED TO ILLUSTRATE THE USE BEING MADE OF THIS TYPE OF ACCEPTANCE PLAN.

Venable, JB Kentucky Department Highways Dec. 1970

1A 215377
HIGH RISE "SYSTEMS BUILDING" IN THE HUDSON VALLEY
THE USE OF "SYSTEMS BUILDING" TECHNIQUES IS DISCUSSED FOR AN URBAN RENEWAL PROJECT IN Poughkeepsie, N. Y. THE PROJECT CONSISTS OF A CENTRAL 18-STORY BUILDING SURROUNDED BY SMALLER BUILDINGS PROVIDING ABOUT 1000 DWELLING UNITS. ALSO CONSTRUCTION IS DESCRIBED OF THE CENTRAL BUILDING WHICH COMBINES CAST-IN-PLACE ELEVATOR AND STAIRWELL CORES AND SHEAR WALLS WITH PRECAST CONCRETE ELEMENTS, SOME OF WHICH WERE CAST ON-SITE. PRECASTING OPERATIONS ARE DESCRIBED AND ERECTION PROCEDURES DISCUSSED. IN THE LATTER, CAST-IN-PLACE WORK AND PRECAST FLOOR ERECTION PROCEEDED TOGETHER FLOOR BY FLOOR FOLLOWED SHORTLY BY ERECTION OF PRECAST EXTERIOR PANELS. SHEAR WALLS AND FLOOR PANELS WERE ERECTED AT A RATE OF ONE FLOOR PER WEEK. /ACIP/

Corbetta, RH Wilson, RE Am Concrete Inst Journal & Proceedings Jan. 1971

1A 215399
CONSTRUCTION PRACTICES
DURING THE 1920S THE DEFENSE DEPARTMENT PIONEERED THE GENERAL DEVELOPMENT AND APPLICATION OF STATISTICAL-BASED PROCESS CONTROL AND ACCEPTANCE CONCEPTS TO INDUSTRIAL PRODUCTS. THE FIRST USE OF THE METHODOLOGY BY HIGHWAY ENGINEERS WAS A RECORD SAMPLING PROGRAM. A LONG SLOW PERIOD OF ADOPTION FOLLOWED. ONLY IN RECENT YEARS HAS REALISTIC PROGRESS BEEN MADE IN THE USE OF STATISTICAL METHODS. NOW, A TOTAL OF 36 STATES HAVE ACTIVELY BEEN ENGAGED IN SOME FORM OF STUDY OR APPLICATION OF STATISTICALLY ORIENTED SPECIFICATION, FOR CONTROL AND ACCEPTANCE OF CONSTRUCTION, AND MORE THAN 1/3 OF THESE STATES ARE USING A STATISTICALLY DESIGNED SPECIFICATION, AS THEIR STANDARD OR PROVISIONAL SPECIFICATION, A NUMBER OF PLANS HAVE PROVED SOUND; YET THE GENERAL CONSENSUS SEEMS TO BE THAT THE APPLICATION OF STATISTICAL CONCEPTS TO HIGHWAY USE IS NOT FEASIBLE AT THIS TIME.

Deyoung, CE Highway Research Board Special Reports 1971

1A 215418
CONSTRUCTION METHODS IMPROVEMENT BY TIME-LAPSE MOVIE ANALYSIS
CONSTANT AND SYSTEMATIC IMPROVEMENT IN CONSTRUCTION METHODS IS AN AREA FOR POSSIBLE COST REDUCTION THAT CONSTRUCTION CONTRACTORS CANNOT AFFORD TO OVERLOOK. THE DETAILS OF DAILY OPERATIONS, INCLUDING SELECTION OF METHODS, TOOLS, AND SIZING OF CREWS, ARE OFTEN DELEGATED TO THE CRAFT FOREMAN. IT IS PROPOSED THAT CONSTRUCTION MANAGEMENT SHOULD ASSUME MORE RESPONSIBILITY FOR THE DEVELOPMENT AND USE OF IMPROVED PROCEDURES. THE USE OF TIME-LAPSE MOVIES FOR ANALYSIS OF OPERATIONS IS SUGGESTED AS AN ADDITIONAL TECHNIQUE BESIDES THE USES OF STOP-WATCH TIME STUDIES AND COST ACCOUNTING DATA. THE ADVANTAGES OF THIS TECHNIQUE ARE DISCUSSED. AN ACTUAL EXAMPLE INVOLVING ERECTION OF TUBULAR METAL FALSEWORK FOR AN ELEVATED FREEWAY STRUCTURE IS USED TO ILLUSTRATE A MOVIE ANALYSIS STUDY. BOTH EQUIPMENT AND PROCEDURES ARE DESCRIBED. /AUTHOR/

Fondahl, JW Highway Research Board Proceedings 1962

1A 215449
CONSTRUCTION OF EMBANKMENTS
THE STATE OF THE ART, AS EMBODIED IN THE AVAILABLE LITERATURE AND IN ADVANCED PRACTICE, IS REVIEWED. THE REPORT OPENS WITH A BRIEF CHARACTERIZATION OF EMBANKMENT FAILURES AND LOADS. THE NEXT FIVE CHAPTERS DEAL WITH SPECIFIC DESIGN AND CONSTRUCTION QUESTIONS: (1) SUBSURFACE INVESTIGATIONS (ROUTE LOCALIZATION, SURVEY, SOIL SURVEYS, EMBANKMENT LOADS); (2) FOUNDATION PREPARATION (MINIMAL PREPARATION, SOFT FOUNDATIONS, SIDEHILL FILLS, CUT-FILL TRANSITIONS, DRAINAGE PROVISIONS); (3) CULVERT DESIGN (DESIGN CONSIDERATIONS, PREPARATION OF PLANS AND SPECIFICATIONS); (4) PROCEDURES AND REQUIREMENTS FOR PLACEMENT OF FILL (ROLLED EARTH, ROCK, AND HYDRAULIC FILLS); AND (5) QUALITY CONTROL PROCEDURES. THE MISCELLANEOUS TOPICS ADDRESSED ARE SPECIAL MATERIALS, BURIED STRUCTURES AND BRIDGE APPROACHES, ECOLOGICAL CONSIDERATIONS, INTRAAGENCY COMMUNICATIONS, AND FIELD INSTRUMENTATION. CURRENT RESEARCH IN EMBANKMENT CONSTRUCTION AROUND THE WORLD IS SUMMARIZED IN A TABLE, AND AREAS WHERE FURTHER RESEARCH IS REQUIRED ARE DESCRIBED.

Hrb Nchrp Synrhesis of Hwy Practice 1971

1A 215456
DEVELOPMENT AND TRIAL USE OF ACCEPTANCE SAMPLING PLANS FOR COMPACTED EMBANKMENTS
THE PURPOSE WAS TO DEVELOP AND PUT IN TRIAL USE STATISTICALLY BASED ACCEPTANCE SAMPLING PLANS FOR COMPACTED EMBANKMENTS BASED ON THE EXISTING VARIABILITY IN ACCEPTABLE CONSTRUCTION. THE FIRST PHASE OF THIS RESEARCH INDICATED THAT THE TRIAL SPECIFICATIONS SHOULD HAVE THE FOLLOWING CHARACTERISTICS: (1) DECISIONS SHOULD BE BASED ON THE AVERAGE OF A NUM-
1A SYSTEM CONSTRUCTION, MANAGEMENT & QUALITY CONTROL

BER OF IN-PLACE DENSITY TESTS; (2) SAMPLE LOCATIONS SHOULD BE DETERMINED BY RANDOM NUMBERS; (3) SPECIFICATIONS SHOULD PROVIDE AN INCENTIVE FOR THE CONTRACTOR TO PRODUCE UNIFORM COMPACTION; AND (4) SPECIFICATIONS SHOULD CALL FOR THE SAME AVERAGE DEGREE OF COMPACTTION AS IS ACCEP TED UNDER THE CURRENT SPECIFICATIONS. SPECIFICATIONS INCORPORATING THESE CHARACTERISTICS WERE DEVELOPED AND USED ALONG WITH CURRENT HIGHWAY DEPARTMENT SPECIFICATIONS ON 3 CONSTRUCTION PROJECTS. THE LOT ACCEPTANCE PLAN USED A SAMPLE SIZE OF 3 TO 5 TESTS. A NUCLEAR MOISTURE-DENSITY INSTRUMENT WAS USED AND RESULTED IN A TESTING TIME OF FROM 40 TO 90 MIN PER LOT. A COMPARISON OF THE CURRENT SPECIFICATIONS THAT ARE BASED ON REPRESENTATIVE SAMPLING WITH A SPECIFIED MINIMUM DENSITY INDICATED THAT (1) THE AVERAGE LOT TEST RESULTS FOR THE REPRESENTATIVE SAMPLING DEVIA TED FROM THE RANDOM TEST RESULTS DEPENDING ON THE JUDGEMENT OF THE INSPECTOR, (2) OF THE 60 LOTS ACCEPTED UNDER THE CURRENT SPECIFICATIONS, 2 LOTS WOULD HAVE BEEN REJECTED UNDER THE TRIAL SPECIFICATIONS, AND (3) 9 OF THE 67 LOTS ACCEPTED BY THREE TRIAL SPECIFICATIONS HAD ONE OR MORE TESTS BELOW THE CURRENT SPECIFICATION LIMITS, INDICATING THAT THEY COULD HAVE BEEN REJECTED BY THE CURRENT SPECIFICATIONS. 

Jorgenson, JL Highway Research Record, Hwy Res Board 1971

1A 215487 DEVELOPMENT AND TRIAL USE OF ACCEPTANCE SAMPLING PLANS FOR ASPHALT CONSTRUCTION

DEVELOPMENT AND TRIAL USE OF ACCEPTANCE SAMPLING PLANS FOR ASPHALT CONSTRUCTION THE RESEARCH ON VARIABILITY IN ASPHALT CONSTRUCTION IN NORTH DAKOTA BROUGHT TO LIGHT MANY CHARACTERISTICS OF CURRENT ACCEPTABLE ASPHALT CONSTRUCTION. THEY ARE (1) SING LE TEST RESULTS EXHIBITED A LARGE VARIABILITY CAUSING MANY OF THE MEASUREMENTS TO BE OUTSIDE THE SPECIFICATIONS; (AVERAGE TEST RESULTS ARE RECOMMENDED); (2) THE CURRENT GRADATION BAND WAS ONLY PARTIALLY EFFECTIVE IN CONTROLLING AGGREGATE GRADATION; (TARGET VALUES SHOULD BE CHosen EITHER AT THE CENTER OF THE BAND OR IN THREE STANDARDS FROM THE CURRENT SPECIFICATION LIMITS; AND (3) PAYMENTS TO THE CONTRACTOR WERE INDEPENDENT OF THE QUALITY OF HIS WORK. SPECIFICATIONS SHOULD REQUIRE THE CONTRACTOR TO BEAR A GREATER RESPONSIBILITY FOR THE QUALITY OF HIS WORK. SUBSTANDARD WORK WOULD NOT BE PERMITTED OR THE PRICE COULD BE ADJUSTED.

Jorgenson, JL Highway Research Record, Hwy Res Board 1971

1A 215488 EARTHWORK COMPACTION SPECIFICATIONS AND CONSTRUCTION CONTROL PROCEDURES

IN 1955 THE OHIO HIGHWAY DEPARTMENT ADOPTED AN EARTHWORK SPECIFICATION WHICH REQUIRED MOISTURE AND DENSITY CONTROL OF THE COMPACTING OF EMBANKMENTS AND SUBGRADES DURING THE 20 YEARS OF OPERATION UNDER THIS SPECIFICATION, THE DEPARTMENT HAS HAD EXCELLENT SUCCESS IN APPLYING MOISTURE AND DENSITY CONTROL, RESULTING IN EMBANKMENTS AND SUBGRADES OF IMPROVED STABILITY. THE IMPROVED EARTHWORK CONSTRUCTION HAS PRODUCED STABLE EMBANKMENTS IN WHICH SLIDES, SETTLEMENTS AND LOCAL FAILURES Seldom OCCUR. SUBGRADES ARE NOW CONSTRUCTED WITH SUFFICIENT STABILITY TO ADEQUATELY SUPPORT TODAY'S HEAVY TRAFFIC WITHOUT MOISTURE-DENSITY CONTROL FOR SUBGRADES. IT WOULD NOT BE POSSIBLE TO BUILD THE STABLE ROADS NOW NEEDED.

Farrell, FB Highway Res Abstracts Hwy Res Board Nov. 1953

1A 215597 SYSTEM FOR CONTROL OF CONSTRUCTION QUALITY


Craig, HR Highway Res Abstracts Hwy Res Board July 1956
ON THE BASIS OF END RESULTS ON A RECENT OVERLAY TANCE. THE END-RESULT TESTING DID PERMIT SOME INTRACTORS VIRTUALLY A FREE HAND IN ESTABLISHING JOB PRODUCTION PROCEDURES. ACCEPTANCE WAS BASED ON Parsons, TO WHAT SERVICES CONSTITUTE CM AND ALSO WHO IS BEST INSPECTORS HAVE SAMPLED AND TESTED ONLY THE MATE
RIAL IN PLACE ON THE ROADWAY, OFFICIALLY IGNORING AND WITHIN BUDGET. ALTHOUGH STILL UNDER DEBATE AS AND SURFACE SMOOTHNESS. IN ADDITION TO UPPER AND ASPHALT CONTENT AND AGGREGATE GRADATION IN THE ACCEPTANCE OF ASPHALT PAVEMENT HAS BEEN STRICTLY 1A 215515
END-RESULT SPECS GET CAUTIOUS OK ON EXPERIMENTAL ASPHALT JOB ACCEPTANCE OF ASPHALT PAVEMENT HAS BEEN STRICTLY ON THE BASIS OF END RESULTS ON A RECENT OVERLAY PROJECT IN ILLINOIS. THE EXPERIMENTAL SPECIFICATIONS AND JOB CONTROL PROCEDURES HAVE GIVEN THE CONTRACTORS VIRTUALLY A FREE HAND IN ESTABLISHING JOB MIXES, SCHEDULING HOT MIX PRODUCTION, AND IN DECIDING ON EQUIPMENT AND CONSTRUCTION METHODS. STATE INSPECTORS HAVE SAMPLED AND TESTED ONLY THE MATERIAL IN PLACE ON THE ROADWAY, OFFICIALLY IGNORING PRODUCTION PROCEDURES. ACCEPTANCE WAS BASED ON ASPHALT CONTENT AND AGGREGATE GRADATION IN THE MIX ON THE ROADWAY, DENSITY, PAVEMENT THICKNESS AND SURFACE SMOOTHNESS. IN ADDITION TO UPPER AND LOWER LIMITS, UNIFORMITY WAS A BIG FACTOR IN ACCEPTANCE. THE END-RESULT TESTING DID PERMIT SOME INCREASE IN PRODUCTION.

Roads and Streets Vol. 113 No. 12, Dec. 1970, pp 61-2, 3 Tab, 1 Phot

1A 215529
WHIRLING IN EVOLUTION AND IN FERMENT CONSTRUCTION MANAGEMENT (CM) IS DESCRIBED PRIMARILY AS THE DELIVERY OF A SOPHISTICATED, ORGANIZED BUILDING TEAM OF A QUALITY PROJECT IN MINIMUM TIME AND WITHIN BUDGET. ALTHOUGH STILL UNDER DEBATE AS TO WHAT SERVICES CONSTITUTE CM AND ALSO WHO IS BEST QUALIFIED TO BE A CONSTRUCTION MANAGER, THE MAJOR SERVICES ARE PLANNING AND PROGRAMMING; CONSULTATION ON DESIGN ESTIMATION REVIEW, INSPECTION, APPROVAL, PROCUREMENT, ETC., CONTRACT LETTING AND COORDINATION, AND COST AND MANAGEMENT CONTROL. BASICALLY CM STRESSES THE TEAM WORK APPROACH. THE GENERAL SERVICES ADMINISTRATION (GSA) AND ITS PUBLIC BUILDING SERVICE (PBS) HAVE BEEN INSTRUMENTAL IN DEVELOPING A CM PROTOTYPE. THREE MAJOR CONTRACTS HAVE BEEN LET: A $37 MILLION FEDERAL DEPARTMENT OF DEFENSE BUILDING IN WASHINGTON D.C; A $148 MILLION SMITHSONIAN INSTITUTE AIR AND SPACE MUSEUM IN WASHINGTON D.C.; AND A $330 MILLION STRATEGIC AIR COMMAND BUILDING IN BELTSVILLE, MARYLAND. AT AN ESTIMATED COST OF $97 MILLION, 3 SOCIAL SECURITY PAYMENT CENTERS IN PHILADELPHIA, CHICAGO, AND SAN FRANCISCO; AND A $335 MILLION SMITHSONIAN INSTITUTE AIR AND SPACE MUSEUM IN WASHINGTON, D.C. THROUGH THE USE OF PROJECT MANAGERS, GSA HAS ATTEMPTED TO REDDEFINE THE RESPONSIBILITIES OF THE PROJECT MANAGER TO INCLUDE WORKING WITH CLIENT AGENCIES ON SPACE NEEDS AND FINANCING, ETC.; PBS WOULD LIKE TO SEE THE PROJECT MANAGERS QUALIFIED IN TERMS OF A FUNDAMENTAL RELATION OF THE APPLICABLE COEFFICIENT OF VARIATION AND ASSUMING MORE RESPONSIBILITY. THE OTHER FIRMS SUCH AS TISHMAN REALITY AND CONSTRUCTION CO., NEW YORK CITY, HAVE CONTRIBUTED TO THE CONCEPT OF CM BY PREPARING AND MONITORING CONSTRUCTION SCHEDULES, ASSISTING IN THE DRAFTING OF BID DOCUMENTS, COORDINATING CONSTRUCTION WORK, FURNISHING MONTHLY COMPUTERIZED COST REPORTS, REVIEWING BILLING AND APPROVING PAYMENTS.

Engineering News-record Vol. 188 No. 18, May 1972, pp 14-9, Phot

1A 215533

Federal Highway Administration /US/ Vol. 6 Mar. 1972, 63 pp

1A 215543
CONCEPT OF STRUCTURAL CONTROL IN AN IDEAL SITUATION, COMPLETELY SAFE STRUCTURES CAN BE DESIGNED IF EXACT INFORMATION IS KNOWN CONCERNING LOADS AND STRESSES INVOLVED DURING THE LIFE TIME OF THESE STRUCTURES, AND EXACT METHODS OF STRUCTURAL ANALYSIS ARE AVAILABLE. IN THE REAL WORLD, UNCERTAINTIES EXIST IN THIS INFORMATION AS WELL AS THE RESULTS OF ANALYSIS TO ACCOUNT FOR THESE UNCERTAINTIES, VARIOUS FACTORS OF SAFETY HAVE BEEN USED IN THE DESIGN OF STRUCTURES. THE OBJECTIVE HEREIN IS TO PRESENT THE CONCEPT OF STRUCTURAL CONTROL AS AN ALTERNATIVE APPROACH TO THE SAFETY PROBLEMS OF STRUCTURAL ENGINEERING. PERTINENT POINTS OF THE CONTROL THEORY ARE REVIEWED ALONG WITH AN APPLICATION OF STRUCTURAL CONTROL TO COMPLICATED STRUCTURES SUCH AS EXTREMELY TALL BUILDINGS OR LONG BRIDGES SUBJECTED TO UNCERTAIN DYNAMIC LOADS SUCH AS WIND AND EARTHQUAKE EXCITATIONS.

Yao, IT Am Soc Civil Engr J Structural Div Vol. 98 No. 7, July 1972, pp 1567-74

1A 215557
RATIONAL QUALITY ASSURANCE THE PAPER DESCRIBES ASPECTS OF A RATIONAL SYSTEM FOR THE APPLICATION OF STATISTICAL QUALITY CONTROL PROCEDURES IN HIGHWAY CONSTRUCTION. NORMS FOR THE JUDGMENT OF COMPLIANCE WITH A DOUBBLE SPECIFICATION LIMIT ARE DEFINED IN TERMS OF PARAMETERS THAT WILL BE MEANINGFUL TO ROAD ENGINEERS. THESE NORMS ARE FURTHER QUALIFIED IN TERMS OF A FUNDAMENTAL RELATION OF THE APPLICABLE COEFFICIENT OF VARIATION AND THE NUMBER OF OBSERVATIONS REQUIRED FOR JUDGMENT PURPOSES. CORRESPONDING JUDGMENT NORMS ARE ALSO PRESENTED FOR USE WHEN A PRODUCT THAT FAILS TO COMPLY WITH SPECIFICATIONS WHEN FIRST SUBMITTED IS SUBSEQUENTLY RESUBMITTED FOR ACCEPTANCE. INFORMATION IS ALSO PRESENTED THAT IS REQUIRED FOR THE PRACTICAL APPLICATION OF THE SCHEME. THIS INCLUDES THE ANALYSIS OF VARIATIONS THAT ARE REPRESENTATIVE OF CURRENT PRACTICE, DESIRED FREQUENCY OF SAMPLING, AND SUGGESTED LOT SIZES. Finally, THE APPLICATION OF THE METHOD IS ILLUSTRATED BY MEANS OF A PROPOSED SYSTEM LOGIC AND A PRACTICAL EXAMPLE BASED ON A DOUBLE SPECIFICATION LIMIT. /AUTHOR/

Kuhn, SH Walker, RN Savage, PF Davis, RL DISCUSSER Highway Research Record, Hwy Res Board No. 385, 1972, pp 36-51, 11 Fig, 4 Tab, 16 Ref

1A 215581
A STUDY OF WASTE IN INDUSTRIALISED BUILDING SYSTEMS PRODUCTIVITY IN CONSTRUCTION IS A SYSTEM-WIDE ATTRIBUTE RATHER THAN ONE LOCALIZED TO THE MANUFACTU-
1A SYSTEM CONSTRUCTION, MANAGEMENT & QUALITY CONTROL

ING PLANT OR THE SITE. IF FAULTY MATERIALS, PROCESSES, OR PRODUCTS ARE USED AT THE PLANT, THEN THE HIGH MORTALITY IN ASSEMBLIES AT THE BUILDING SITE WILL REDUCE THE OVERALL PRODUCTIVITY. THE GENERALLY ALLOWS WASTE OF 7-9% IS WELL BELOW THE ACTUAL AVERAGE, WHICH IS OVER 15%. AN EIGHT-MONTH STUDY OF LARGE PRECAST CONCRETE COMPONENTS REVEALED THAT 70% OF DAMAGES OCCURRED AT THE FACTORY AND THE REMAINING 30% EITHER IN TRANSIT OR AT THE SITE. THE MAIN PROBLEM IS THAT THE CONCEPT OF ACCEPTABILITY IS SO VAGUE AND RELATIVE THAT ITS INTERPRETATION IS LEFT SOLELY TO THE SKILL AND ABILITY OF THE INDIVIDUAL IN CHARGE. IN THE CASE OF BULKY COMPONENTS, SUCH AS CONCRETE SLABS, STANDARDIZATION OF QUALITY CONTROL IS RENDERED DIFFICULT. IN SYSTEM BUILDING IT IS VITALY IMPORTANT TO LAY OUT THE PRODUCTION PROCESS IN SCHEMATIC FORM, IDENTIFY THE VARIOUS TYPES OF PRODUCTION FAULTS, RELATE THESE FAULTS TO THE STEPS IN THE PRODUCTION PROCESS, IDENTIFY THE QUALITY CONTROL CHECKS APPROPRIATE TO EACH STEP, AND PROVIDE EQUIPMENT AND PROCEDURES SUITABLE FOR THE INDIVIDUAL QUALITY CONTROL OPERATIONS. EACH OF THESE REQUIREMENTS IS ILLUSTRATED, WITH PARTICULAR ATTENTION TO A SURVEY OF PRODUCTION FAULTS.

Dunung, PV Concrete /UK/ Vol. 6 No. 9, Sept. 1972, pp 22-7, 7 Tab, 4 Phot

1A 215587 WHAT DIRECTION IN BRIDGE BUILDING?

MAJOR ADVANCES IN THE DESIGN AND CONSTRUCTION OF BRIDGES OVER THE PAST TWO MILLENNIA ARE TRACED, AND THE PRINCIPAL ADVANCES SINCE WORLD WAR II ARE LISTED. TWO MAJOR CHALLENGES FACING DESIGNERS TODAY ARE (1) COMBINING AESTHETICS, ENGINEERING, AND ECONOMY INTO AN APPROPRIATE BLEND AND (2) ADOPTING A SYSTEMS APPROACH, WITH IMPLICATIONS FOR TRAINING AND MANPOWER REQUIREMENTS, PRICING, USE OF NEW MATERIALS, AND CONSTRUCTION TECHNOLOGY.

Bartlett, RG Highway Research Board Special Reports No. 132, 1972, pp 3-5

1A 215588 SYSTEMS BUILDING: FOUNDATIONS

A SURVEY OF EUROPEAN HIGH-RISE CONCRETE PREFABRICATION PLANTS DETERMINED THAT NO RESEARCH ON THE FOUNDATION SUBSYSTEM HAS BEEN UNDERTAKEN BECAUSE IT WAS CONSIDERED THAT THE FOUNDATION PROBLEMS WERE UNIQUE FOR EACH SITE. ON THE OTHER HAND, WORK HAS BEEN DONE TO REDUCE FOUNDATION SITES TO A LIMITED SET OF SUBSYSTEM TYPES BEST SUITED FOR VARIOUS FOUNDATION SOIL CONDITIONS ON A WORLDWIDE BASIS. ACCORDING TO THE CLOSED-SYSTEM APPROACH, A SINGLE FIRM SHOULD HANDLE THE DESIGN, CONSTRUCTION, AND POSTCONSTRUCTION MANAGEMENT. BY CONTRAST, THE OPEN SYSTEM WITH MODULAR COORDINATION PERMITS WIDE INTERCHANGEABILITY OF COMPONENTS OR SUBSYSTEMS BY VARIOUS MANUFACTURERS. LARGER AND LARGER COMPONENTS ARE BEING PREFABRICATED. IN THE SAN FRANCISCO BAY AREA, 900-FOOT CONTINUOUS CASTING BEDS FOR PRESTRESSED CONCRETE PILES WERE USED FOR THE SAN MATEO–HAYWARD BRIDGE. THE MOVE TO LARGER PREFABRICATION IN URBAN AREAS HAS BEEN PRIMARILY FOR WATER CROSSINGS WHERE WATER TRANSPORT TO THE SITE IS THE PRIMARY CONSIDERATION. A BRIDGE BETWEEN SIBERIA AND ALASKA HAS BEEN PROPOSED FOR WHICH A BRIDGE PIER 300 FEET HIGH WOULD BE PREFABRICATED AT A SITE SUCH AS SEATTLE, TOWED TO THE BRIDGE SITE, PLACED UPRIGHT, AND SUNK INTO THE FOUNDATION SOILS. FROM A SYSTEMS STANDPOINT, COMPUTER SOFTWARE IS INCREASINGLY BEING USED TO DETERMINE THE MOST ECONOMICAL COMBINATIONS OF DECK SPANS AND OTHER PRECAST COMPONENTS. GREATER ATTENTION SHOULD BE GIVEN TO MOBILE OR RELOCATABLE BRIDGES.

Wigginton, WB Highway Research Board Special Reports No. 132, 1972, pp 6-8, 4 Fig

1A 215592 DESIGN, MANUFACTURE, TRANSPORTATION, AND ERECTION OF SYSTEMS BRIDGES

THE SECTION ON DESIGN DEALS WITH STANDARDIZATION OF DETAILS AND SECTIONS, STABILIZATION OF DESIGN CONCEPTS, FLEXIBILITY OF DESIGN TO PERMIT OTHER THAN THE INTENDED USE, THE EUROPEAN APPROACH TO CONTRACTING, LOAD FACTORS, AND MARKET AGGREGATION TO SPUR INNOVATION. THE SECTION ON MANUFACTURING ADDRESSES POTENTIAL INNOVATIONS IN SUBSTRUCTURES, PIER CAPS, BEARINGS, GIRDER DECKS, EXPANSION JOINTS, DRAINS, AND AUTOMATION. THE SECTION ON TRANSPORTATION NOTES THAT WITH MINOR MODIFICATIONS THE EXISTING METHODS ARE ADEQUATE. SHIPPERS MUST BE CONVERSANT WITH DIFFERING STATE REGULATIONS, AND SHIPMENTS MUST BE COORDINATED AMONG THE VARIOUS GROUPS RESPONSIBLE FOR TRANSPORTATION, COVER DESIGN, SHOP QUALITY CONTROL, AND ERECTION. THE FINAL SECTION SPECIFIES A NUMBER OF WAYS TO KEEP FIELD WORK TO A MINIMUM.

Hanson, TA Elliott, AL Holesapple, JC Elasser, HB Highway Research Board Special Reports No. 132, 1972, pp 42-50

1A 215610 GENERAL PROBLEMS, MEANING AND SCOPE OF CONTROL-SESSION 1

THE REPORTS INCLUDED ARE: (1) SPECIFIC PROBLEMS OF PAVEMENT QUALITY CONTROL IN FRANCE, J. BONITZER; (2) RISK IN SPECIFICATION, CONTROL AND ACCEPTANCE OF ROAD MATERIALS, D. H. MATHEWS, R. HARDMAN; (3) ASSESSMENT AND ACCOUNTING OF BUILDING OPERATIONS IN THE FIELD OF ROAD CONSTRUCTION USING STATISTICALLY GUARANTEED CHARACTERISTIC VALUES, J. NAGEL; (4) STATISTICAL QUALITY CONTROL IN BITUMINOUS ROAD CONSTRUCTION, A. SCHUHBAUER; (5) QUALITY ASSURANCE FOR HIGHWAY CONSTRUCTION IN THE UNITED STATES OF AMERICA, W. J. HALSTEAD, T. F. MCMAHON; (6) QUALITY CONTROL OF ROAD PAVEMENTS IN THE NETHERLANDS, C. VAN DE FLIERT, J. A. C. BROUWERS, H. J. J. H. SPAN, K. WESTER; AND (7) CONTROL OF ROAD CONSTRUCTION WORK IN BELGIUM, H. HONDERMARQ, A. DOYEN. A SUMMARY OF DISCUSSIONS IS ALSO INCLUDED.

Halstead, WJ Oost, Paris /France/ 1972, pp 13-56, Figs, Tabs, Refs

1A 215672 MAKE A PROFIT ON QUALITY

FOUR PAPERS DESCRIBE MEANS OF CONTROLLING THE QUALITY OF CONCRETE PAVEMENT CONSTRUCTION INCLUDING THE APPLICATION OF STATISTICAL PROCEDURES, ALSO DISCUSSED ARE THE RESPONSIBILITIES OF QUALITY CONTROL, VIEWPOINTS OF BOTH OWNERS AND CONTRACTORS ARE PRESENTED. THE FOUR PAPERS ARE: (1) K.H. MCGHEE, STATISTICAL CONCEPTS IN THE QUALITY CONTROL OF PAVEMENT CONCRETE; (2) J. HODE KEYSER, QUALITY ASSURANCE IN ROAD CONSTRUCTION; HOW PROFITABLE CAN IT BE?; (3) BRUCE B. CLOUD, QUALITY CONTROL--THE CONTRACTORS' RESPONSIBILITY; (4) HARRY S. CURLIN, RE: OR THE CHAIRMAN OF THE COMMITTEE OF CONTRARY OPINION.

MCGHEE, KH Keyser, JH Cloud, BB Curlin, HS American Concrete Paving Association Tech Rpt No. 16, 1973, 43 pp, Figs, Tabs. 12 Ref
SYSTEM CONSTRUCTION, MANAGEMENT & QUALITY CONTROL 1A

1A 215674
PROJECT PLANNING AND SCHEDULING: UNIFIED APPROACH

ESSENTIAL LOGICAL DETAILS ARE EXPLAINED FOR A PROCEDURE THAT INTEGRATES TWO IMPORTANT NETWORK-BASED PROJECT MANAGEMENT TECHNIQUES: (1) RESOURCE ALLOCATION; AND (2) TIME-COST TRADE-OFF ANALYSIS. IN THE RESEARCH PROJECT UPON WHICH THE PAPER IS BASED, THESE TECHNIQUES WERE ALSO INTEGRATED WITH BASIC CRITICAL PATH NETWORKING, RESOURCE LEVELING, AND CASH FLOW ANALYSIS. ALL WERE DEVELOPED IN THE CONTEXT OF AN INTERACTIVE MAN-COMPUTER SYSTEM. THE PROCEDURE RETAINS PROPERTIES OF NETWORKS ANALOGOUS TO THE "CRITICAL PATH" AND "FLOAT" WHILE OPERATING WITHIN RESOURCE CONSTRAINTS. A NEW "INTERVAL APPROACH" TO TIME-COST TRADE-OFF ANALYSIS ALSO OVERCOMES MANY THEORETICAL AND PRACTICAL PROBLEMS OF EARLIER OPTIMIZATION TECHNIQUES. HUMAN INPUT FORMS AN INTEGRAL PART OF THE SYSTEM AS A SOURCE OF MANAGEMENT INSIGHT, JUDGEMENT, INTUITION, QUALITATIVE ANALYSIS, AND PRACTICAL EVALUATION. A STEP-BY-STEP EXAMPLE ILLUSTRATES THE BASIC CONCEPTS.

/ASCE/

Paulson, BC Am Soc Civil Engr J Construction Div Vol. 99 No. 01, July 1973, pp 45-58, 8 Fig, 9 Ref

1A 215680
MDC CREATES A DISCIPLINE FOR CONSTRUCTION MANAGEMENT

A PROJECT AND MANAGEMENT INFORMATION SYSTEM IS DESCRIBED THAT CAN MAXIMIZE THE BENEFITS OF PROJECT AND CONSTRUCTION MANAGEMENT. THE SYSTEM IS DESIGNED TO PLAN, SCHEDULE AND CONTROL PROJECTS. THEY ARE BASICALLY COMPUTERIZED, MODULAR, NETWORK BASED SYSTEMS THAT CAN BE GEARED TO TOTAL PROGRAM MANAGEMENT, MULTIPROJECT SCHEDULING OR TO INDIVIDUAL PROJECTS. THE SYSTEMS WERE DESIGNED WITH THE PURPOSE OF MAKING EFFECTIVE USE BY MANAGEMENT OF TIME, COST AND MANPOWER. THE SYSTEM IS COMPRISSED OF 3 SUBSYSTEMS, ONE CONTAINS PROGRESS RELATIVE TO PROJECT, ANOTHER COMPARSES BUDGET AND ACTUAL COST INFORMATION AND A THIRD PROVIDES INFORMATION THAT RELATES MANPOWER NEEDS TO TIME AND COST DEVELOPMENTS. THIS INTERLOCKING NETWORK OF SUBSYSTEMS GIVES CONTINUOUS AND ACCURATE PROJECT OF PHYSICAL AND FINANCIAL REQUIREMENTS. A CLEAR PICTURE OF THE TOTAL PROGRAM AND PROGRESS ON A PROJECT-BY-PROJECT BASIS, AND A REVIEW OF ALL PROJECTS ON A "BY-EXCEPTION" BASIS THAT ZEROS IN ON PROJECTS OR PHASES OF PROJECTS THAT FACE POTENTIAL OPERATING OR FISCAL PROBLEMS. THE APPLICATION OF THIS SYSTEM IN A VARIETY OF CONSTRUCTION PROJECTS BY PUBLIC AND PRIVATE AGENCIES IS BRIEFLY REVIEWED. THE SEASONED PROFESSIONAL TALENT RESPONSIBLE FOR THE DEVELOPMENT OF THIS INFORMATION SYSTEM IS REVIEWED.

Engineering News-record Vol. 191 No. 8, Aug. 1973, pp 11-20, 1 Fig, 1 Phot

1A 215708
QUALITY CONTROL IN HIGHWAY CONSTRUCTION


Kuhne, SH Nat Inst Road Research /5 Africa/ R&d Rpt No. c9r, 1972, 48 pp, Fig, Tabs, 48 Ref

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/IRRD 203 139, 3C33235479

1A 215716
STEEL FIBROUS SHOTCRETE

THE LARGEST CONTRACT EVER AWARDED FOR THE APPLICATION OF STEEL FIBROUS SHOTCRETE WAS RECENTLY COMPLETED NEAR PENAWAYA IN WHITMAN COUNTY, WASHINGTON, BY CORAL CORPORATION OF GLADSTAN, OREGON. THE FIBROUS CONCRETE WAS USED TO STABILIZE A SECTION OF RELOCATED CAMAS PRAIRIE RAILROAD TRACK THAT HAS BEEN THREATENED BY FALLING ROCK FROM AN ADJACENT BASALT CUT FOR THE PAST 5 YEARS. COMPOSITION OF THE SHOTCRETE MIXTURE USED WAS PORTLAND CEMENT, WATER, FINE AGGREGATE, STEEL WIRE REINFORCEMENT, AND ACCELERATOR ADMIXTURE. BEFORE THE SHOTCRETE WAS APPLIED HOLES WERE DRI-LED INTO THE SLOPE WITH A PNEUMATIC DRILL FOR 114 ROCK BOLTS. AFTER THE ROCK BOLTS WERE IN PLACE, STRESSED AND REINFORCED, THE FIBROUS CONCRETE WAS SHOT ONTO THE SLOPE WITH A REED GUNCORTE MACHINE TO WHICH THE CONTRACTOR MADE SEVERAL MODIFICATIONS. THE MODIFICATIONS WERE MADE PRIMARILY TO PREVENT "BALLING" AS THE MIX WAS DIRECTED INTO THE GUNCORTE HAPER. THE RESULTING PRODUCTION FIGURES WERE APPROXIMATELY 10 CUBIC YARDS PER HOUR, ALMOST 2 CUBIC YARDS PER HOUR BETTER THAN PREVIOUS EXPERIENCES WITH FIBROUS SHOTCRETE. APPLICATION BEGAN AT THE BOTTOM OF THE SLOPE AND PROGRESSED UPWARD A SEGMENT AT A TIME IN PLANNED SEQUENCE.

Kaden, RA Western Construction Vol. 49 No. 4, Apr. 1974, 3 pp, 3 Phot

1A 215747
QUALITY CONTROL IN ASPHALTIC CONCRETE ROAD CONSTRUCTION

THE FUNCTION OF QUALITY CONTROL IN ASPHALTIC CONCRETE AND CONSTRUCTION IS TWO-FOLD:(1) CONTROL OF AN ASPHALT PLANT AND (2) PAYING OPERATIONS. THE BATCH TYPE OF HOT-MIX PLANT IS CONSIDERED TO GIVE CLOSER CONTROL OF QUALITY THAN THE CONTINUOUS TYPE, AND OTHER FACTORS AFFECTING THE PRODUCTION OF A UNIFORM HIGH QUALITY ASPHALTIC CONCRETE ARE DISCUSSED. THESE INCLUDE:(1) SELECTION AND CONTROL OF OPTIMUM ASPHALT CONTENT; (2) TESTING AND INSPECTION OF AGGREGATES; (3) COLD FEEDING PROPORTIONING; (4) DRYER OPERATION; (5) HOT BIN GRADATION; (6) HOT AGGREGATE PROPORTIONING; (7) TEMPERATURE CONTROL; (8) MIX-
THE GAGE WAS PERFORMED BOTH UNDER CAREFULLY CONTROLLED LABORATORY TESTS, THE GAGE HAS NOT BEEN SATISFACTORY WHEN USED UNDER FIELD CONDITIONS. THE PRIMARY PROBLEM APPEARS TO BE THE SENSITIVITY OF THE GAGE TO THE SURFACE LAYERS UPON WHICH IT IS PLACED. THIS NOT ONLY TENDS TO GIVE FALSE DENSITY MEASUREMENTS BUT CAN NEGATE ATTEMPTS TO OBTAIN BY CONVENTIONAL DENSITY MEASURING METHODS. SURFACE EFFECTS HAVE BEEN LESS APPARENT WHEN TESTING UNIFORM SANDS. (2) WHEN SPECIAL SURFACES WERE PREPARED FOR THE GAGES THE TIME REQUIRED PER TEST WAS REDUCED SUBSTANTIALLY, BUT RATHER TO THE HARDWARE. IN THE LATTER METHOD, WITH LITTLE OR NO TIME SAVINGS, THE HIGH INITIAL AND OPERATING COST OF THE EQUIPMENT CANNOT BE JUSTIFIED. AND (3) EVEN WHEN USING NEW EQUIPMENT, CONSIDERABLE MAINTENANCE WAS REQUIRED RESULTING IN SERIOUS CONSTRUCTION DELAYS.


AN INVESTIGATION OF NUCLEAR METHODS OF DETERMINING MOISTURE CONTENTS AND COMPACTED DENSITIES OF SOILS AND AGGREGATES RESULTS ARE PRESENTED OF LABORATORY AND FIELD TESTING OF A PORTABLE NUCLEAR GAGE FOR THE MEASUREMENT OF IN-PLACE MOISTURE CONTENT AND DENSITY OF EARTHEN STRUCTURES. BOTH LABORATORY AND FIELD EVALUATIONS HAVE BEEN DIRECTED TOWARD DETERMINING A PRACTICAL AND ACCURATE METHOD OF TESTING OPERATIONS TO FIELD CALIBRATE THE SMALLER, PORTABLE TYPE NUCLEAR DENSITY GAGES BEING USED ON A LIMITED BASIS BY THE TEXAS HIGHWAY DEPARTMENT. THE RESULTS OF THE CORRELATION STUDY INDICATED REASONABLY GOOD CORRELATION BETWEEN THE ROAD LOGGER AND CONVENTIONAL MEASUREMENTS OF MOISTURE CONTENT AND WET DENSITY, HOWEVER, IN MOST CASES, THE ROAD LOGGER VALUES EXCEEDED THOSE OF THE CONVENTIONAL TESTS. IN THE MORE UNIFORM BASE MATERIALS THAT WERE TESTED, SUBSTANTIAL AGREEMENT REQUIRED RESULTING IN SERIOUS CONSTRUCTION DELAYS.

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PROVIDE TIGHT CONTROL TO ESTABLISH UNIFORMITY OF COMPACTION WAS ASSESSED AND FOUND SATISFACTORY. THE TWO-YEAR EVALUATION PROGRAM INDICATED THAT WHEN PROPERLY USED, THE ROAD LOGGER MEASUREMENTS ARE AS ACCURATE AS CONVENTIONAL TEST MEASUREMENTS. A SERIES OF TESTS CARRIED OUT BY M. TESSONNEAU ON THE CONSTRUCTION SITE OF THE AUXERRE- AVALON MOTORWAY SECTION IS REVIEWED. TEST RESULTS ARE PRESENTED, AND THE APPLICATION OF INDUSTRIAL METHODS OF CONTROL TO ROAD CONSTRUCTION IS STRESSED, AND EMPHASIS IS PLACED ON THE NEED FOR FURTHER STUDIES BEFORE APPLYING STATISTICAL CONTROL TO ROAD CONSTRUCTION ON A GENERAL BASIS. /LCPC/A/RRL/

Bull Liaison Labs Routiers /France/ Apr. 1968

ACKNOWLEDGMENT: Road Research Laboratory UK/

1A 216589 QUALITY CONTROL IN CONCRETE ROAD CONSTRUCTION /IN FRENCH/

THE CONDITIONS NECESSARY TO ENSURE THE PRODUCTION OF HIGH-QUALITY CONCRETE ARE: PRELIMINARY CONTROL OF INGREDIENTS AND CONTINUOUS CONTROL DURING MANUFACTURE BY RECORDING PRODUCTION PARAMETERS. RECENT TESTS ON CONSTRUCTION SITES SHOW THAT IT IS POSSIBLE TO RECORD THE TEMPERATURE OF CEMENT AND WATER, TO RECORD THE WEIGHT OF AGGREGATES, CEMENT AND WATER IN A BATCH. TO EVALUATE THE CONSISTENCY OF CONCRETE AND REGULARITY OF PRODUCTION BY RECORDING THE ENERGY CONSUMPTION OF THE MIXER, AND TO EVALUATE THE ENERGY CONSUMPTION OF THE MIXER AND TO MAINTAIN THE EQUIPMENT, IT IS POSSIBLE TO OBTAIN A HIGH DEGREE OF REGULARITY IN PRODUCTION. TESTS CARRIED OUT ON SAMPLES SHOW A WIDE DISPERSION IN MEASUREMENTS ON FRESH CONCRETE. THIS DISPERSION DECREASES FOR RESULTS OF MECHANICAL TESTS ON HARDENED CONCRETE. /LCPC(A)/RRL/

Parey, C Bull Liaison Labs Routiers /France/ Dec. 1969

ACKNOWLEDGMENT: Road Research Laboratory UK/

1A 216726 INSPECTION OF WELDED STRUCTURAL STEEL

THE JOB OF THE WELDING INSPECTOR IS OUTLINED. HE SHOULD ASSIST THE STRUCTURAL ENGINEER AND THE CONTRACTOR WHEREEVER POSSIBLE TO PRODUCE A JOB IN THE MOST EFFICIENT AND ECONOMICAL WAY. HE MUST ASSURE THE CLIENT THAT THE WELDING HAS BEEN PROPERLY PERFORMED IN COMPLIANCE WITH THE STRUCTURAL DESIGN AND APPLICABLE CODES. A THOROUGH KNOWLEDGE IS NECESSARY OF THE AMERICAN WELDING SOCIETY CODE AND SPECIFICATIONS. THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION CODE AND SPECIFICATIONS, AND FABRICATION AND ERECTION PRACTICES. A WELDING INSPECTION CHECKLIST IS PRESENTED OF: (1) INSPECTION BEFORE WELD-

ING IS STARTED, (2) INSPECTION DURING WELDING, AND (3) INSPECTION AFTER WELDING. A REVIEW OF THE TYPE OF STEEL SPECIFIED AND PROPER ELECTRODES FOR THAT STEEL SHOULD BE MADE. THE INSPECTOR SHOULD CHECK DRAWINGS AND PROCEDURES BEFORE WELDING, AND SHOULD CHECK THE PREPARATION AND FIT-UP. WELD QUANTITY AND QUALITY ARE CHECKED. IN WELDED BUILDINGS, THE PREPONDERANCE OF JOINTS ENCOUNTERED ARE FILLET WELDS FOR SHEAR, BUTT BELTS OF BEAM FLANGES TO COLUMNS, AND EITHER BUTT OR FILLET WELDS FOR COLUMN SPLICES. VISUAL INSPECTION IS USUALLY SATISFACTORY FOR THESE CONNECTIONS.

Julicher, A Civil Engineering Ase June 1968

1A 216730 THE CONSTANT DRY WEIGHT METHOD-A NO-WEIGHING FIELD COMPACTION TEST


Schonfeld, R Ontario Dept Hwys, Downsview /Canada/ Sept. 1968

1A 216909 COMPACTION MEASUREMENTS BY NUCLEAR DEVICES

STUDY WAS CONDUCTED TO DEVELOP METHODS, PROCEDURES, AND CALIBRATION CURVES FOR USING NUCLEAR DEVICES TO MAKE FIELD DENSITY AND MOISTURE MEASUREMENTS. THE NUCLEAR ASPHALT DENSITY GAUGE MEASUREMENTS WERE COMPARED TO MOISTURE CONTENTS DETERMINED BY THE AIR GAP PROCEDURE AND THE SPECIFIC GRAVITIES OF CORES CUT FROM BITUMINOUS PAVEMENTS. ANALYSIS OF DATA COLLECTED INDICATED A STANDARD ERROR ESTIMATE OF 0.04. THE DATA INDICATE THAT A SUBSTANTIAL PORTION OF THE VARIATION IS NOT EXPLAINED BY THE ESTIMATING EQUATIONS. THE NUCLEAR ASPHALT DENSITY GAUGE IS NOT RECOMMENDED FOR CONSTRUCTION CONTROL OF BITUMINOUS PAVEMENT DENSITY. THE NUCLEAR SOIL DENSITY GAUGE MEASUREMENTS WERE COMPARED TO THE WET UNIT WEIGHTS MEASURED BY THE SAND CONE METHOD IN THE FIELD AND A CALIBRATED BOX MOLD IN THE LABORATORY. THE STANDARD ERRORS OF ESTIMATE WERE 4 TO 5 PCF FOR ALL ANALYSES. VERY GOOD CORRELATIONS WERE OBTAINED IN THE LIMITED LABORATORY STUDY. DATA INDICATE THAT THE NUCLEAR DENSITY GAUGE MEASUREMENTS ARE AFFECTED BY VARIATIONS IN MATERIAL COMPOSITION AND THAT A SEPARATE CALIBRATION CURVE FOR EACH SOIL IS NECESSARY. THE SURFACE NUCLEAR SOIL DENSITY GAUGE AND MEASUREMENT PROCEDURES ARE NOT RECOMMENDED FOR CONSTRUCTION COMPACTION CONTROL FOR EMBANKMENT OR SUBGRADE SOILS. IF THIS TYPE OF GAUGE IS USED, IT IS RECOMMENDED THAT THE AIR GAP PROCEDURE BE USED AND THAT THE CALIBRATION CURVES ESTABLISHED. FOR EACH SOIL, THE NUCLEAR SOIL MOISTURE GAUGE MEASUREMENTS WERE COMPARED TO MOISTURE CONTENTS DETERMINED BY
1A SYSTEM CONSTRUCTION, MANAGEMENT & QUALITY CONTROL

Oven Drying. The standard errors of estimate were 1.0 PCF or less. Data indicate that a single calibration curve for the determination of moisture content by the nuclear gauge would be satisfactory for most soils.

Holman, FL Eiland, EN McCullough, WF Alabama State Highway Department June 1969

1A 216911 QUALITY ASSURANCE IN HIGHWAY CONSTRUCTION—PART 5 SUMMARY OF RESEARCH FOR QUALITY ASSURANCE OF AGGREGATE

A review of the evaluation by statistical techniques of highway aggregate characteristics is presented as a condensed compilation of both historical data and data from designed quality-measurement projects. The degree of conformance to specifications was statistically estimated. Reports from nine states on projects in which research data have been obtained are abstracted and summarized in this compilation to illustrate trends in gradation analysis, sampling and testing procedures, sand equivalent analysis as an alternate to gradation analysis, and soundness tests for designated quality specifications. For base course aggregate usually contain limits for gradation, plasticity, soundness, and amount of deleterious material. The degree of conformance to gradation specifications was found to vary from step to step in the processing. Analysis of variance was applied during construction to determine cause of the variation and to locate conditions needing corrective action. For aggregate control, the sand-equivalent test rather than gradation is preferred in some states, and statistical research, conducted to ascertain whether the sand-equivalent test is informative and reproducible, has confirmed its usefulness. Although the amount of data at present is rather limited, statistical research on salt-soundness determination indicates that drying time did not need to be changed; that sodium sulphate testing could be discontinued, as magnesium sulphate testing is satisfactory; and that it is possible to place acceptance of fine aggregate sources on a sound statistical foundation. In statistically-centered research on aggregate gradation of bituminous mixtures, information similar to that for base courses was developed, and indicated that variation from the specifications differs according to the point of sampling. The research also indicated that sampling at the hot bins was preferred for process control, whereas sampling at the compacted bituminous layer was best for establishing uniformity of the mixture. Data indicated that aggregate used in Portland cement concrete had a smaller standard deviation than the aggregate used in bituminous mixtures or in base courses, but that statistical analysis provided information for early detection of undesirable gradation or undesirable quality. The use of statistical quality control charts is highly recommended for control of the characteristics of aggregate by some states.


1A 216917 STATISTICAL QUALITY CONTROL OF HIGHWAY CONSTRUCTION MATERIALS

The greater increase in highway construction work which was experienced during the 1950’s and early 1960’s resulted in rapid advancement of construction methods. With emphasis being placed upon high production, testing and control procedures did not keep pace and this resulted in a slight reduction in overall quality. However, the highway industry was challenged and, through readjustment of control procedures, improvement in quality was made. To date, specifications have been of the absolute type with considerable reliance being placed upon the experience of the engineer and his ability to select representative samples. This system has drawbacks, particularly under the stress of an increasing tempo of construction and lack of trained inspectors. In an attempt to improve specifications, it was suggested that the highway engineer consider adopting statistical quality control (SQC) procedures, with a road rating system was taken by the United States Bureau of Public Roads who held workshops on quality control throughout the nation in the fall of 1963. At these workshops the Bureau proposed that the State Highway Departments research the subject of using statistical control methods. In the spring of 1964, the California Division of Highways submitted a research proposal intended to determine control limits to be used in statistical specifications for nine construction items. The research has been completed on these nine items and eight interim reports containing the findings relative to these construction items have been completed and are listed in bibliography. /Author/

Sherman, GB Watkins, RO California Division Highways May 1968

1A 217019 RECOMMENDATIONS FOR CAST-IN-PLACE NONREINFORCED CONCRETE PIPE

A general view is given of present knowledge together with recommendations for design, construction, and testing procedures. Construction specifications are contained in “Specifications for Cast-in-Place Nonreinforced Concrete Pipe.” /Author/

Am Concrete Inst Journal & Proceedings Apr. 1969

1A 217823 CONSTRUCTION SPECIFICATIONS FOR VOLCANIC CINDERS USED AS ROAD-SURFACING AGGREGATE

A study was conducted to determine parameters that influence the performance of volcanic cinders when used as a road-surfacing aggregate for unpaved forest access roads. The safety depletion of good, high-type aggregate sources has brought about renewed interest in other aggregate types. Making this study particularly timely, a literature review, correspondence, and personal interviews were conducted to determine existing use and performance of cinders. A road rating system was developed, similar to the AASHO road test method, to determine which were “good roads” and which were “poor roads” based on a 0 to 5 numerical rating scale. Thirty of the rated roads and the corresponding cinder pits were sampled and the material was tested in the laboratory. The physical properties of the cinders were then, and statistical correlation with the road rating. It was found that density, gradation, durability, and plasticity were the most significant independent variables. Based on these results, specifications for unheated cinder surface courses have been developed. These include (1) a minimum of 100 percent compaction relative to AASHTO T 99; (2) gradation limits of 100 percent passing the 1-in. sieve, 80 to 95 percent passing the 1/4-in., 35 to 60 percent passing the No. 40, and 3 to

90
12 PERCENT PASSING THE NO. 200; (3) A PLASTIC INDEX VALUE BETWEEN 2 AND 15; AND (4) A MAXIMUM LOS ANGELES ABRASION VALUE OF 50 PRIOR TO PROCESSING. IN MOST CASES, THIS WILL REQUIRE CRUSHING OF THE HARDER (PURPLE, GRAY, AND BLACK) CINDERS. /AUTHOR/

Hendrickson, LG Lund, JW Highway Research Record, Hwy Res Board 1970

1A 217849

QUALITY ASSURANCE IN HIGHWAY CONSTRUCTION

QUALITY ASSURANCE IS RELATED TO THE QUESTIONS WHAT TO DO, HOW TO ORDER IT, HOW TO ASSURE GETTING WHAT WAS ORDERED, SPECIFICATIONS WRITTEN TO ANSWER THE SECOND QUESTION HAVE HERETOFORE NOT PERMITTED THE THIRD TO BE ANSWERED QUANTITATIVELY. ENGINEERING JUDGMENT CAN USUALLY ASSURE A GOOD PRODUCT, BUT "SUBSTANTIAL COMPLIANCE" IS DIFFICULT TO DEFINE LEGALLY OR CONTRACTUALLY; FURTHERMORE, TRUE VARIATIONS IN MATERIALS OR CONSTRUCTION CAN REMAIN UNKNOWN WITHOUT PROPER SAMPLING AND INTERPRETATIVE METHODS. NEW TEST METHODS AVAILABLE FOR QUALITY CONTROL ARE SURVEYED. MEANS OF INCLUDING STATISTICAL QUALITY CONTROL IN SPECIFICATIONS AND TESTS, THE DIFFERENCES BETWEEN PRODUCTION AND ACCEPTANCE TESTING, AND FEDERAL AND STATE EFFORTS TO PROMOTE STATISTICAL CONCEPTS IN QUALITY CONTROL ARE DISCUSSED. THE IMPACT OF CONTRACTOR-STATE RELATIONS IS TREATED BRIEFLY. DETAILED TREATMENT IS GIVEN IN SEPARATE ARTICLES TO STATISTICAL QUALITY ASSURANCE FOR EMBANKMENTS AND BASE COURSES, PORTLAND CEMENT, BITUMINOUS CONSTRUCTION, AND HIGHWAY AGGREGATES.

Memahan, TL Halstead, WJ Baker, WM Granley, EC Kelley, JA Public Roads, Us Bureau Public Roads 70

1A 217911

DEGRADATION OF LIMESTONE AGGREGATES DURING CONSTRUCTION

THERE IS GROWING EVIDENCE THAT THE STABILITY OR STRENGTH OF GRANULAR BASES IS NOT DIRECTLY RELATED TO GRADATION, DENSITY, OR PERCENTAGE OF THEORETICAL SOLID VOLUME. UNDER THESE CIRCUMSTANCES, QUESTION ARISES AS TO THE IMPORTANCE OF CONTROLLING GRADATION AND COMPACTION IN CONSTRUCTION. THE SAME QUESTION ARISES AS TO THE IMPORTANCE OF STRENGTH OF THE AGGREGATE PARTICLES MAY BE THE CONTROLLING FACTOR. EVEN SO, IF OVERSTRESSED THE BEARING POINTS WILL CRUSH UNTIL SUFFICIENT BEARING AREAS ARE PRODUCED TO WITHSTAND THE STRESS, THIS IS ACCOMPANIED BY VOLUME CHANGE AND DEGRADATION IT CAN BE INFERRED THAT LOAD-INDUCED DEGRADATION PROCEEDS TO A STABLE STAGE. IT HAS BEEN ARGUED AT TIMES THAT GRADATION AND DENSITY ARE REDUNDANT REQUIREMENTS, AND THAT GRADATION REQUIREMENTS SHOULD BE WAIVED IF THE DENSITY IS ACHIEVED IN THE END PRODUCT. INDEED, THE POINT OF TESTING AND ACCEPTANCE WITH RESPECT TO DENSITY IS ON THE ROAD FOLLOWING COMPACTION. IF GRADATION CONTROL IS DEFERRED TO THIS POINT AND DENSITY IS ACHIEVED, A DILEMMA EXISTS, IF NEITHER DENSITY OR GRADATION REQUIREMENTS ARE MET IN THE END PRODUCT, UPSTREAM CONTROL OF THE GRADATION WOULD HAVE FOREWARNED OF THE PROBLEM. THE PRESENT STUDY WAS UNDERTAKEN TO DETERMINE WHETHER AND TO WHAT EXTENT CERTAIN PROPERTIES (PARTICULARLY GRADATION) OF KENTUCKY LIMESTONES USED IN BASE CONSTRUCTION CHANGED DURING THE CONSTRUCTION PERIOD. TWELVE CONSTRUCTION PROJECTS WERE USED IN THE PROGRAM. SAMPLES OF DENSE GRADED AGGREGATE WERE TAKEN AT THE PUGMILL, BEFORE SPREADING ON THE ROAD. AFTER SPREADING, AND AFTER COMPACTION. LABORATORY GRADATION ANALYSIS WAS PERFORMED ON ALL SAMPLES. LESS FREQUENTLY, LARGER SAMPLES WERE TAKEN AT THE PUGMILL AND AFTER SPREADING AND SUBJECTED TO A SPECIFIC GRAVITY TEST. A DEGRADATION TEST, AND ATTERBERG LIMIT ANALYSIS. ANALYSIS-OF-VARIANCE COMPUTER PROGRAMS WERE WRITTEN. ON THE WHOLE THE KENTUCKY LIMESTONES—WHICH ARE VERY HARD, HIGH-QUALITY AGGREGATES—EXHIBITED NO SIGNIFICANT DEGRADATION UNDER CURRENT CONSTRUCTION PRACTICES.

Deen, RC Southgate, HF Kentucky Department Highways Mar. 1972, pp 1-13, 10 Tab, 24 Ref

1A 218516

DATA STRUCTURE FOR A CONSTRUCTION COMPANY MANAGEMENT SYSTEM


Froemming, AP Fenves, SJ Highway Research Record, Hwy Res Board 1969

1A 219351

AUTOMATIC BATCH PLANTS

A BRIEF HISTORY IS PRESENTED OF NEW YORK STATE'S EXPERIENCE WITH AUTOMATIC BATCH PLANTS. EMPHASIS IS PLACED ON QUALITY ASSURANCE PROGRAMS BECAUSE OF: (1) THE ENORMOUS INCREASE IN THE HIGHWAY CONSTRUCTION PROGRAM WHICH REQUIRES THE ADOPTION OF BUSINESS PROCEDURES FOR ALL ACTIVITIES SO THAT DOCUMENTATION MUST BE PROVIDED WHICH PERMITS A COMPLETE REVIEW AND AUDIT BY PROGRAM MANAGEMENT, (2) THE INCREASE IN TECHNOLOGY PROVIDING A MORE SCIENTIFIC UNDERSTANDING OF THE DESIRABLE PROPERTIES OF MATERIALS, AND (3) THE SHORTAGE OF MANPOWER FOR INSPECTION, REQUIRING A QUALITY CONTROL SYSTEM MAY BE HANDLED BY AN INSPECTOR WITH LIMITED TECHNICAL CAPACITY. THE DEPARTMENT'S SPECIFICATIONS, TOGETHER WITH NEW PROCEDURES FOR PLANT INSPECTION, DEFINE THE CURRENT APPROACH TO QUALITY CONTROL AT BATCH PLANTS WHICH INVOLVE: (1) THAT THE GRADATION OF EACH OF THE SIZES IN THE BINS BE KEPT WITHIN SPECIFIC RANGES, AND (2) THAT THE PROPORTIONING EQUIPMENT BE AUTOMATED SO AS TO ASSURE THAT THIS OPERATION WILL BE UNIFORM. IT IS REQUIRED THAT ALL BATCH WEIGHTS BE RECORDED. AS OF DECEMBER, 1968, 130 BITUMINOUS CONCRETE MIX PLANTS AND 143 PORTLAND CEMENT CONCRETE PLANTS HAVE AUTOMATIC PROPOR-TIONING AND RECORDING SYSTEMS. GENERAL CONSIDERATIONS, TO ALL PLANTS ARE: (1) THE SCALE AND CONTROL SYSTEM, (2) THE INTERLOCKING OVER AND UNDERWEIGHT CONTROLS, AND (3) THE RECORDING. THE RECORDER TELLS WHAT KIND OF MIX WAS PRODUCED AND PRODUCES A PERMANENT RECORD OF THE PROPORTIONAL CHARACTER-
ISTICS OF THE MATERIAL AND THE TOTAL WEIGHT OF THE
THEM THE NEED FOR DOCUMENTATION, MAXIMUM USE OF NEW TECHNOLOGY AND EQUIPMENT, AND CONSERVATION OF MANPOWER IS PROVIDED BY: (1) AUTOMATIC RECORDING WHICH SUPPLIES THE REQUIRED DOCUMENTATION. (2) AUTOMATIC WEIGHING WITH INTERLOCKING OVER AND UNDERWEIGHT CONTROLS ILLUSTRATING AN ADVANTAGEOUS USE OF NEW MODERN EQUIPMENT AND ASSURES A HIGHER LEVEL OF PRODUCT UNIFORMITY, AND (3) THE NECESSARY PLANT INSPECTION REQUIRED FOR COMPLETE ENFORCEMENT OF THE QUALITY ASSURANCE PROGRAM CAN BE DONE BY ONE TECHNICIAN.

Mcalpin, GW American Highways Apr. 1969

1A 219891

CHECKLIST FOR SAFETY AT HIGHWAY WORKSITES

Mcgarry, TF Constructor Nov. 1966

1A 229808

THE SAND EQUIVALENT TEST FOR QUALITY CONTROL OF QUALITY PRODUCTS
THE USE OF STATISTICAL QUALITY CONTROL IN INDUSTRY HAS LONG BEEN RECOGNIZED AS AN IMPORTANT ADJUNCT TO EFFICIENT OPERATION, BUT IN THE EQUALLY COMPETITIVE FIELD OF ROAD CONSTRUCTION LITTLE IS MADE OF STATISTICAL TECHNIQUES AS AN AID TO SPECIFICATION WRITING AND THE CONTROL OF MATERIAL QUALITY. PAVEMENT MATERIALS ARE CUSTOMARILY SPECIFIED IN TERMS OF PLASTICITY INDEX AND MECHANICAL GRADING; HOWEVER, THESE TESTS ARE NOT CONVENIENT FOR THE CONTROL OF PRODUCTION AND THE SAND EQUIVALENT TEST HAS FOUND EXTENSIVE USE IN THIS REGARD. TO EVALUATE THE CONTROL ACHIEVED BY THIS TEST, RESULTS FOR MATERIALS SUPPLIED BY SOME MELBOURNE QUARRIES OVER A PERIOD HAVE BEEN CORRELATED WITH PLASTICITY INDEX AND GRADING RESULTS AFTER ALLOWING FOR THE EFFECT ON THE SAND EQUIVALENT TEST OF MOISTURE IN THE SAMPLE. THE TEST WAS FOUND TO BE A SATISFACTORY INDICATOR OF QUALITY. THE EFFECT OF TEMPERATURE AND THE INFLUENCE OF THE VARIOUS ROCK TYPES, GRADING, AND CLAY CONTAMINATION ON THE TEST WAS ALSO INVESTIGATED. THE PAPER CONCLUDES WITH THE DEVELOPMENT OF A TENTATIVE METHOD OF QUALITY CONTROL FOR QUARRY AND PLANT MIXED PRODUCTS USING THE SAND EQUIVALENT TEST. /AUTHOR/

Head, BL Raper, LR Kneipp, H DISCUSSER Ackehurst, CA DISCUSSER Paffett, AT DISCUSSER Hanks, JR DISCUSSER Aut-
SYSTEM CONSTRUCTION, MANAGEMENT & QUALITY CONTROL

1A 230616
DETERMINATION OF EMBANKMENT DENSITY BY THE SEISMIC METHOD
THE APPLICATION OF SEISMIC TECHNIQUES FOR THE MEASUREMENT OF SOIL DENSITY IN CONSTRUCTION CONTROL WAS EXAMINED BY EXTENSIVE FIELD WORK ON ACTUAL EMBANKMENT CONSTRUCTION PROJECTS. MEASUREMENTS OF SOIL DENSITY AND SEISMIC WAVE VELOCITY WERE OBTAINED FROM TEST PLATFORMS EACH OF WHICH WAS TESTED AT THREE STATES OF COMPACTION, LOOSE, INTERMEDIATE & HIGHLY COMPACT. A SIMPLIFIED RELATIONSHIP BETWEEN VELOCITY AND DENSITY WAS EXPECTED. THE RAW FIELD DATA SHOW THAT (1) INDIVIDUAL SOILS CANNOT BE GROUPED TO AVOID SIMPLE CORRELATION OF VELOCITY WITH DENSITY, (2) THE RELATION BETWEEN VELOCITY AND DENSITY FOR A GIVEN SOIL IS OF A PARABOLIC—NOT LINEAR—CHARACTER IN THE RANGE OF INTEREST, AND (3) THE ELASTIC CONSTANTS OF SOILS ARE FAR MORE VARIABLE THAN ORIGINALLY SUPPOSED, AND FAR MORE IMPORTANT THAN SMALL CHANGES IN DENSITY. THE THEORY OF WAVE PROPAGATION IN ELASTIC BODIES WAS INVESTIGATED WITH REGARD TO DEGREE OF CORRESPONDENCE WITH FIELD DATA ON COMPACTED SOILS. DENSITY MEASUREMENTS BY THREE DIFFERENT METHODS WERE STUDIED IN RELATION TO SCATTER IN VALUES IN EXCESS OF THE RANGES NORMALLY EXPECTED KNOW FOR THE METHODS. AN ENTIRELY NEW APPROACH TO COMPACTION EMERGED, BASED UPON THE SOIL RESPONSE TO DYNAMIC WAVE PROPAGATION. THE COMPACTION PROCESS IS A PROCESS OF DENSIFICATION ONLY IN THE VERY EARLY STAGES. DENSITY CHANGES WITH FURTHER COMPACTION DIMINISH RAPIDLY WHILE THE ELASTIC MODULI BECOME SUBSTANTIALLY INCREASED. THE REPORT DISCUSSES THE USE OF A DYNAMIC APPROACH TO EMBANKMENT PERFORMANCE AND VIEWS THE LATTER AS A CONSEQUENCE OF THE PRESENCE OR ABSENCE OF AN ELASTIC RESPONSE TO DYNAMIC STRESSES IMPOSED IN SERVICE.

Weaver, R.J. Rebull, PM
New York State Dept Transportation Hpr-pr/1/1/ Doc. 1966
ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4722444 66)PB 175 763, 1C62030900

1A 230681
BITUMINOUS STABILIZATION FIELD PROJECT, WADENA COUNTY
THE FINAL REPORT IS PRESENTED OF A FIELD STUDY FEATURING STABILIZATION OF SANDY SUBGRADE SOILS WITH EMBLUSIFIED ASPHALT (SS-1) CUT BACK ASPHALT (MC-2) AND ROAD TAR (RT-6) TO UPGRADE THEM TO SERVE AS AN ADEQUATE BASE COURSE FOR LOW TRAFFIC DENSITY ROADS. THE SUBGRADE WAS STABILIZED TO A DEPTH OF 2 FEET AND SURFACED WITH A 1 1/2 INCH BITUMINOUS MAT AND SAND SEAL COAT RESPECTIVELY. THE RESEARCH WAS RATHER INCONCLUSIVE PARTLY DUE TO SOMEWHAT POOR CONSTRUCTION CONTROL OF THE SOIL MOISTURE CONTENT AT THE TIME OF MIXING AND THE AMOUNT OF BITUMINOUS MATERIAL ADDED. LACK OF CONTROL RESULTED IN THE BASE MATERIAL REMAINING SOFT AFTER COMPACTION. ALTHOUGH CONSTRUCTION DIFFICULTIES AND THE ABSENCE OF FAILURES PRECLUDED EVALUATION OF DESIGN PROCEDURE USED BY OBSERVING THE RELATIVE PERFORMANCE OF THE VARIOUS SECTIONS SOME GENERAL CONCLUSIONS WERE DEVELOPED: (1) STABILIZATION OF SANDY SUBGRADES WITH BITUMINOUS MATERIALS AND SURFACING WITH A SEAL COAT OR BITUMINOUS MAT PROVIDE A SUITABLE ROADWAY FOR AREAS WITH SIMILAR SOIL AND TRAFFIC CONDITIONS. (2) A 4-IN. BASE AND SEAL COAT COMBINATION IS MORE ECONOMICAL THAN 2 IN. BASE 1 1/2-IN. BITUMINOUS MAT COMBINATION, AND (3) NO APPARENT BENEFITS RESULT FROM ADDITION OF MORE THAN 4 PERCENT BITUMINOUS MATERIAL. /BPR/

Korhage, GR
Minnesota Department of Highways, Bureau of Public Roads /US/

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4651272 69)CFSTI PB 185 446, 1C62021636

1A 230759
DYNAMIC STUDIES ON THE BEARING CAPACITY OF PILES-PROJECT REPORT ON PHASE III
AN AUTOMATED PREDICTION SCHEME IS PRESENTED WHICH USES BOTH MEASURED FORCE AND ACCELERATION AT THE TOP OF THE PILE AS INPUT AND COMPUTES THE SOIL RESISTANCE FORCES ACTING ON THE PILE DURING DRIVING. THE DISTRIBUTION OF THESE RESISTANCE FORCES ACTING ALONG THE PILE IS ALLOWED TO SHAPED AND DYNAMIC RESISTANCE FORCES ARE DISTINGUISHED SUCH THAT A PREDICTION OF TOTAL STATIC BEARING CAPACITY IS POSSIBLE. USING THE SHEAR FORCE PREDICTION, A STATIC LOAD VERSUS PENETRATION CURVE IS COMPUTED FOR COMPARISON WITH THE RESULT FROM A CORRESPONDING FIELD STATIC LOAD TEST. USING STRESS WAVE THEORY TWO SIMPLIFIED METHODS ARE DEVELOPED FOR PREDICTING STATIC BEARING CAPACITY FROM ACCELERATIONS AND FORCE MEASUREMENTS. THESE METHODS CAN BE USED DURING FIELD OPERATIONS FOR CONSTRUCTION CONTROL WHEN INCORPORATED IN A SPECIAL PURPOSE COMPUTER. THE AUTOMATED PREDICTION SCHEME AND SIMPLIFIED METHODS ARE APPLIED TO 24 DIFFERENT SETS OF DATA FROM FULL SCALE PILES. THE PILES WERE ALL OF 12 INCHES DIAMETER, STEEL PIPE WITH LENGTHS RANGING FROM 33 TO 83 FEET. ALSO, 24 SETS OF DATA FROM REDUCED SCALE PILES ARE ANALYZED BY THE SIMPLIFIED METHODS. ALL PREDICTIONS ARE COMPARED WITH RESULTS FROM STATIC LOAD TESTS. CORRELATION IS VERY GOOD FOR PILES DRIVEN INTO NON-COHESIVE SOILS. FOR COHESIVE SOILS, BETTER AGREEMENT WITH STATIC LOAD MEASUREMENTS ARE OBTAINED THAN FROM EXISTING METHODS. /FHWA/

Gob, GG Rausche, F Moses, F
Case Western Reserve University, Federal Highway Administration /US/ Vol. 1 &

ACKNOWLEDGMENT: Federal Highway Administration NTIS PB 207228, 3C6202896

1A 230916
MEASURED PORE PRESSURES USED FOR THE CONTROL OF TWO STAGE CONSTRUCTION OF AN EMBANKMENT
BECAUSE OF SOFT FOUNDATION SOIL IT WAS NECESSARY TO USE TWO STAGE CONSTRUCTION FOR A DOUBLE-TRACK RAILWAY EMBANKMENT VARIED IN HEIGHT FROM 21 TO 33 FEET. EFFECTIVE STRESS METHODS OF ANALYSIS WERE USED, AND PIEZOMETERS WERE INSTALLED IN THE FOUNDATION SOIL TO INDICATE THE PORE PRESSURES. PORE PRESSURES MEASURED DURING THE FIRST-STAGE LOADING INDICATED THAT THE SECOND STAGE COULD BE ADDED TO COMPLETE THE EMBANKMENT ABOUT A YEAR AFTER THE FIRST STAGE. MEASUREMENTS OF PORE PRESSURES CONTINUED DURING THE SECOND STAGE LOADING SO THAT A CHECK ON STABILITY COULD BE MAINTAINED. THE EMBANKMENT WAS SUCCESSFULLY COMPLETED. /CGRA/

Delory, FA Gass, AA Wong, WW Canadian Geotechnical Journal

1A 231021
CURRENT SPECIFICATIONS, FIELD PRACTICES AND PROBLEMS IN COMPACTION FOR HIGHWAY PURPOSES
THE CURRENT STATUS OF HIGHWAY SPECIFICATIONS AND FIELD PRACTICES FOR COMPACTION OF EMBANKMENTS, SUBGRADES AND GRANULAR BASES IS SUMMARIZED. THE INFORMATION HAS BEEN OBTAINED FROM THE PUBLISHED STANDARD SPECIFICATIONS OF THE 50 STATES AND FROM AN EXTENSIVE INTERVIEW PROGRAM WITH STATE HIGHWAY ENGINEERS. CONSTRUCTION SPECIFICATIONS AND PROCEDURES FOR EMBANKMENTS, SUBGRADES AND GRANULAR BASES ARE SUMMARIZED AND FOLLOWED BY DISCUSSIONS OF THE PROBLEMS RELATED TO THE PRACTICAL APPLICATION OF THE SPECIFICATIONS TO FIELD CONSTRUCTION.
1A SYSTEM CONSTRUCTION, MANAGEMENT & QUALITY CONTROL

QUALITY CONTROL PROCEDURES AND RELATED PROBLEMS ALSO ARE DISCUSSED, THE REVIEW INDICATES THAT THE MAJORITY OF EMBANKMENT AND SUBGRADE COMPACTION IS ACCOMPLISHED BY CONTROLLING LIFT THICKNESS AND MOISTURE CONDITIONS AND BY SPECIFYING MINIMUM DENSITY REQUIREMENTS, USUALLY AS A PERCENT OF THE MAXIMUM DENSITY DETERMINED FROM THE AASHO T-99 TEST. THE MAJOR PROBLEMS ARE ENCOUNTERED IN SILTS, VERY WET CLAYS OF HIGH PLASTICITY AND EXPANSIVE CLAYS CONSTRUCTION PRACTICES TO OVERCOME THESE PROBLEMS ARE OUTLINED WHEREBY ENGINEERING DECISIONS CAN BE MADE BASED ON THE SAMPLING SCHEME ARE USED, ALSO, TO DEFINE THE REQUIREMENTS FOR THE DESIGN, SPECIFICATION AND CONTROL OF DRY DENSITY IN A ROAD LAYER. BY COMPARING THE AVERAGE DENSITY OBTAINED FROM THE SPECIFIED NUMBER OF OBSERVATIONS WITH THE SPECIFICATION DENSITY, A RELIABLE DECISION CAN BE TAKEN IMMEDIATELY ON THE ACCEPTANCE OR REJECTION OF THE COMPLETED LAYER. /AUTHOR/

Kuhn, SH Burton, RW Cist Research Reports /South Africa/

1A 231453

DESIGN AND CONSTRUCTION OF AGGREGATE BASE COURSES WITH CALCIUM CHLORIDE

AGGREGATE BASE COURSES ARE DEFINED AS THE USE OF WELL GRATED, SOUND AND DURABLE CRUSHED STONE, GRAVEL OR OTHER SUITABLE AGGREGATES AS FOUNDATION COURSES FOR BITUMINOUS PAVEMENTS. FINAL PERFORMANCE DEPENDS UPON DESIGN, MATERIALS AND CONSTRUCTION. THE DESIGN TREND NOW IS TOWARD THE USE OF EQUATIONS OR FORMULAS BASED ON RELATIONSHIPS BETWEEN TRAFFIC AND VARIOUS PAVEMENT DESIGNS. BETTER CONSTRUCTION CONTROL AND PRACTICES ARE ADVOCATED TO HELP ATTAIN MAXIMUM PERFORMANCE FROM THE NATURAL SUBGRADE, SUBBASE AND BASE COURSE MATERIALS AND THEN IMPOVE PAVEMENT PERFORMANCE. SEVEN EXAMPLES ARE OUTLINED OF POOR CONSTRUCTION PRACTICES OFTEN ASSOCIATED WITH AGGREGATE BASE COURSE CONSTRUCTION. IT IS POINTED OUT THAT THE USE OF CALCIUM CHLORIDE IN BASE CONSTRUCTION, WITH THE RESULTING UNIFORM MOISTURE CONTROL, PROVIDES THE FOLLOWING BENEFITS: (1) IT AIDS COMPACTION AND INCREASES DENSITY, (2) IT REDUCES OR ELIMINATES THE NEED FOR SURFACE APPLICATIONS OF WATER (3) IT PERMITS CARRYING OF TRAFFIC WITHOUT RAVELLING OR DUST, (4) IT PROVIDES A MORE STABLE PLACEMENT AND PLACING EQUIPMENT, (5) IT PERMITS USE OF MINIMUM FINES OR BINDER, AND (6) IT ACTS AS A QUALITY CONTROL INGREDIENT TO HELP INSURE DESIRED RESULTS. IT IS CONCLUDED THAT HIGH QUALITY GRADED AGGREGATE BASE COURSES HAVE A DEFINITE PLACE IN BALANCED DESIGN OF MODERN FLEXIBLE PAVEMENTS BASED ON YEARS OF ACCUMULATED EXPERIENCE. THE ASH ROAD TEST AND LATEST RESEARCH, THE PROPER USE OF CALCIUM CHLORIDE IN AGGREGATE BASE COURSES INSURES AN EFFECTIVE METHOD OF ACHIEVING MAXIMUM PERFORMANCE FROM QUALITY MATERIALS.

Smith, HA Am Assoc State Highway Officials Oct. 1565

ACKNOWLEDGMENT Calcium Chloride Institute

1A 231685

PROBLEMS OF SOIL STABILIZATION AND THE SCIENTIFIC CONTROL OF CONCRETE FOR ROAD WORKS

A DETAILED ACCOUNT IS GIVEN OF THE CLOSELY CONTROLLED CONSTRUCTION OF CONCRETE AND CEMENT-STABILIZED HOGGIN ROADS AND FOUNDATION SLABS FOR PRE-FABRICATED HOUSES ON A HOUSING SITE AT LUDON. METHODS OF CARRYING OUT AND INTERPRETING TESTS ON AGGREGATES, CONCRETE, AND STABILIZED HOGGIN ARE DESCRIBED, AND A LIST IS GIVEN OF EQUIPMENT FOR A FIELD LABORATORY.

Gauntlett, HD J Inst Munic Engrs /UK/. Road Abstracts /UK/

ACKNOWLEDGMENT Highway Research Board Bibliography

1A 231725

SOIL-CEMENT CONSTRUCTION HANDBOOK

THE HANDBOOK PRESENTS IN PRACTICAL FORM THE COMPLETE PROCEDURES FOR BUILDING SOIL-CEMENT ROADS, STREETS, AIRPORTS, PARKING, AND STORAGE AREAS AND SHOULDERS PROCEDURES FOR SOIL SAMPLING AND FOR INSPECTION AND FIELD CONTROL ARE INCLUDED.

Portland Cement Association

ACKNOWLEDGMENT Highway Research Board Bibliography
ECONOMICAL ROAD CONSTRUCTION IN MARSHY AREAS /IN GERMAN/

The author describes how firm economical roads were built under the most difficult subsidence conditions in the region of the great marsh near Rendsburg in Schleswig-Holstein, and how the special problems which arose were solved. According to the tendering, specification cement Z-275 had to be used to solidify the soil, and a guide value of 140 kg/cum of soil solidification was given. The requirement was a crushing strength of 30-40 KP/square meter after 144 hours (a cube of 20 cm edge length after storage according to DIN 1048). Sample measurements showed that during the construction time the required minimum crushing strength was not attained, in spite of 180 kg/cum of cement being used. With the subsequent use of Pectracrete cement Z-275 in a quantity of 120 kg/cum of cement, crushing strengths were obtained which were greater than the required minimum value. Humic constituents in the sand were chemically neutralized through the addition of calcium chloride amounting to 2 per cent of the cement weight, the construction is described in detail. /FG/RRL/

Acknowledgment: Transport & Road Research Laboratory /UK/

1A 232001

GENERAL PROCEDURE IN INVESTIGATION, DESIGN, AND CONTROL DURING CONSTRUCTION OF EARTH AND ROCK-FILL DAMS IN NORWAY

The methods of studying, constructing and controlling earth and rock-fill dams recommended by the Norwegian Geotechnical Institute are described. Special reference is made to selection of sites and materials, laboratory measurements of soil characteristics, work projects, stability studies, and execution and control during construction. Numerous examples are appended. In particular the characteristic curve obtained in the laboratory for a moraine used to build a watertight core, results of a stability study, and characteristics of 23 earth and rock-fill dams constructed in Norway during the last ten years. /LCPC/RRL/

Kjersøl, B
Norwegian Geotechnical Inst

Acknowledgment: Road Research Laboratory /UK/

1A 232437

STATISTICAL ANALYSIS OF DENSITY TESTS

The principles of statistical analysis are explained and used to make a comparison of the relative effectiveness of different testing and compaction methods for various types of subgrade and base course materials for roadway work. The nuclear and conventional density testing methods are compared, the compaction obtained by sheepfoot roller, pneumatically-tired roller, and hand operated vibratory-impact equipment is analyzed and compared statistically for volcanic tuff subgrades and variable soil type subgrades. In the light of the normal distribution theory, the minimum density requirement found in most specifications is seen to be unrealistic. Statistical analysis of earthwork can also be used as a tool in keeping construction control charts to achieve better product or quality control. /ASCE/

Petitt, RA
Am Soc Civil Engr J Highway Div

1A 232497

SAND DRAINS FOR EMBANKMENT ON MARL FOUNDATION

The engineering details are described in the establishment of an embankment on a soft foundation consisting of 60 ft. of marl and silt. After establishing the soil profile by field explorations, undisturbed soil samples were tested to determine the strength and consolidation characteristics of the foundation materials. Analyses were then made of various design treatments, consideration being given to the availability of materials, the rights-of-way requirements, the possible construction sequence and required time of completion, and the overall costs. The use of sand drains was found to be most advantageous. A description is given of the preconstruction consideration involving the design layout of preconstruction devices, consideration of the mechanical behavior of aggregates, the effects of the construction method, the efficiency of the soil drainage process, and the cost of construction. The data obtained from field measurements are presented and compared to those obtained from preconstruction analyses. Comments are made concerning the effectiveness of sand drains at this installation and a note made of the general application of the procedure of treatment. /Author/
1A SYSTEM CONSTRUCTION, MANAGEMENT & QUALITY CONTROL

McAlpin, GW Sinacon, MN Highway Research Board Bulletin

1A 232498
STABILIZATION OF MARSH DEPOSIT

Tsien, SI Highway Research Board Bulletin

1A 232551
COMPUTER PROGRAM TO REPORT AND EVALUATE FIELD TEST DATA FOR EMBANKMENT AND BASE CONSTRUCTION
A COMPUTER PROGRAM WAS DEVELOPED IN MONTANA TO DEVELOP AND IMPORT FIELD TEST DATA, TO ASSIST IN MONITORING CONSTRUCTION PROJECTS FOR COMPLIANCE WITH MOISTURE, DENSITY AND GRADATION SPECIFICATIONS AND TESTING RATES AND TO BE STORED ON TAPE TO SERVE AS A BACK-UP FOR THE ORIGINAL FIELD TEST DATA. THIS INVOLVED A METHOD OF COLLECTING THE DATA IN SUCH A FORM THAT IT COULD BE RAPIDLY TRANSLATED INTO PUNCHED CARDS TO BE INSERTED INTO THE COMPUTER AND BE AUTOMATICALLY RECORDED AND STORED IN A USABLE FORM. IT WAS DESIRED TO ANALYZE THE TEST DATA BY COMPARING THE TEST RESULTS WITH THE PERTINENT SPECIFICATION FOR THAT PROJECT AND TO DETERMINE WHETHER OR NOT THE TEST MET REQUIREMENTS AND, IF IT DID NOT, TO DETERMINE IF THE FAILING AREA REPRESENTS THE TEST HAD BEEN CORRECTED AND RE-TESTED THE DEVELOPMENT AND OPERATIONS OF THE PROGRAM ARE DESCRIBED. TWO YEARS OF EXPERIENCE WITH THE PROGRAM INDICATES THAT, WITH THE USE OF PROPER TRAINING AIDS. FIELD PERSONNEL WILL READILY ADAPT TO THE SYSTEM. IT HAS BEEN DETERMINED: (1) THE PROGRAM IS FEASIBLE AND DATA CAN BE COLLECTED WITH A LARGE NUMBER OF PEOPLE PARTICIPATING IN THE PREPARATION OF THE IMPORTED FIELD TEST DATA, TO ASSIST IN MONITORING CONSTRUCTION PROJECTS FOR COMPLIANCE WITH MOISTURE, DENSITY AND GRADATION SPECIFICATIONS AND TESTING RATES AND TO BE STORED ON TAPE TO SERVE AS A BACK-UP FOR THE ORIGINAL FIELD TEST DATA. THIS INVOLVED A METHOD OF COLLECTING THE DATA IN SUCH A FORM THAT IT COULD BE RAPIDLY TRANSLATED INTO PUNCHED CARDS TO BE INSERTED INTO THE COMPUTER AND BE AUTOMATICALLY RECORDED AND STORED IN A USABLE FORM. IT WAS DESIRED TO ANALYZE THE TEST DATA BY COMPARING THE TEST RESULTS WITH THE PERTINENT SPECIFICATION FOR THAT PROJECT AND TO DETERMINE WHETHER OR NOT THE TEST MET REQUIREMENTS AND, IF IT DID NOT, TO DETERMINE IF THE FAILING AREA REPRESENTS THE TEST HAD BEEN CORRECTED AND RE-TESTED THE DEVELOPMENT AND OPERATIONS OF THE PROGRAM ARE DESCRIBED. 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1A 232576
MODIFICATION OF NATURAL GRAVELS AND SOILS BY THE ADDITION OF SMALL AMOUNTS OF CEMENT
THIS PAPER DESCRIBES THE USE THAT THE COMMONWEALTH DEPARTMENT OF WORKS HAS MADE OF THE MODIFICATIONS OF NATURAL SOILS AND GRAVELS WITH CEMENT IN THE CONSTRUCTION OF AIRFIELD PAVEMENTS IN AUSTRALIA. PROBLEMS ASSOCIATED WITH CEMENT MODIFICATION OR STABILIZATION ARE SHRINKAGE CRACKING, CONSTRUCTION CONTROL, SPREADING OF CEMENT, CHECKING OF CEMENT CONTENT, SURFACE FINISHING, AND BITUMEN SURFACE

Williams, HC Purdam, RK Constructional Review /Australia/

ACKNOWLEDGMENT: Portland Cement Association

1A 232621
AN EVALUATION OF THE ROAD LOGGER
THE LANE-WELLS ROAD LOGGER, A MOBILE TRUCK AND TRAILER MOUNTED NUCLEAR GAUGE THAT UTILIZES THE PRINCIPLE OF RADIATION BACK SCATTER TO MAKE CONTINUOUS RECORDINGS OF MOISTURE AND DENSITY AS IT IS DRIVEN OVER A TESTED SURFACE, WAS EVALUATED TO COMPARE ITS PERFORMANCE AND COST OF OPERATION TO PRESENT TESTING METHODS. TO STUDY ITS VARIABILITY, AND TO ASSESS ITS POSSIBLE ADVANTAGES AS A MEANS OF CONSTRUCTION CONTROL. A REASONABLY GOOD CORRELATION WITH THE SAND CONE METHOD OF TESTING WAS OBTAINED. THE LOGS INDICATE THAT MOISTURE AND DENSITY READINGS ARE INFLUENCED MARKEDLY BY AIR GAP SIZE, TIME CONSTANT, AND LOGGING SPEED, BUT REPEATABILITY IS GOOD. THE AMBIENT TEMPERATURE WAS FOUND TO AFFECT DENSITY READINGS IN COLD WEATHER. UTILIZATION OF THE ROAD LOGGER AS A COMPACTION CONTROL DEVICE IS FEASIBLE, BUT COST LIMITS RECOMMENDATION FOR ITS USE TO SITUATIONS WHERE THERE IS ENOUGH CONSTRUCTION WORK. THE EQUIPMENT IS NOT RUGGED ENOUGH, AND IS SUBJECT TO FREQUENT BREAKDOWNS. IT TAKES CONSIDERABLE TIME AND KNOWLEDGE TO ELIMINATE SUCH MALFUNCTIONS. /AUTHOR/

Teng, TC Curran, JW Goff, EP Mississippi State Highway Department

1A 232653
SOME REFINEMENTS IN MEASUREMENT OF SURFACE DENSITY BY GAMMA RAY ABSORPTION
THE AASHO ROAD TEST SYSTEM OF NUCLEAR DENSITY DETERMINATION IS DESCRIBED, WITH EMPHASIS ON THE SOURCE OF ERROR THAT HAS BEEN ISOLATED AND IN SOME CASES ELIMINATED. SOME OF THE IMPORTANT CONSIDERATIONS IN THE DESIGN OF NUCLEAR SURFACE GAUGES ARE DISCUSSED, AS WELL AS CALIBRATION TECHNIQUES, LICENSING, HEALTH PRECAUTIONS, AND COST. THE PRINCIPLES INVOLVED IN NUCLEAR DETERMINATION OF DENSITY ARE PRESENTED IN AN APPENDIX. CONCLUSIONS OF THE SURVEY ARE THAT: (1) THE NUCLEAR SURFACE DENSITY GAUGE CAN BE USED FOR CONSTRUCTION COMPACTION CONTROL TESTING, (2) MOISTURE CONTENT MUST BE CONSIDERED WHERE PRECISE ESTIMATE OF DENSITY IS DESIRED, (3) IF THE MATERIAL BEING CHECKED EXISTS IN A THIN LAYER THE DENSITY OF THE UNDERLYING MATERIAL MUST BE TAKEN INTO ACCOUNT, AND (4) OPTIMUM SURFACE GAUGE DESIGN DIMENSIONS VARY WITH THE DENSITY OF THE MATERIAL UNDER TEST, SO Provision SHOULD BE MADE FOR CHANGING THE SOURCE-TO-TUBE DISTANCE IN THE FIELD.

Highway Research Board Special Reports
EARTH DAMS AND ROADS IN THE NATIONAL FORESTS
THE FOREST SERVICE HAS MADE PRACTICAL USE OF RECENT DEVELOPMENTS IN THE INTELLIGENT HANDLING OF SOILS IN DAMS AND ROADS. MOST OF THE DAMS ARE COMPARE

VIOUSLY SMALL AND DO NOT JUSTIFY LARGE EXPENDITURES FOR LABORATORY EQUIPMENT. THE PROBLEM HAS BEEN GROSSED INSTRUMENTATION AND OBSERVATION WERE SU

E AND HAS INCLUDED THE TRAINING OF ENGINEERS RESPONSIBLE FOR FIELD SUPERVISION. THE CONTROL OVER THE SELECTION OF EMBANKMENT MATERIAL AND CONSTRUCTION CONTROL OPERATIONS ARE DISCUSSED. WORK IN ROAD CONSTRUCTION IS CONFINED TO EXPERIMENTAL SECTIONS. INSTALLATION AND MAINTENANCE COSTS ARE BEING CAREFULLY DETERMINED, AS THEY WILL BE IMPORTANT FACTORS IN THE DETERMINATION OF METHOD AND EXTENT OF USE ON LOW STANDARD FOREST ROADS. /AUTHOR/

Necross, TW Conner, CN DISCUSSER Highway Research Board Proceedings Nov. 1936

FIELD COMPACTION CONTROL
FIELD COMPACTION QUALITY CONTROL CAN BE DIVIDED INTO PROCESS AND ACCEPTANCE CONTROL EACH WITH ITS OWN PHYSICAL CRITERIA AND TEST METHODS BUT SUBJECT TO SIMILAR STATISTICAL EVALUATIONS. THE DEGREE OF COMPACTION CAN USUALLY BE DETERMINED FROM DENSITY, WHICH MEANS, STATISTICALLY, DETERMINATION OF AVERAGE DENSITY AND ITS VARIABILITY. METHODS OF TESTING THE DENSITY OF BITUMINOUS-BOUND, GRANULAR, AND STABILIZED MATERIALS ARE DISCUSSED BRIEFLY FROM THE STANDPOINT OF ACCURACY AND STANDARD DEVIATION. THE PROCEDURE CONTROL ADVOCATED HERE EMPLOYS A BI

VARIATE (BULK STATISTICAL EVALUATIONS) TEST: A DETAILED APPLICATION OF THE METHOD UTILIZING STEWART-TYPE CONTROL CHARTS IS GIVEN. ACCEPTANCE CONTROL IS BASED ON SAMPLES REPRESENTING A VERY SMALL PERCENTAGE OF THE WHOLE AND IS THEREFORE AIMED AT REFINING ESTIMATES OF PROBABLE AVERAGES AND THEIR VARIABILITY. AN IMPLICATION OF THIS IS THAT RAPID TESTS NEED TO BE DEVELOPED SINCE STATISTICAL CONTROL REQUIRES AN ADEQUATE NUMBER OF TEST RESULTS TO SUPPLY EVIDENCE FOR MEANINGFUL DECISIONS. IT IS DESIRABLE TO HAVE MORE EVIDENCE ON THE ECONOMIC JUSTIFICATION FOR CONDUCTING SATISFACTORY CONTROL.

Kuhn, SH Marais, CP Nat Inst Road Research /S Africa/ July 1969

MEASURING INSTRUMENTS FOR STRUTTED EXCAVATIONS
A SUMMARY IS PRESENTED OF THE EXPERIENCE GAINED BY THE NORWEGIAN GEO TECHNICAL INSTITUTE WITH FIELD INSTRUMENTATION OF STRUTTED EXCAVATIONS IN CLAY. DESCRIPTIONS ARE GIVEN OF THE INSTRUMENTS AND TECHNIQUES WHICH HAVE BEEN USED TO MEASURE STRUT LOADS, EARTH AND WATER PRESSURE, SETTLEMENT, HEAVE AND DEFORMATION, AND INFORMATION IS PRESENTED CONCERNING COST, ACCURACY AND RELIABILITY OF THESE INSTRUMENTS. SEVERAL JOBS ARE BRIEFLY DISCUSSED WHEREIN INSTRUMENTATION AND OBSERVATION WERE SUCCESSFULLY EMPLOYED TO CONTROL CONSTRUCTION PROCEDURES AND TO OBTAIN IMPORTANT DESIGN DATA. /RRL/


Bjerrum, L Kenney, TC Kjaernsli, B Norwegian Geotechnical Inst 1965

AN INVESTIGATION OF PORE WATER PRESSURE IN COMPACTED COHESIVE SOILS

Hill, JW Bureau of Reclamation /US/ Oct. 1956
1A SYSTEM CONSTRUCTION, MANAGEMENT & QUALITY CONTROL

1A 235570
NUCLEAR RADIATION IN CONSTRUCTION CONTROL OF EARTH AND ROCKFILL DAMS
IN RECENT YEARS NUCLEAR RADIATION TECHNIQUES HAVE BEEN WIDELY USED IN SOIL INVESTIGATION IN ORDER TO DETERMINE CERTAIN CHARACTERISTIC PROPERTIES OF SOILS. PRINCIPALLY THE DEVELOPMENT IN THIS FIELD HAS BEEN CONCENTRATED ON METHODS FOR DETERMINING THE MOISTURE CONTENT IN SOILS AND THE DENSITY CONDITIONS IN SITU AND IN COMPACTED EMBANKMENTS, WHEREAS VERY LITTLE ATTENTION HAS BEEN DEVOTED TO THE POSSIBILITY OF APPLYING THE NEW TECHNIQUE TO OTHER FIELDS OF SOIL AND ROCK MECHANICS. IN CONNECTION WITH THE DESIGN AND CONSTRUCTION OF SEVERAL EARTH AND ROCKFILL DAMS THE SWEDISH STATE POWER BOARD HAS DEVELOPED THE NUCLEAR RADIATION TECHNIQUE FOR SOLVING MANY PROBLEMS IN CONSTRUCTION CONTROL. THE EXPERIENCE THERFORE OBTAINED HAVE RESULTED IN RELIABLE AND SIMPLE METHODS FOR DETERMINING SETTLEMENTS IN EARTH AND ROCKFILL EMBANKMENTS AND FOR CONTROLLING THE EFFECT OF GRAVITY IN SOIL AND ROCK. THESE APPLICATIONS OF THE NUCLEAR METHOD ARE BRIEFLY DESCRIBED. /AUTHOR/


1A 236544
THE THRESHOLD OF THE SEVENTIES; THE EAST 63RD STREET
THE EAST 63RD STREET TUNNEL IS PLANNED AS A 3.140 FT. LONG TUNNEL, TWO-LEVEL TUNNEL STRUCTURE. THE TWO UPPER LEVEL TRACKS FOR SUBWAY USE AND THE TWO LOWER LEVEL TRACKS FOR LONG ISLAND RAILROAD USE. GEOLOGICAL STUDIES FOR TUNNEL WORK UNDER QUEENS, WELFARE ISLAND, AND MANHATTAN REVEALED THAT QUEENS IS UNDERLAIN WITH A HARD ROCK FORMATION (BROOKLYN INJECTION GNEISS); UNDER WELFARE ISLAND THE ROCK IS FORDHAM GNEISS AND BROOKLYN INJECTION GNEISS WITH SOME GRANODIORITE; AND UNDER MANHATTAN THE ROCK IS OF MANHATTAN SCHIST. THE CONSTRUCTION SCHEDULE PERMITTED 34 MONTHS TO COMPLETE THE TRACK AND SIGNAL INSTALLATION AND A TOTAL OF 39 MONTHS FOR ALL WORK. THE CONSTRUCTION METHODS USED FOR THE WELFARE ISLAND TUNNEL ARE DESCRIBED IN DETAIL TO ILLUSTRATE SHAFT AND TUNNEL EXCAVATION PROBLEMS. THE QUALITY OF THE WORK IMPROVED WITH LOWER ELEVATIONS IN ONE INSTANCE.

Casey, EF N Am Rapid Excav & Tunneling Conf Proc Vol 1 June 1972, pp 419-17, 7 Fig, 2 Phot

1A 236558
TUNNEL EXCAVATION GRAND COULEE THIRD POWERPLANT
A 3,600,000 KILOWATT THIRD POWERPLANT WAS ADDED TO GRAND COULEE DAM BY AWARDING CONTRACTS FOR (1) MODIFYING THE EXISTING POWER FACILITIES, INCLUDING TUNNEL EXCAVATION WITHIN THE DAM AND TUNNEL CONSTRUCTION CONNECTING THE DAM TO THE 230 KILOWOLT SWITCHYARD; (2) MODIFYING THE FOREBAY DAM AND THE THIRD POWERPLANT STRUCTURE; (3) INSTALLING THE PENTSTOCKS, CONSTRUCTING THE FOREBAY DAM AND THE POWER PLANT STRUCTURE, INCLUDING CONNECTING THE LATTER'S TUNNEL WITH THE FOREBAY DAM'S STRUCTURE TO THE GALLERY SYSTEM; AND (4) EXCAVATING AND GRADING FOR A 300 KILOWOLT CABLE SPREADING YARD AND A 500 KILOWOLT SWITCHYARD, AND INSURING AN EXTRA HIGH VOLTAGE (EHV) CABLE TUNNEL. TUNNEL EXCAVATION THROUGH CONCRETE (COMPRESSIVE STRENGTH OF OVER 7,000 PSI AND A MODULUS OF ELASTICITY OF 6,000,000 PSI) WAS ACHIEVED BY DRILLING OPENINGS INTO THE FINISHED FACE OF EXISTING GALLERIES IN THE DAM. STRUCTURAL VIBRATIONS WERE DETECTED BY TRANSDUCING ACCELEROMETERS, TRANSMITTED BY PREAMPHIFYING EQUIPMENT AND RECORDED BY TRACING PEN ON CALIBRATED PAPER. PARTICLE ACCELERATION WAS MEASURED IN TWO DIRECTIONS, VERTICAL AND HORIZONTAL, NORMAL TO THE DAM AXIS. TUNNEL EXCAVATION THROUGH ROCK (COARSE TO FINE-GRAINED GRANITE WITH A COMPRESSIVE STRENGTH OF ABOUT 20,000 PSI, MODULUS OF ELASTICITY 4.5 TO 6.0 X 10 TO THE 6TH PSI, AND SPECIFIC GRAVITY OF 2.57 TO 2.63) WAS ACCOMPLISHED BY DRILLING FROM A MODIFIED END OF A DUMP TRUCK AND WITH A CUSTOM DRILL JUMBO. SPECIFICATIONS PROVIDED FOR ROCKBOLTING AND/OR STRUCTURAL STEEL SUPPORTS. WITH THE EXCEPTION OF USING A RESISTANCE IGNITED FIRING SCHEME IN THE EHV TUNNEL, BLASTING METHODS WERE THE SAME FOR BOTH TUNNEL EXCAVATIONS—HANDTIME SAFETY FUSES, BLASTING CAPS, AND CARTRIDGE EXPLOSIONS.

Duck, DJ N Am Rapid Excav & Tunneling Conf Proc Vol 1 June 1972, pp 765-63, 13 Fig, 5 Tab

1A 236585
THE MECHANICAL MOLE--A BREAK THROUGH IN INCLINED SHAFT MINE CONSTRUCTION
THE TUNNEL BORING MACHINE OR MECHANICAL MOLE OFFERS GREATER PRODUCTION RATES, HIGHER SAFETY AND A BETTER, CLEANER BORE. THE DESIGN AND OPERATION OF THIS MACHINE WHICH HAVE BEEN USED ON AN...
SYSTEM CONSTRUCTION, MANAGEMENT & QUALITY CONTROL 1A


Brickle, EW Mcguire, EJ N Am Rapid Excav & Tunnelling Conf Proc Vol. 2 June 1972, pp 1185-96, 5 Fig

1A 236639 PENNDOT'S RESPONSE TO EROSION CONTROL PENNSYLVANIA DEPARTMENT OF TRANSPORTATION (PENNDOT) HAS BEEN ENGAGED IN POST-CONSTRUCTION EROSION CONTROL ACTIVITIES FOR MANY YEARS THROUGH THE USE OF SEEDING, MULCHING AND PLANTINGS, PROPER LANDSCAPE MANAGEMENT, EROSION CONTROL DIRT EORING, MCH, EORATION OF EXPLOSIVE METHANE GAS AND FLOODING GROUND WATER. GROUND SUPPORT, METHANE GAS PROTECTION, GROUND WATER PROTECTION, LINE AND GRADE CONTROL, MUCK REMOVAL, HAULAGE RAIL, AND VENTILATION ARE ASPECTS OF THE CONSTRUCTION PROCEDURE WHICH ARE REVIEWED. PRODUCTION RATES HAVE BEEN ABOVE ENGINEERING FORECASTS. THE POSSIBILITY OF USING THE MACHINE FOR OTHER MAJOR CONSTRUCTION PROJECTS SUCH AS RAPID TRANSIT, WATER TRANSPORT AND STORAGE IS ENVISAGED.

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1A 236643 SOIL AS AN ENGINEERING CONSTRUCTION MATERIAL /IN JAPANESE/ BECAUSE OF THE GREAT DISTANCES AND VARIED CLIMATIC CONDITIONS, MANY SOIL TYPES OCCUR IN AUSTRALIA, AND THEIR PROPER USAGE AS CONSTRUCTION MATERIALS REQUIRES A KNOWLEDGE OF HOW TO DEAL WITH SOIL VARIABILITY. FOR THIS REASON, NEW METHODS HAVE BEEN HIGHLY DEVELOPED FOR THESE PURPOSES, AS WELL AS THE VARIOUS METHODS OF SOIL STABILIZATION. RECENTLY, NEW METHODS OF STATICAL ANALYSIS (BAYESIAN PROBABILITY) HAVE BEEN STUDIED AS A MEANS OF IMPROVING CONSTRUCTION CONTROL AND ASSISTING RECOGNITION OF THE CRITICAL FACTORS INVOLVED IN ANY PARTICULAR SOIL CONSTRUCTION WORK. NEWLY DEVELOPED TECHNIQUES FOR THE TESTING AND EVALUATION OF SOIL AND STABILIZED SOIL FOR USE AS PAVEMENT MATERIAL, AND IN EARTHEN EMBANKMENT CONSTRUCTION, ARE DESCRIBED WITH PARTICULAR REFERENCE TO CURRENT AUSTRALIAN RESEARCH, BOTH IN THE LABORATORY AND AS CONTROLLED LONG-TERM FIELD TRIALS. THE RESULTS OF THIS EXPERIENCE ARE NOW BEING INCORPORATED IN PRACTICAL CONSTRUCTION MANUALS. /CSIRO/

Ingles. OG

ACKNOWLEDGMENT: Commonwealth Scient Indus Res Org /Australia/


Corwin, SC Highway Research Record Hwv Res Board 1965

1A 238346 CHANGED CONDITIONS CLAUSE IN HIGHWAY CONSTRUCTION CONTRACTS THE USUAL CHANGED CONDITIONS CLAUSE IS IN TWO PARTS. THE FIRST PART PROVIDES THAT SHOULD THE CONTRACTOR ENCOUNTER OR THE STATE DISCOVER, DURING THE PROGRESS OF THE HIGHWAY CONSTRUCTION WORK SUB-SURFACE AND/OR LATENT CONDITIONS AT THE SITE
MATERIALLY DIFFERING FROM THOSE INDICATED ON THE DRAWINGS OR IN THE SPECIFICATIONS, THE ATTENTION OF THE ENGINEER SHALL BE CALLED IMMEDIATELY TO SUCH CONDITIONS BEFORE THEY ARE DISTURBED. THE SECOND PART PROVIDES THAT SHOULD THE CONTRACTOR ENCOUNTER, OR THE STATE DISCOVER, UNKNOWN CONDITIONS OF AN UNUSUAL NATURE DIFFERING MATERIALLY FROM THOSE ORDINARILY ENCOUNTERED, THIS TOO SHOULD BE CALLED TO THE ATTENTION OF THE ENGINEER. ACTUALLY, THE PROVISIONS OF THE PROVISIONS OF THE CHANGED CONDITIONS CLAUSE IS APPARENTLY NOT NEEDED IN HIGHWAY CONSTRUCTION CONTRACTS BECAUSE THE FEELINGS OF THE COURTS APPEAR TO BE THAT JUSTICE AND EQUITY DO NOT REQUIRE A STATE TO REIMBURSE A CONTRACTOR FOR INCREASED EXPENSE UNLESS THE MISTAKE WAS DUE TO THE ACT OF THE STATE. ON THE OTHER HAND, SHOULD THE CONTRACT BE EASIER TO PERFORM THAN ANTICIPATED, NO ONE WOULD REQUIRE THE HOLDER OF PROFITABLE CONTRACT TO SURRENDER A PORTION OF HIS LEGITIMATE PROFITS.

Lindos, LI Am Asce State Highway Officials Proc pp 1-20, Dec. 1966

1A 238435 LEGAL ASPECTS OF QUALITY CONTROL

THE DESIGNER, THE ENGINEER OR ARCHITECT, THE CONTRACTOR, AND SUB-CONTRACTOR—AND SOMETIMES EVEN THE OWNER—are legally responsible for different parts of quality control of construction. The responsibility is determined primarily by contract terms and is delineated by what the courts have said in litigated disputes. The engineer is responsible in cases of negligence or where he has undertaken work for which he is not qualified. He is not liable for mistakes of judgement if he exercises the skill and diligence reasonably expected of a professional. Tests and inspections must follow trade practices and must be prompt. Claims must be made promptly. In general, inspection and acceptance at completion are final and conclusive. Warranty and guaranty are so closely related to quality control that they can be treated as one and the same. The responsibility of Quality control in engineered construction are probably among the top problems engaging the attention of those in the legal profession who devote their time to the construction industry.

Jarvis, KB Civil Engineering Asce Oct. 1965

1A 238608 QUALITY CONTROL IN HIGHWAY CONSTRUCTION PROGRAMS

EACH OF THE PARTIES IN HIGHWAY CONSTRUCTION ENGINEERING PROJECTS HAS RESPONSIBILITIES TO THOSE WITH WHOM HE HAS AN IMMEDIATE AND DIRECT CONTRACTUAL RELATIONSHIP. THESE RESPONSIBILITIES ARE DETERMINED PRIMARILY BY THE TERMS OF PARTIES' WRITTEN CONTRACTS. THE MATTER OF ASSURING THAT CONSTRUCTION IS PERFORMED ACCORDING TO ACCEPTABLE STANDARDS OF QUALITY IS CUSTOMARILY COVERED BY CONTRACT AND CERTAIN INCITEMENT OF LAW. THE IMPORTANCE OF THIS IS DISCUSSED OF SPECIFICATIONS IN HIGHWAY PROJECTS AND IN QUALITY CONTROL, THE CRITERIA OF QUALITY IS DISCUSSED IN RELATION TO: THE CONCEPT OF EQUALITY AND TRADE PRACTICES. QUALITY CONTROL MUST DEPEND UPON CONTRACT PROVISION FOR STORAGE AND HANDLING OF MATERIALS, INSPECTION PROCEDURE, AND ADJUSTMENT PROCEDURES. THE CONTRACT LAW THAT HIGHWAY DE-
VARIATIONS IN PORTLAND CEMENT CONCRETE CONSTRUCTION IN NEBRASKA

This is a report of historical data in a statistical manner which is useful in formulating statistically based specifications for Portland Cement Concrete.

The report covers data from the 1969, 1970, and 1971 construction seasons. Two possible methods of utilizing this data in a statistically based specification are suggested. /FHWA/

Prepared in cooperation with the U.S. Department of Transportation, Federal Highway Administration.

Broughton, J
Nebraska Department of Roads. (R73-95369) Final Rpt. Nov. 1973, 36 pp

Contract HPR Study 64-4

ACKNOWLEDGMENT: Federal Highway Administration (P-0047)

PURCHASE FROM: NTIS Repr. FC. Microfiche
PB-231382

1A 260465

USING SHOTCRETE TO SUPPORT UNDERGROUND STRUCTURES

A conference was conducted to discuss the making, testing, and using of shotcrete for underground support. With regard to the making of shotcrete, quality control was considered essential. It was believed that average 28-day compressive strengths in the range of 3,000-4,000 psi (20.6-27.5 million N/sq m) were more realistic than the presently specified 5,000 psi (34.4 million N/sq m) compressive strength at 28 days. Opinion on the maximum size of coarse aggregate to be used in a shotcrete mix varied at least 1/2-inch (13 mm) maximum size. The importance of compatibility tests of the cement and accelerator to be used was emphasized. Though remotely controlled nozzles and wet mix shotcrete equipment has had wider use in Europe, there was considerable interest shown in the use of skilled nozzlemen as employed in the U.S. To use core, probe, impact, and pull-out tests were discussed, and it was concluded that such tests need further development. In discussions of where to use shotcrete, it appeared that shotcrete offered economies in normally unlined water tunnels built by the drill and blast method, where it could serve the dual function of support and final lining. It also appeared to offer economies where a drill and blast tunnel had a persistent need for support and coverage of the rock to prevent deterioration due to moisture change or stress relief. Though it is not believed to be presently compatible with the tunneling machine, an example was presented where a tunneling machine had been designed to accommodate the use of a specific shotcrete system.

Morris, JW (Bureau of Reclamation) ASCE Civil Engineering Vol. 43 No. 9, Sept. 1973, p 17

1A 260478

MANAGEMENT OF SOLID WASTES INCIDENT TO HIGHWAY CONSTRUCTION AND MAINTENANCE

The problem with which this report deals involves (1) the disposal of wastes resulting from highway construction with minimum offense to the environment and (2) the prevention and removal of roadside litter. Current highway waste management practices are reviewed and alternative solutions are proposed for more effective management of these wastes. The results of a survey of the current practices of the fifty states in meeting environmental legislation and litter control are reported. In addition, the report includes data regarding waste management efforts by Federal and State agencies. The report is divided into the following three parts: (1) management of highway construction wastes; (2) management of highway litter; and (3) highway erosion control.

Prepared under a grant from the State of Tennessee, Department of Transportation, Nashville, Tennessee.

Connells, AA Friedman, AA
Tennessee Technological University Final Rpt. Feb. 1974, 96 pp, 5 Fig, 8 Tab, Refs, 3 App

1A 260639

PRE-PLANNING YOUR ARBITRATION

Commercial arbitration is a viable and economical alternative to court litigation in the construction industry. The arbitrator has a better understanding of the industry and can act faster than a crowded court's judge. The process of arbitration itself can promote the relationship between contractor, owner, employees, subcontractors etc. This article reviews recent court decisions dealing with arbitration as a means of settlement. Also discussed are contract clauses specifying arbitration of disputes before litigation.

Curtin, WI Constructor Vol. 55 No. 9, Sept. 1973, pp 41-43
QUALITY CONTROL OF COMPACTION IN EARTHWORKS

Present density and moisture control methods are fast becoming inadequate, especially with the increased use of high speed, large capacity earth moving and compaction equipment. The in situ density of concrete can readily be checked to a high degree of accuracy and rapid moisture determination of timber is possible. In the absence of weight-bridges, the loading of vehicles carrying soils and aggregates can be checked, if the volume of the load is known. In summary, nuclear density and moisture test methods are comparable in accuracy with conventional test methods, and in some applications superior, are more economical on a long term basis, and offer greater coverage, simplicity, and flexibility of operation. Of greatest importance is the ability of these instruments to provide almost instantaneous results of tests.

An invaluable application of nuclear Hidrodensimeters is determination of the moisture content of borrow areas before the material is placed, thus preventing the use of unsuitable materials, eliminating rule of thumb methods, guess work, "getting away with it", and other hopeful measures which are used in a surprising number of cases. Greater coverage of a job is possible, in the form of many more up to date tests within the same time as those recorded by conventional methods. Thus a truer picture of "as built" conditions is provided. The capability of the equipment makes it possible for several sites to be checked in one day. The testing organization becomes more flexible, as it is not as dependent on static laboratory based equipment. A qualified soil technician is essential for intelligent operation of the instrument, and for intelligent interpretation of results, but total labor requirements are considerably reduced. Applications of the nuclear method not previously discussed, include determination of the density and asphalt content (while still hot) of thick lift asphalt pavements, in place of expensive conventional coring techniques. Greater coverage and non-destructive properties contribute to its value in this application. Evaluation of compaction equipment and materials in test banks, or in actual site conditions can be readily carried out on the same sites, following subsequent roller passes of smooth wheeled equipment. This non-destructive technique is of great value for investigating the performance of road materials and road rollers. The in situ density of concrete can readily be checked to a high degree of accuracy and rapid moisture determination of timber is possible. In the absence of weight-bridges, the loading of vehicles carrying soils and aggregates can be checked, if the volume of the load is known. In summary, nuclear density and moisture test methods are comparable in accuracy with conventional test methods, and in some applications superior, are more economical on a long term basis, and offer greater coverage, simplicity, and flexibility of operation. Of greatest importance is the ability of these instruments to provide almost instantaneous results of tests.


Fergusson, DJ, (Stevenson WJ and Sons Limited)

IA 264559
NEW METHODS IN CONSTRUCTION SYSTEMS

Contemporary computer applications make it possible to achieve construction resource planning data and to present this information to a variety of users. Estimating and scheduling are interdependent functions of construction planning. Adequate planning requires detailed construction cost estimates which have been converted to time-dependent models by allocation of resources to activities. Computer printouts, in both tabular and graphic forms, isolate anomalies and provide a basis for redistribution of resources. From the assembled data, histograms representing resource demand modes can be compiled. When two of these resource histograms are compared mathematically, useful effectiveness ratios can be devised, such as man-hours per ton of reinforcing steel. Such planning data can be compared to on-the-job experience in order to evaluate project management.


IA 264503
QUALITY CONTROL OF COMPACTION IN EARTHWORKS AND PAVEMENTS BY NUCLEAR METHODS

Present density and moisture control methods are fast becoming inadequate, especially with the increased use of high speed, large capacity earth moving and compaction equipment. The in situ density of concrete can readily be checked to a high degree of accuracy and rapid moisture determination of timber is possible. In the absence of weight-bridges, the loading of vehicles carrying soils and aggregates can be checked, if the volume of the load is known. In summary, nuclear density and moisture test methods are comparable in accuracy with conventional test methods, and in some applications superior, are more economical on a long term basis, and offer greater coverage, simplicity, and flexibility of operation. Of greatest importance is the ability of these instruments to provide almost instantaneous results of tests.


Fergusson, DJ, (Stevenson WJ and Sons Limited)

IA 265111
AN INTEGRATED APPROACH TO CONSTRUCTION MANAGEMENT

This research developed an integrated approach to construction management that provides an optimal decision-making tool for improving the cost-effectiveness of management organizations. The construction problem is defined in terms of the management processes of planning, scheduling, and controlling construction operations. These processes evaluate the time-cost tradeoffs of alternative courses of action when resources are limited. The integrated approach reflects the real state of the decision-maker in hierarchical management organizations of dynamic construction systems. A new network-based procedure has been developed that calculates the total costs of construction operations. A rigorous mathematical formulation of the model provides a basis for an optimal solution method utilizing an explicit enumeration, computer routine. The integrated approach was applied to a sample project to yield optimal project and resource schedules.

Richards, JL

IA 263105
QUALITY CONTROL OF COMPACTION IN EARTHWORKS AND PAVEMENTS BY NUCLEAR METHODS

Present density and moisture control methods are fast becoming inadequate, especially with the increased use of high speed, large capacity earth moving and compaction equipment. The in situ density of concrete can readily be checked to a high degree of accuracy and rapid moisture determination of timber is possible. In the absence of weight-bridges, the loading of vehicles carrying soils and aggregates can be checked, if the volume of the load is known. In summary, nuclear density and moisture test methods are comparable in accuracy with conventional test methods, and in some applications superior, are more economical on a long term basis, and offer greater coverage, simplicity, and flexibility of operation. Of greatest importance is the ability of these instruments to provide almost instantaneous results of tests.


Fergusson, DJ, (Stevenson WJ and Sons Limited)

IA 261495
A DATA-BASED METHODOLOGY FOR SPECIFYING CONSTRUCTION PROJECT DURATIONS

This report presents a method of determining the construction contract performance times for Military Construction projects. This method is based on information that is regularly reported as feedback during the execution of a construction contract for Military Construction. Army projects. By organizing the data from the manpower-utilization feedback reports, a model is formulated and mathematically derived. An example of data reduction is presented, and the results of applying the methodology to these projects are reported. A proposal of implementation of the methodology in U.S. Army Corps of Engineers' district offices is presented.

Halpin, DW, Delong, CE

IA 261493
REINFORCEMENT FOR CONCRETE

This publication which is intended primarily for the use of those working, or acting in a supervisory capacity on construction sites, covers (mainly) the practical operations relating to reinforcement from the stages of ordering, unloading and storing, through those of cutting and bending, to the final stage of fixing preparatory to placing the concrete. In order that the need for the accurate placing of the reinforcement may be understood, the underlying principles of the reinforcing of concrete structural members is briefly described. The book is also intended to provide a value to the manager, design staff and detailer of reinforced concrete structures. The data provided here is entirely in metric SI units.

Disney, LA, Reynolds, CE
SYSTEM CONSTRUCTION, MANAGEMENT & QUALITY CONTROL

IA 264579
ENVIRONMENTAL AND CONSTRUCTION MANAGEMENT ENGINEERS
The paper presents the construction management engineer in the first line of defense in preventing environmental pollution and degradation during construction. Damage can be reduced through knowledge about the environment and the project. The major construction activities that cause pollution and its magnitude are examined. The engineer is in a position to influence the outcome if he is aware of the problems associated with construction and their magnitude.


IA 264587
RATE OF WORK METHOD: SIMPLIFIED PROJECT CONTROL
The preponderance of management consultants that has to date, successfully offered their services to contractors assuming the Construction Manager role, have relied on a relatively new form of network planning-precedence planning-to illustrate their expertise in the planning and scheduling aspects of project control. Precedence planning has been acclaimed to better meet the scheduling needs of the general contractor in the field; however, it is a major thesis of this article that the use of precedence planning creates a situation in which the contractor is more dependent on the major contractor while the total project time has decreased and, in some cases, the project activities are scheduled on a late start basis. This article will elaborate on the inherent deficiencies of precedence planning as presently employed in the construction industry and, by doing so, will attempt to diminish the mystique of this approach to scheduling.

Cunningham, JA Yarmowich, EP (General Electric Company) ASCE Civil Engineering Vol. 43 No. 11, Nov. 1973, pp 62-64, 4 Fig., 1 Phot.

IA 264664
A HEURISTIC MODEL FOR PREDICTING BRIDGE CONSTRUCTION REQUIREMENTS
Research is directed to formulating a bridge and resource requirements simulation model for use by program managers concerned with the ground 1 lines-of-communication sector of the construction industry. Bridge construction alternatives are designed and selected to reduce the obstacle effect of the terrain such that commodities flow (traffic) along the line-of-communication (highway) is improved. The resulting tool provides a heuristic high-resolution model for policy testing and decision making in a highly dynamic system involving non-commensurable objectives such as cost, time and manpower. The problem of predicting bridge and resource requirements is defined as a systematic analysis of the bridge construction system's purpose, components, constraints and required information. Examples of the need for accurate prediction of requirements are discussed for both the civilian and military applications. The bridge construction system is described in terms of four components: (a) an aggregation of terrain obstacles, (b) a set of obstacle reducing alternatives, (c) a pool of construction resources, and (d) a set of bridge construction management criteria. Each of the components is discussed in terms of its attributes and then variable and parameter classifications. With the elements of the system description a realistic simulation model is formulated. A controlled enumeration technique is used to generate a small set of feasible alternative bridge designs to be used in the highway construction simulation. Alternatives are designed and selected for construction from a model-user-specific construction criteria or objective function. Bridge and resource requirements are predicted by simulating over the selected terrain, a sufficient number of highway-construction operations to satisfy the preset constraint level. The bridge construction simulation model is then applied to the consideration of gap-type obstacles which may be neutralized by bridging. Two specific demonstrations of the flexibility of the model concept are provided: (a) prediction of bridge hardware and construction resource requirements for a hypothesized military operation in West Germany under conditions of uncertainty; and (b) identification of requirements for a flood disaster relief operation in Korea for the deterministic case. Results and consequent model validity are discussed. Recommendations for further study are presented.

Ryan, TC Army Construction Engineering Research Laboratory Tech Manu CERL-TM-C-03, July 1974, 117 pp

IA 264754
DENSITY OF BITUMINOUS SURFACE COURSES
Research is reported to have been conducted to determine the probable causes of low densities obtained during construction of bituminous surface courses designed with slab aggregate, and to determine the effect of low densities on the performance and durability of low-surface bituminous surface course throughout Tennessee. The research literature in this field is reviewed and the causes of low density are classified. The probable primary causes of low densities in bituminous surface courses were found to be the lack of rolling in the breakdown and intermediate rolling sequences, the low mat temperatures during rilling operations, and the asphalt contents below the design asphalt content. The effect of density on surface performance is discussed and tables are presented of record densities, core densities and ratings from field inspections. As a result of this project more widespread use is being made of nuclear density surface gauges. A large number of tests may be conducted in a short time after laydown and rolling operations and a closer quality control of paving operations may be maintained.

Marks, BD (Department of the Air Force); Ford, HO Tennessee University, Knoxville Proceeding Bulletin No. 40, Jan. 1974, 6 Fig., 6 Ref.

IA 264756
TOOLS AND TUNNELS HELP EARN FAT CONSTRUCTION BONUSES
An army of jumbos and intricate temporary tunneling has helped speed work on an underground powerhouse, maximize drill use and increase the contractor's overall job profit. Short stroke Copco drills were used which add 25 to 40 percent to equipment speed and adoption well to the stratified mica schist. The drill steel was changed every 1,500 ft and detachable bits every 750 ft. Three 7-boom tractor-mounted jumbos worked side-by-side in the 82 x 778 x 187-ft-high main powerhouse excavation. Other units included a 4-drill jumbo, two Atlas Copco 3-drill jumbos and 11 Gardner-Denver Model 3200 Air-Trac units plus stopers and jacklegs. The big 7-boomers and the 3-boomers added flexibility and adapted to the varying heading sizes and shapes. The observation is made that smaller drills can be mined more efficiently with custom-built jumbos that can handle rockbolting and meshing during the drill cycle. The custom-made BUT 14ER booms cover twice the area and they position easier than standard units. Details of the timing and tunneling are described as well as the drilling cycle, blasting and rockbolting.


IA 265142
PANEL DISCUSSION ON PERFORMANCE OF PAVEMENT WITH GRADED AGGREGATE BASES
In this panel discussion of the performance of pavement with graded aggregate bases, case histories are presented of specific projects. Projects in North Carolina are described in which ungraded aggregate bases, treated full-depth bases and concrete bases have been utilized. A representative selection is also presented of several constructed projects in Maryland, where the use of graded aggregate materials will continue to be specified as base courses in flexible pavement construction for the foreseeable future. Experience in Virginia is reviewed where considerable use has been made of the controlled strip method for checking density, particularly in stone bases. In a review of production control systems in aggregate industries, the New York State Department of Transportation requirements are presented, and the point is made that in some states graded aggregate is used only as subbase beneath bases that are stabilized with asphalt or other additives. In such cases gradation control is not required to be as close as where the material is designed to serve as heavy duty base course. Distinction is made between subbase materials and quality controlled base materials.


Drake, WB; Berrier, LH; Creasey, WB; Fielding, RV National Crushed Stone Association Civil Paper Mar. 1974

IA 265648
CONSTRUCTION SOLID WASTE
This paper examines the classification and composition of construction solid waste and debris. The components of solid waste management systems are

103
reviewed with emphasis on disposal procedures. Incineration, burial, and recycling options are evaluated for application to construction wastes. A strategy designed for the construction management engineer is presented.

CONSTRUCTION MATERIALS

2A 033160
DISPLACEMENT OF ADJACENT ROADWAY AND GROUND SURFACE DURING CONSTRUCTION PERIOD OF OPEN CAISSON

As the open caisson pier foundation was to be constructed very close to the existing roadway of embankment of weak strata in recent double tracking work on Chuoh line, observation of displacement was carried out to judge the degree of danger for running a train during construction period. According to the results of observation it was confirmed that the protection method by sheet piling was very effective and in this case the displacements or strains were too small to disturb the track or to interrupt the traffic.


ACKNOWLEDGEMENT: Battelle Memorial Institute (BCL-114)

2A 033183
RAILWAY TRACK STRUCTURE FOR HIGH-SPEED TRAIN

Examines the specifications of rail, fastenings, ballast vs. precoated with asphalt ballast, subgrade construction, longitudinal forces present when welded rail used on a bridge, transition curves and PC ties to be used on the New Tokaido Line. Results of tests of the above under high speed conditions are also discussed.

Special Issue
Hoshino, Y (Japanese National Railways) Railway Technical Research Institute Nov. 1961, pp4-14

ACKNOWLEDGEMENT: Battelle Memorial Institute (BCL-137)

2A 033191
RESEARCH ON REASONABLE EMBANKMENT CONSTRUCTION (FIRST PROGRESS REPORT)

Various problems involved in railway fill construction were attacked in many respects. Several methods of soft subsoil stabilization were compared with each other with particular reference to prevention of base failure, acceleration of settlement, and reduction of excessive vibration. Also, subsidence and slope failure of newly built embankments were investigated.

Uezawa, H Watanabe, S Saito, M Miyako, J Muromachi, T (Japanese National Railways) Railway Technical Research Institute Quart Rpt Vol. 9 No. 3, Sept. 1968, pp139-150

ACKNOWLEDGEMENT: Battelle Memorial Institute (BCL-147)

2A 037198
CHEMICAL GROUTING FOR PARIS RAPID TRANSIT TUNNELS

Special problems in the construction of substructure systems for a new rapid transit railroad line in Paris, France. Consolidation of soils was provided by chemical grouting. Grouting technique was also used to consolidate the foundations of a bridge, over the tunnel. Silicate and resin grouting provided the consolidation without recourse to compressed air or dewatering. A classification of modern chemical grouts is given with their limits of injectability. Elaborate grouting procedures prove their efficiency in supplementing or replacing modern tunneling methods.


ACKNOWLEDGEMENT: EI (EI 70 183532) PURCHASE FROM ESL Repr PC, Microfilm

2A 037447
EXPERIMENTAL CONCRETE TRACK-BED AT RADCLIFFE

Using a slab form continuous road making machine. British Railways has laid a trial length of concrete slab foundation on which six kinds of fastenings are being tested. All systems were laid to give rail alignment level and gauge tolerances considered adequate for 200 km/h conventional trains, although the actual speed of trains through Radcliffe will not exceed 110 km/h. Axleloads are up to 25 tons. Acoustic and vibrational measurements will be made, together with general structural and component performance. Load-detection tests are being made in the laboratory on the different fastening assemblies and site measurements will be made under service conditions.
tunneling. The program contains logic to permit the estimate of costs of complicated tunnel-shaft systems. In any estimate, the program will accommodate a large number of values or changes in the values of the factors that affect cost, such as tunnel shape and size, shaft depth, rock characteristics, and construction method. To provide great flexibility, the user of the program is provided with the option of selecting lining type and thickness, profit and overhead margins, and other input data. Suggestions for selecting an appropriate value for these inputs are contained in the report. Complete operating instructions and an illustrative example are presented. (Author)


2A 039233 STUDIES FOR RAIL VEHICLE TRACK STRUCTURES
Conventional (tie-type) and non-conventional rail vehicle track structures were studied, with the restriction that standard gauge and rail-head contour be used. Computer programs were developed and used to analyze track response to both static and dynamic vehicle loading. The models of conventional track were validated by track, and on the Penn-Central high-speed track near Bowie, Maryland. The DOT research cars were used to obtain a series of controlled-speed passes at speeds up to 125 mph. Track response under Metroliner and regular freight traffic was also recorded, both at a joint and away from a joint. The measurements showed the lack of consistency of track characteristics at different locations and at different times, and indicated the computer results to be as accurate as the degree to which track parameters could be defined. The testing presence of individual pressure pulses for individual axles on trucks with wheelbases exceeding 6' was verified by measured subgrade pressures 3' beneath the tie base, at speeds up to 125 mph. A major philosophy in the development of improved track structures was to reduce the magnitude and number of pressure cycles transmitted into the roadbed, with the number of cycles reduced by using beam and slab type rail supports having substantial longitudinal bending stiffness. Following the analysis, performance specifications were written for rail fasteners and the three types of reinforced concrete structures recommended for further evaluation in field tests: cast-in-place slab, cast-in-place twin beams, and precast twin beams. (Author)


2A 039236 ELEVATED STRUCTURES-CONTINUOUS BEAMS
The report addresses the problem of elevated guideway structures employing continuous span beams and spread footing. Various structural materials and components are considered. On the basis of static analysis, practical information about the design requirements was generated. Results are displayed in convenient graphical form for span length up to 160 feet and maximum deflection up to 16 feet. (Author)

Report on High-Speed Ground Transportation Systems Engineering Study.


2A 039240 A SYSTEMS STUDY OF SOFT GROUND TUNNELING
A fundamental investigation of soft-ground tunneling operations was made to identify and assess the potential technical and economic feasibility of new tunneling system concepts. Quantitative estimates were made of costs and rate of advance of different candidate system concepts relative to an assumed set of tunneling conditions. The magnitude of R and D effort required to achieve cost reductions and performance improvements over the 1970 to 1985 time period was estimated. The study concludes that the major constraints to reducing costs and increasing performance in soft ground tunneling over the 1970 to 1985 time period will result from the lack of any effective method for handling bouldery ground and from the lack of a method for rapid installation of the permanent tunnel liner continuously and concurrently with the advance of the face. With a 15-year R and D effort of $35 to $70 million, these problems could be substantially overcome and current tunneling costs could be expected to decrease by 40-65% and advance rates could be expected to increase by a factor of 4 to 8. Cost differences among the more promising alternative system concepts were found to be small relative to the range of uncertainty associated with the cost forecasts. (Author)


2A 039303 THE KANSAS TEST TRACK
The Federal Railroad Administration and the Atchison, Topeka and Santa Fe Railway Company are jointly sponsoring the construction of a test track as part of the railroad's heavy tonnage main line in Kansas. The objective of the project is a determination of the levels of increased train stability provided by 8 specimens of incrementally improved track support. A further objective is a definition of the cost-benefit relationship associated with each augmentation of stability. The various test segments are defined, associated instrumentation requirements are outlined, and progress to date described. (Author)

Prepared in cooperation with The Atchison, Topeka and Santa Fe Railway Co.


2A 039603 TRACK STABILITY ON THE NETHERLANDS RAILWAYS
The science of soil mechanics is of greater importance in Holland than in almost any other country because the bearing capacity of the ground is generally low. For the preliminary exploration of the quality of the soil, two standard field tests are made by specially-trained inspectors. The first involves the measurement at intervals of the resistance to pressure when and as a cone of standard diameter and angle is forced down into the ground. The other is the sampling of the soil taken from borings at different depths; the samples are subsequently dried out and examined. Three track construction and stabilization works were in hand in 1950. A new 6-1/2 mile double line had to be constructed between Rotterdam and Nieuwerkerk, almost entirely over polder land 15 ft. below sea level. The second work was the strengthening of the formation under the double-track main line between Gouda and Oudewater where it is on embankment over peaty subsoil. In the third operation though an electrified and reballedast track was maintained by laying a temporary track at one side complete with overhead conductor.

Railway Gazette Vol. 96 Apr. 1952, p 397, Ref

ACKNOWLEDGMENT: Battelle Memorial Institute (BCL-1255)

2A 039822 QUARTERLY REPORTS: RAILWAY TECHNICAL RESEARCH INSTITUTE, VOLUME 12, NUMBER 3, 1971 Contents: Surface-stratum failure of sandy slope; Horizontal load test of vertical H-type piles; Dynamic response of railway bridge to the passage of
CONSTRUCTION MATERIALS

PAPER 2A

876-SET.
Massachusetts Institute of Technology, (UMTA-MA-06-0008) R72-33, Mar. 1972, 359 pp
Contract DOT-H-753
ACKNOWLEDGMENT: NTIS (PB-220877/5)
PURCHASE FROM: NTIS Repr PC, Microfiche
PB-220877/5, DOTL NTIS

2A 047304
M.I.T. TEST SECTION INSTRUMENTATION. MASSACHUSETTS BAY TRANSPORTATION AUTHORITY, HAYMARKET-NORTH EXTENSION. ADDENDUM TO FINAL PROJECT REPORT
The finite element technique was used to develop a unique computer program for analyzing the performance of braced excavations in test sections of a cut-and-cover subway constructed by the Massachusetts Bay Transportation Authority. Finite element programs permit the analysis of previously unsolvable problems, element type, method of load application, element grid size, and input material properties are a few of the variables which determine the accuracy of simulations using this method. The report examines seven limitations and problems of the latest version of the program, called BRACE 2. A complete printout of the braced excavation analysis is provided. This report was generated as an addendum to the final report of MASS-MTD-2 in which development and application of the program is covered in greater detail.
Paper copy also available from NTIS $8.00/set of 2 reports as PB-220 876-SET.

Massachusetts Institute of Technology, (UMTA-MA-06-0008) R72-33-Add, Mar. 1972, 60 pp
Contract DOT-H-753
ACKNOWLEDGMENT: NTIS (PB-220570/6)
PURCHASE FROM: NTIS Repr PC, Microfiche
PB-220570/6, DOTL NTIS

2A 047278
M.I.T. TEST SECTION INSTRUMENTATION. MASSACHUSETTS BAY TRANSPORTATION AUTHORITY, HAYMARKET-NORTH EXTENSION. FINAL PROJECT REPORT
The finite element technique was used to develop a unique computer program for analyzing the performance of braced excavations in test sections of a cut-and-cover subway constructed by the Massachusetts Bay Transportation Authority. Finite element programs permit the analysis of previously unsolvable problems, element type, method of load application, element grid size, and input material properties are a few of the variables which determine the accuracy of simulations using this method. The report examines seven limitations and problems of the latest version of the program, called BRACE 2. A complete printout of the braced excavation analysis is provided. This report was generated as an addendum to the final report of MASS-MTD-2 in which development and application of the program is covered in greater detail.
Paper copy also available from NTIS $8.00/set of 2 reports as PB-220 876-SET.

Massachusetts Institute of Technology, (UMTA-MA-06-0008) R72-33, Mar. 1972, 359 pp
Contract DOT-H-753
ACKNOWLEDGMENT: NTIS (PB-220877/5)
PURCHASE FROM: NTIS Repr PC, Microfiche
PB-220877/5, DOTL NTIS

2A 047277
M.I.T. TEST SECTION INSTRUMENTATION. MASSACHUSETTS BAY TRANSPORTATION AUTHORITY, HAYMARKET-NORTH EXTENSION. FINAL PROJECT REPORT
Three objectives of the research were to: (1) develop a method for analyzing braced excavations based on the principles of soil mechanics and the finite element technique, (2) provide insight into the undrained behavior of braced excavations in clay, and (3) predict the performance of two instrumented sections of a braced excavation. The demonstration was undertaken in a section of cut-and-cover subway constructed by the Massachusetts Bay Transportation Authority. The research was intended to illuminate design and engineering considerations with reference to load factors applied to brace sheeting, the transfer of loads to the bracing system, ground movements and changes in water hydrology due to construction, and other questions. The finite element technique was used to develop a unique computer program for predicting movements in the soil mass and the retaining wall, stresses on the wall, and loads in the struts. Appendix material includes a user's guide for future applications of the BRACE program.
Paper copy also available from NTIS $8.00/set of 2 reports as PB-220

2A 048007
STEEL CASTINGS IN RAILWAY ENGINEERING
Review of developments in the use of steel castings in railway construction in the United States and Great Britain. The way in which casting processes fulfilled a very necessary role during the development of advanced railroad products is explained.

ACKNOWLEDGMENT: EI (EI 72 079915)
PURCHASE FROM: ESI Repr PC, Microfilm

2A 052480
SERVICE TESTS OF SOLID AND MANGANESE STEEL INSERT CROSSINGS SUPPORTED BY STEEL T-BEAMS AND LONGITUDINAL TIMBERS
The purpose of this investigation was to develop an integrally welded steel T-beam type of frog support for crossings to reduce the flexural stresses in the castings and to determine its practicality under actual use in a service
test. Two steel T-beam cross section supports imbedded in asphalt bound crushed rock ballast were compared to two sections having longitudinally framed crossing timbers and crushed rock ballast. One of each of the two crossings in each group was a reversible manganese-insert type, and the other a solid manganese type. It is concluded that the T-beam support was strong enough to support the crossing. The steel substructure was moderately beneficial in reducing the extent of flangeway cracks in the manganese-insert type of crossing. The solid manganese crossing with steel support developed more flangeway cracks than the solid manganese supported by crossing timbers. A vertical lip welded along the edge of the T-beam flanges would greatly facilitate the retaining of the ballast under the steel plate. The plan of having the lip on the edges of the T-beams flange with graded 3/4 in. minimum stone ballast and vibratory tamping appears to be the most practical. A greatly improved design of the clamping arrangement must be provided in order to have the steel substructure and the crossing flex function as a unit.

AREA Bulletin Proceeding Vol. 57 1956, pp 689-696, 1 Fig. 2 Phot
ACKNOWLEDGMENT: AAR
PURCHASE FROM: AREA Repr PC

2A 052449
SERVICE TESTS ON CROSSINGS
Service tests of crossings were reported. A shot peened casting installed in a test corner of a crossing showed that the depth hardened running surfaces had not worn down to fit the average wheel tread three months after installation. An inspection of four crossings using manganese insert and solid manganese supported on structural steel substructure and longitudinal timbers showed that all crossings were slightly out of line in the east and west direction, and the movement had been with the traffic on the north and south tracks. The crossings were in good condition except for some batter on the castings. A new installation of a solid manganese crossing on a structural steel T-beam substructure of revised design was described. Continuing tests of crossing frog bolt tension was discussed. The installation of a test crossing on a main line location where high speed operation prevails at Warsaw, Indiana was described.

AREA Bulletin Proceeding Vol. 51 1950, pp 653-660, 1 Fig. 7 Phot
ACKNOWLEDGMENT: AAR
PURCHASE FROM: AREA Repr PC

2A 057873
EXPERIMENTAL TESTS ON VIBRATION-PROOF TRACKS AND THEIR EFFECTS
To minimize vibrations and noise from subway operation under a primarily residential area, a new line incorporated test sections of rubber mats under crushed-stone ballast, neoprene strips in a cast concrete roadway, and vibration-proof asphalt concrete under crushed stone. The mats proved most effective but would invite greater settling of the track, complicating maintenance. The concrete slab, while more expensive, would minimize maintenance but would be costly to restore once performance had deteriorated. The vibration-proof asphalt concrete was not effective. Also available through Japan Railway Civil Engineering Association.

Fujiwara, T Nakamura, S (Teito Rapid Transit Authority, Japan) Permanent Way Vol. 15 No. 3, No. 56, pp 20-28
ACKNOWLEDGMENT: Permanent Way
PURCHASE FROM: ESL Repr. PC, Microfilm

2A 080071
RECENT RESULTS IN FRENCH RESEARCH ON REINFORCED EARTH
The fundamental mechanism of reinforced earth is based on friction between earth and reinforcements. Points of maximum tension in the reinforcements separate two zones: an active zone close to the face of the structure and a resistance zone analogous to the anchoring zone in the case of a tie rod. The influence of the fine fraction of the fill on the friction between earth and reinforcements has been studied in laboratory tests on samples of sand and powdered clay mixtures. Calculation methods of friction forces in the reinforcements are presented. A comparison is made between theoretical and experimental values for reinforced earth walls with and without surcharge (full-scale experiment, two-dimensional or three-dimensional models). A method based on the elastoplasticity theory is formulated for reinforced earth foundation rafts.

ACKNOWLEDGMENT: ASCE Journal of the Construction Division
PURCHASE FROM: ESL Repr. PC, Microfilm

2A 080378
FIRE-PROOF BUILDING MATERIALS [Materiales de Construccion Censado el Fuego]
This article deals with the problem of the combustibility of the more common building materials: wood, concrete, plastics, textiles, etc., and indicates the treatment these materials must undergo to become effectively non-inflammable. A chapter discusses national and international standards for testing materials which are to be used for delaying combustion or keeping flames down. [Spanish]

Tobio, J Informes de La Construccion No. 243, Aug. 1972, pp 49-63, 10 Fig., 4 Tab.
ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 206572)

2A 080382
ASPHALT IN ROAD CONSTRUCTION AND HYDRAULIC ENGINEERING [Asfalt i Wegom Waterhuw]
This book is intended as a manual for polytechnic schools as well as for road-building and asphalt technicians. It includes chapters on road structure, materials, mixtures, asphalt mixing plants, construction of bituminous pavements, testing and control, pavement design, pavement structures, contract prescriptions, and various applications of bituminous materials. A list of references, acknowledgement of illustrations and an index are appended. [Dutch]

Vereniging Voor Bitumineuze Werken Textbook 1973, 219 pp, 81 Fig., 31 Tab., 42 Phot., 17 Ref.
ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 207240)

2A 080562
COMPARISON BETWEEN LIGHTWEIGHT AGGREGATE CONCRETE AND CONVENTIONAL CONCRETE IN CONCRETE BRIDGE CONSTRUCTION, ENGINEERING AND ECONOMIC ASPECTS [Techniek-Ekonomisch Jassencertal Mellen Bettamboor Ufoeroida I Laettheballastog och Konventionell Betong]
A STUDY IS MADE OF THE PRICE ANALYSIS AND ECONOMIC ASPECTS OF SWEDISH BRIDGE PROJECTS IN ORDER TO FORM AN ESTIMATE OF THE COMPETITIVE NATURE OF THE MATERIAL USED: LIGHT-WEIGHT AGGREGATE CONCRETE. FIRST IT IS NECESSARY TO EXAMINE THE RELEVANT REGULATIONS AND STANDARD SPECIFICATIONS, DESIGN RULES, ETC., FOR STRUCTURAL MEMBERS PROVIDED WITH NON-PRESTRESSED REINFORCEMENT. THE SAME HAS BEEN STANDARDIZED IN SWEDEN. IN THE CASE OF THE PRESTRESSED CONCRETE, THE MOST OBVIOUS DRAWBACK IS THE EFFECT OF THE INCREASED CREEP AND SHRINKAGE LOSSES. A STUDY OF THE FORMWORK COSTS FOR TWO SIGNIFICANT BRIDGES INDICATED THAT THE CORRESPONDING SAVINGS RANGE FROM 7.30 TO 26.50 SWEDISH CROWNS PER CUBIC METRE OF CONCRETE FOR THE LAKE ALBYSSJOEN BRIDGE, WHICH IS AN UNDERGROUND RAILWAY BRIDGE SOUTH OF STOCKHOLM, THE TOTAL SAVING VARIES FROM 49 TO 84 CROWNS PER CUBIC METRE OF CONCRETE ACCORDING TO THE ASSUMPTIONS WHICH CONCERN THE FORMWORK EQUIPMENT. FOR THE ROAD BRIDGE AT FRESCATI IN THE NORTH PART OF STOCKHOLM, THE SAVING ESTIMATED IN THE SAME WAY AMOUNTS TO APPROXIMATELY 34 CROWNS PER CUBIC METRE OF CONCRETE DUE TO THE FOLLOWING FACTORS: (1) FOUNDATIONS ON PILES OF GREAT OR MEDIUM LENGTH, (2) HEAVY SUPERSTRUCTURE, THAT IS THE DEAD LOAD BEING EQUAL TO AT LEAST 50 PER CENT OF THE DESIGN LOADS, AND (3) FORMWORK BRIDGING OVER RELATIVELY GREAT LENGTHS OF SPAN, E.G. OVER HIGHWAYS OR RAILWAYS. [Swedish]
CONSTRUCTION MATERIALS

Alkbrant, F. *Nordisk Betong* Vol. 130 No. 11, Nov. 1974, pp 23-26 4, Fig.

**ACKNOWLEDGMENT:** Transport and Road Research Laboratory (IRRD 207246)

2A 080574

**MATERIAL TESTS FOR ROAD CONSTRUCTION WORK AND THEIR INFLUENCE ON THE QUALITY OF CONSTRUCTION ATTAINED** [Materialprüfungen bei Strassenbauarbeiten und ihr Einfluss auf die Erreichte Ausführungsqualität]

Apart from intensive supervision by the contractor as part of quality testing, continuous control examinations are considered necessary so that direct influence on the quality of the construction can be attained. The extensive control test results available at the Munich Materials Testing Centre were evaluated statistically. Two important characteristic features were taken from the present programme of determining quality characteristics, and the changes in the features during the last four years are illustrated graphically. From this, some interesting conclusions can be drawn: it was for example established that the chippings content of Guissaphalt for urban road construction could be regarded as being optimum at 47 percent of weight, because of processing. Moreover, it was regular checks, significantly during the construction period as a result of [German]

Spaeth, M. *Strasse und Autobahn* Vol. 23 No. 8, Aug. 1972, pp 415-417, 2 Fig., 1 Ref.

**ACKNOWLEDGMENT:** Transport and Road Research Laboratory (IRRD 300691)

2A 080709

**RECENT DEVELOPMENTS IN THE CONSTRUCTION OF CONCRETE ROADS** [Neure Entwicklungen beim bauen von Betonfahrbahnen]

Hitherto Concrete Surfacing has been regarded as having two functions: to act as a carriage way and to transfer the loads usually not taken into account. Tests carried out in the USA and theoretical investigations show that the stress on the concrete surfacing is more or less dissipated depending on the stiffness and the bonding action between the surfacing and the stabilized layer. The inclusion of stabilized layers into the supporting system leads to new methods of constructing concrete roads, enabling better adaptation and stability conditions to be achieved by means of partial or complete elimination of the frost blanket, particularly high bearing capacity can be brought about by the use of a thin, continuously reinforced concrete surfacing, where the bond between the surfacing and the cement-stabilized layer is even guaranteed after repeated loading and the effects of temperature. [German]

Eisemann, J (Technical University of Munich, West Germany) *Zement und Beton* pp 17-25, 4 Fig., 3 Tab., 4 Phot., 12 Ref.

**ACKNOWLEDGMENT:** Transport and Road Research Laboratory (IRRD 301109)

2A 080711

**THE CONSTRUCTION OF LIGHTLY TRAFFICKED ROADS IN FRAME**

Lightly trafficked roads represent a substantial proportion of the road network in France. Lower standards than those applicable to heavily trafficked roads should be acceptable for these roads. The present design of roads carrying between 200 and 700 vehicles a day in France requires the use of the same high quality materials as for more heavily trafficked roads except that surface dressings are permitted for the weaving course. These requirements are probably too stringent because the percentage of heavy vehicles in the total volume of traffic is smaller for lightly trafficked roads than for more heavily trafficked roads. Results from the AASHO Road Test are used to show that a reduced thickness of bitumen-bound bases is adequate for lightly trafficked roads. For these roads, local materials which are unsuitable for heavily trafficked roads are recommended to reduce construction costs. Practical examples of the use of local materials in France are given; in particular, hot sand mix made with hard bitumen and emulsion stabilized gravel are being increasingly employed for this purpose. Flexible construction is preferred because relatively thin layers are adequate for these roads and semi-rigid construction is therefore uneconomic.


**ACKNOWLEDGMENT:** Transport and Road Research Laboratory (IRRD 207891)

2A 080716

**QUALITY REQUIREMENTS FOR AGGREGATES IN SOUTH AFRICA**

This paper discusses a draft new specification for aggregates that has been prepared by the South African Bureau of Standards (SABS) to supersede two earlier ones on aggregate for roads and aggregate for concrete, respectively. Entitled "Aggregates from Natural Sources" it covers (A) fine and coarse aggregate for concrete, (B) five aggregate for bituminous mixtures, (C) five aggregate for slurry seals, (D) single-sized coarse aggregate for road construction and (E) aggregate for base-course material. The author gives an outline of the scope and content of the draft specification in which tables have been used as much as possible to show the requirements for different purposes. He considers that the unification of the grading and flakiness requirements of coarse aggregate for concrete and road construction will ease production problems. The main document is to give details of the tests required by the specification itself, other tests are to form appendices. Reference is made by the author to the production of aggregates under the sabs mark scheme which is made possible by the comprehensive testing facilities of the bureau. The mark indicates that the bureau is satisfied that an aggregate complies with the relevant specification and that adequate quality control is exercised in its production.


**ACKNOWLEDGMENT:** Transport and Road Research Laboratory (IRRD 207889)

2A 080830

**EVALUATION OF STRESS CELL PERFORMANCE**

Described in this paper are the design and construction of a series of low compliance total stress cells and their performance in the laboratory and in the field. Experimental data from laboratory calibration tests are evaluated by means of several different finite element models, and the results indicate that, within the limits investigated, neither the thickness-to-diameter ratio of these cells nor the relative stiffness of the soil and the cell has much influence on the measured response, but regions of loose or dense soil in the immediate vicinity of the cells do affect their output. Limited evidence suggests that these cells can also measure horizontal stresses quite reliably. The qualitative field performance of 35 cells within two soil-pipe installations and the quantitative field performance of three free field cells suggest rather strongly that cells are relatively insensitive to temperature variations and are capable of measuring accurately the static stresses acting normal to their faces. /ASCE/

Krizek, RJ (Northwestern University, Evanston); Farzin, MH (Stone and Webster Engineering Corporation); Wissa, AEZ (Geotechnical International Incorporated); Martin, RT (Massachusetts Institute of Technology) *ASCE Journal of the Geotechnical Engineering Div* Vol. 100 No. GT12, Proc. Paper 11030, Dec. 1974, pp 1275-95, 8 Fig., 1 Tab., 10 Ref.

2A 080850

**THE WORK OF THE STANDARDS COMMITTEE ON MASSIVE CONSTRUCTION AND THE EUROPEAN COMMITTEE ON CONCRETE** (De Arbeiten des Fachnormenausschusses Massivbau und des Europaischen Betonausschusses (CEB))

The author describes the work being carried out by the standards committee on massive construction, and by groups working on highway bridges, prestressed concrete and standards is discussed. Finally a description is given of the work of the European Committee on concrete. /TRRL/ [German]

Soretz, Z. *Zement und Beton* Dec. 1972, pp 1-8, 3 Fig., 9 Ref.

**ACKNOWLEDGMENT:** Transport and Road Research Laboratory (IRRD 301119)
2A 080925
HIGHWAY CONSTRUCTION USAGE FACTORS FOR AGGREGATES
In an effort to aid commercial pit and quarry operators as well as highway contractors, engineers and economists in planning highway construction programs, tables are presented of usage factors for aggregates. Aggregates constitute between 20 and 30 percent of the cost of all materials and supplies and between 9 and 13 percent of the total construction cost (excluding the cost of right-of-way and engineering). The data employed in the development of the factors are quantities of the major materials used and the factors are quantities of the major materials used and construction projects on the Federal-aid Primary System. The factors are quotients obtained when total quantities are divided by corresponding totals in millions of dollars of final construction costs. These factors may be applied to any program of highway construction expenditures to obtain estimated requirements. Percentage distribution of cost for aggregate are tabulated, as well as the estimated construction expenditures for all public highways. Estimated national average secondary road factors are also presented.

Federal Highway Administration 1974, 5 pp, Tabs.

2A 080926
HIGHWAY CONSTRUCTION USAGE FACTORS FOR LUMBER TIMBER PILING, PETROLEUM PRODUCTS, AND EXPLOSIVES
The report which provides tabulated data on usage factors, is intended to aid producers, manufacturers and suppliers of lumber, timber piling, petroleum products and explosives. The usage factors, in terms of units of the various materials per million dollars of construction cost, when multiplied by the number of millions of dollars for either Federal-aid highway construction programs, will give reasonably accurate estimates of material requirements. Percentage distributions of cost for lumber, timber piling, petroleum products and explosives are tabulated, as well as estimated construction costs for all public highways. The estimated national average secondary road factors are also presented.

Federal Highway Administration 1974, 5 pp, Tabs.

2A 080927
HIGHWAY CONSTRUCTION USAGE FACTORS FOR STEEL
Tables are presented of usage factors that are intended to aid mills, fabricators, and related industries as well as highway contractors, engineers, and economists in planning to meet the needs of highway construction programs. The usage factors, in terms of units of the various materials per million dollars of construction cost when multiplied by the number of millions of dollars for either Federal-aid or non-Federal-aid highway construction program, will result in reasonably accurate estimates of material requirements. Steel constitutes between 16 and 29 percent of the cost of all materials and supplies, and between 7 and 13 percent of the total construction cost (excluding the costs of right-of-way and engineering). The percentage distributions of costs for various steel classifications are presented, as well as the estimated construction expenditures for all public highways. The estimated national average secondary road factors are tabulated.

Federal Highway Administration 1974, 5 pp, Tabs.

2A 080921
THE EFFECTS OF VARIATIONS IN HEAT TREATMENT ON THE STRENGTH AND TOUGHNESS OF RAIL STEEL
In an effort to develop stronger and tougher rail material, a research program is outlined which was designed to investigate the fundamental metallurgical parameters involved in rail design and manufacture. The first area of study reported here is concerned with the effects of heat treatment variations on mechanical properties of steel, and was planned to determine the feasibility of developing a rail with improved mechanical properties by making only minor variations in the conventional method of processing. A systematic heat-treating schedule was developed to isolate as well as possible, the effects of the different heat-treating parameters. The two main variables studied were austenization temperature and isothermal transformation temperature. Experimentally, both tensile and impact tests were performed on each of the 14 different heat-treatment programs. Preliminary results are discussed, and the general effects are defined and evaluated.

Hyzak, JM (Carnegie-Mellon University); Stone, DM (Association of American Railroads); Bernstein, IM (Carnegie-Mellon University) AREA Bulletin Vol. 75 No. 468, 75-648-8, June 1974, pp 776-778, 2 Fig.

2A 081016
BIBLIOGRAPHY OF TIMBER BRIDGE DESIGN
Properly designed and constructed timber bridges offer one possible solution to the problem of replacing and upgrading bridge structures on secondary and county highways. For each document on this comprehensive list of design literature on timber highway bridges, a brief abstract is provided to aid the designer in selecting appropriate reference information for a specific design problem. It requires less energy to process timber to a usable construction material than other conventional construction materials.


2A 081100
BUILDING TIME HALVED ON KIMBERLEY BY-PASS
This article describes the completion of the Kimberley-Eastwood By-pass 16 months ahead of schedule, despite difficult soil conditions and derelict mine workings. The 6.4 km dual carriageway runs from Langley Mill to the mi at Nuthall. Two soil surveys indicated that the line of the bypass was underlain by faulted argillaceous and arenaceous strata of lower and middle coal measures, marl, limestone and sandstone. Coal seams, which had been worked, were present. CBR values of 6% for argillaceous strata and 30% for sandstone were recommended for road design purposes. Seven mine shafts were drilled and grouted and a concrete plug placed at rock head level. The contract included 8 bridges and 3 subways. Two bridges are 3-span reinforced concrete anchor/cantilevered with pre-stressed concrete T-suspended beams. Circular columns for 2 bridges were cast on-site from one reinforced glass-fibre mould other bridges include a 2-span bridge with a 15 degree skew and a footbridge with a 47.0 parabolic arch. The subways are in-situ reinforced concrete U-sections with suspended deck slabs.


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 210191)

2A 081148
THE GLION TUNNELS ON THE LEMAN MOTORWAY [Les tunnels de glion sur l'autoroute du leman]
The project is outlined and details given of the ventilation, lighting, equipment, and entrance works. Geological and hydrological conditions are outlined together with construction methods used, work progress, incidents on site during construction, strengthening by means of metal centering and cement injection. [French]


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 100120)

2A 081173
SEISMOGRAPH SPEEDS SUBSURFACE INVESTIGATION
The seismograph technique is described where shock waves bounced off bedrock permit rapid reconnaissance and eliminate need for expensive and time consuming proings. The use is detailed of the seismograph system for the determination of the depth of bedrock, the identification of soil types and the detection of interfaces between different soils, the study of highway materials deposits, and the detection of the water table.

Bigelow, N Public Works Vol. 95 No. 9, Sept. 1964, pp 96-99, 2 Tab., 2 Phot.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 100120)

2A 081265
STABILITY OF RIBBED PLATES IN THE CONSTRUCTION OF RAILWAY VEHICLES [Zur Stabilitat gesickelter Bleche im Schienenfahrzeugbau]
In the case of plates with tailed-in ends, compressed along the ribbing, coupled elongations are produced as a result of bending deformation. These
additional compression stresses are superposed upon the primary buckling constraints. For this reason, the elastic limit can be exceeded locally in ribbed walls, more especially in the intervention zone of the transversal forces. Other origins of this phenomenon can be: lack of precision in assembling, pre-existing deformations in the ribbed plates, residual welding tensions and the very asymmetrical form of the ribbing. Tests have been carried out in order to determine the bending stress. [German]


ACKNOWLEDGMENT: International Railway Documentation, Selection of (UIC Serial No. 1188)
PURCHASE FROM: International Union of Railways, BD 14 rue Jean Rey, 75015 Paris, France Repr. PC

2A 081346
USE OF LATERITIC SOILS FOR ROAD CONSTRUCTION IN NORTH DAHOMEY

Simon, AB Giesecke, J (Institut fuer Erd-und Grundbau, West Germany); Bidlo, G Engineering Geology Vol. 7 No. 3, Dec. 1973, pp 197-218, 17 Fig., 3 Tab., 8 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 210194)

2A 081376
THE USE OF FLY ASH, AN INDUSTRIAL BY-PRODUCT, FOR THE CONSTRUCTION OF A HIGHWAY EMBANKMENT
The typical composition range of flyash is given, as well as the standard laboratory density of the flyash used on the embankment construction project. The design criteria and site conditions are outlined and details are given of the construction. Research in this area is briefly reviewed and conclusions based on experience are set forth. The age hardening characteristic of the material is expected to give a strong, lightweight, stable fill. When the moisture content is controlled within a range of 20-25 percent, the material is workable and stable provided appropriate construction methods are utilized. Excellent compaction and penetrometric results were obtained when the flyash was compacted at a moisture content of 2-5 percent below optimum. Flyash may prove useful in the bridging of weak soils.

Bacon, LD (Illinois Department of Transportation) Highway Focus Vol. 6 No. 3, July 1974, pp 1-14, 3 Fig., 9 Phot., 6 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 210194)

2A 081397
TEXAS HIGHWAY DEPARTMENT PAVEMENT MANAGEMENT SYSTEM
This paper describes a conceptual version of a pavement management system to assist in making pavement decisions that will result in users getting better services for their expenditures. These decisions are made about programming, design, constructing, and maintaining pavements. A description is given of the conceptual system and the present working system.

Brown, JL (Texas Highway Department) Transportation Research Record No. 512, 1974, pp 16-20, 15 Ref.

PURCHASE FROM: TRB Publications Off Orig. PC

2A 081420
INTERNATIONAL RECOMMENDATIONS FOR THE DESIGN AND CONSTRUCTION OF CONCRETE STRUCTURES. PRINCIPLES AND RECOMMENDATIONS
These recommendations cover the whole field of the design and construction of reinforced concrete and prestressed concrete engineering structures. The work is divided into four parts: Principles and Recommendations, which are contained in this volume, and Supplements and Appendices which will be published separately.

Presented at Federation Internationale de la Precontrainte Sixth Congress, Prague, Czechoslovakia.

Cement and Concrete Association 1970, 89 pp., Figs., Tabs.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 58731)

2A 081553
WIRAND FIBRE-REINFORCED CONCRETE--A NEW CONSTRUCTION MATERIAL [Fibremerad WIRAND-beton--ett nytt konstruktionsmaterial]
The article is based upon the literature describing the experimental work done by J.P. Roumalki and researchers at the Columbus Laboratories of the Battelle Memorial Institute under the guidance of the Battelle Development Corporation, Columbus, Ohio, which led to the international patent for WIRAND concrete. This concrete contains up to 3 percent in volume of 0.25-0.40 mm steel fibre 25 mm long. The size of the largest aggregate is 10 mm. The material is characterized by a high bending tensile strength of 150 kg/sq. cm maximum. This concrete can be used especially for shell structures, thin plates-road and runway surfacings, bridge decks, beams, marine constructions, etc. [Swedish]

Lankard, RR Dickerson, RF Cement och Betong Vol. 46 No. 4, Nov. 1971, pp 590-515, 1 Fig., 3 Tab., 6 Phot., 2 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 55811)

2A 081558
CONSTRUCTION AND LANDSCAPE PANEL
The engineering-construction aspects are discussed of the problems and advances encountered in land reclamation. Attention is focussed on the use of one method (vertical sand drains) of foundation treatment to deal with a section of the Washington, D.C. Circumferential Highway (Interstate 495) passing over swampy area. Methods of treatment for soft foundations are reviewed, and the consolidation behavior of soils is discussed. Details are given of the specific treatment in which sand drains consisting of columns of clean sand are installed at specifically designed spacings through the treatment area. The incorporation into the system of stabilizing toe berms, the rate of construction of the overload embankment, and the use of construction control devices are detailed. The basic construction sequence is discussed. Details are given of the placement of a working platform, the use of windrows, the installation of piezometers, and the placement of the overload surcharge beam. The evaluation of the treatment is discussed.

Raysa, EP (Virginia Department of Highways and Transportation); Furgielle, AW Virginia Highway Conference Nov. 1963, pp 27-44, 6 Fig.
CONSTRUCTION MATERIALS

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 209532)

2A 081685

VERY HIGH-FREQUENCY HUMIDITY METER FOR CONSTRUCTION MATERIALS [Sruch-Vlagomere Streitel'Nykh Materialov.]


Makarov, AN Streitel' Nye Materialy No. 5, May 1972, pp 32-4, 4 Fig., 1 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 100497)

2A 081742

CONSTRUCTION OF BITUMINOUS PAVEMENTS WITH A DEGREE OF EVENNESS AND A MINIMUM QUANTITY OF MATERIAL

Owing to the requirement that paved surfaces should be smooth and even, and still have a specified minimum thickness, new plans are constantly being devised to improve the surface quality of newly constructed surfacing. In this paper the problem is discussed with reference to the construction of bituminous overlays on existing airport pavements. It is shown how to deviate from a theoretically perfect plane to a plane deformed within certain tolerances without decreasing the serviceability. Thus the quantity of material required may be considerably reduced with corresponding financial benefits. Particulars of the method with respect to surveying, tolerances, the computer program, plant and construction techniques are given. /TRRL/

Rauth, PL Hugo Conference on Asphalt Pavements for So Africa Proc Vol. 1 Session X, July 1969, 13 pp. 5 Fig., 8 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 58381)

2A 081743

ASPHALT CONSTRUCTION TECHNIQUES

A detailed description is given of the techniques required for asphalt construction with particular reference to Durban's Southern Freeway. The advantages of this type of construction for South African conditions are also considered and the contractor's problems discussed. /TRRL/

Conference held on July 28-Aug. 1, 1969.


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 53372)

2A 081769

MODERN FLEXIBLE ROAD CONSTRUCTION

This book covers the design and construction of flexible pavements under the chapter headings of structural elements of flexible roads, the application of elastic theory to flexible pavements, design of flexible pavements according to Road Note 29 (third edition), materials used in the construction of flexible roads, prestressed bituminous materials, dense bituminous road bases, base course materials, wearing course materials, construction of flexible pavements and characteristics of flexible roads. /IRRD/

Asphalt and Coated Macadam Association 1971, 82 pp. 3 Fig., 19 Tab., 11 Phot.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 61781)

2A 081800

MOTORWAYS IN NORTHERN IRELAND

There are at the present time 56 miles of motorway completed and opened to traffic in Northern Ireland, a further 7 miles under construction and a further 47 miles at the project stage. These motorways are similar to those in Great Britain except for the mound barrier on the central reservation, special curbing along each side of the pavement, and a continuous 4.5 ft-wide paved strip next to the fast lane of the pavement in the central reservation. Mention is made of the predominance of boulder clay and peat and construction methods used. Details are given of aggregates and materials utilized, concrete bridge design and construction, motorway lighting systems, and preliminary survey works. Costs are quoted. /IRRD/

This article is based on a paper presented at the Institution of Highway Engineers National Conference- Northern Ireland, July 5-7, 1971.

Allen, GWH Roads and Road Construction Vol. 49 No. 584, Aug. 1971, pp 278-281, 1 Fig., 1 Tab., 1 Phot.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 61955)

2A 081809

ROAD CONSTRUCTION IN THE CARIBBEAN

Details are given of the 14.1-mile main highway under construction between Cheesewars and San Fernando in Trinidad. It will provide two 24-ft pavements, 15 steel and reinforced concrete bridges and four underpasses, and seven miles of frontage roads. The works include earthworks, drainage, sub-base, bridges and culverts for both pavements, and the gravel base and asphaltic concrete for one pavements only. Mention is made of the soil along the route, earthmoving and compaction equipment. /IRRD/


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 42489)

2A 081820

STRUCTURAL ANALYSIS OF STEAM-HARDENED CONSTRUCTION MATERIALS BY MEANS OF THE SCREEN ELECTRON MICROSCOPE [Gesetzeuntersuchungen an dampfgehaerteten Baustoffen mit Hilfe des Raster-Elektronenmikroskops]

The operation of the microscope is described, and examples of application to the structural analysis of steam-hardened construction materials containing calcium silicate are given. /IRRD/ [German]


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 53372)

2A 081847

MILTON KEYNES NEW CITY - THE ROAD TO SUCCESS

The development of the new town of Milton Keynes provided an opportunity to plan a road network designed to serve the new population and industry in the best possible way. A rectangular grid road system with road spacings at approximately 1 km intervals was adopted. The occurrence of the River Ouzel, the Grand Union Canal (which is elevated above ground level over much of its length), and the main London Midland region railway line formed obstacles for road construction since each required construction of a bridge. This article discusses the soil conditions encountered, cut-and-fill operations, the use of CBR tests for pavement design purposes, and the consideration given to the stability of slopes. The solutions found for runoff problems and problems encountered in obtaining construction materials are also discussed.

James, H Lucey, ME Ground Engineering Vol. 7 No. 6, Nov. 1974, pp 39-42, 2 Fig., 5 Phot.

2A 081886

INTERNATIONAL STATE OF THE STATISTICAL SAFETY THEORY AND PLASTIC THEORY [Internationale S:\cund der statistischen Sicherheitstheorie und der Plastizitaetsstheorie]

The author describes the application of mathematical statistics methods to the design of structures. The first part of the article discusses (1) statistics in the manufacture of construction materials, (2) statistics in design, (3) partial coefficient of safety, and (4) damage frequency. The second part entitled "plastic theory" for statistically indeterminate systems, deals with...
CONSTRUCTION MATERIALS

2A084134

FROST DAMAGE [Frostschäden]
The author differentiates between primary and secondary frost damage and makes a special study of secondary damages, e.g. rupture of the surfacing above joints weakened by water penetration under traffic loads. Several preventive and remedial measures are proposed, and mention is made of the "Criterium-Canagrande" which lists natural construction materials resistant to frost and their source. /IRRD/ [German]

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 53379)

2A 081895

TESTING CONSTRUCTION MATERIALS WITH THE PYCNOMETER [Baustoff-Untersuchungen mit dem Pyknometer]
Details are given on the use of the pycnometer in a number of tests on construction materials. The dimensions of the pycnometer and scale are a function of the characteristics of the materials tested and of the desired accuracy. Fine materials and construction materials such as cement, bitumen, sand and gravel up to a grading of 12 mm, fine asphaltic concrete, and mortar can be studied with a glass pycnometer and a scale having a capacity of 4 kg and accuracy of 0.2 g. For materials of higher grading, a pycnometer preferably made of metal with a capacity of 10 liters and accuracy of 1 g must be utilized. Results can be evaluated by means of simple calculations. The absolute density of the materials and mixed materials tested is used as a basis for the calculations. /IRRD/ [German]

Foth, J Betonwerk und Fertigteile-Technik No. 11, Nov. 1969, pp 667-671, 2 Tab., 2 Phot., 1 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 53396)

2A 082731

PRODUCTION EFFICIENCY STUDY ON LARGE-CAPACITY, RUBBER-TIRED FRONT-END LOADERS
In an effort to determine the capabilities of the machine in loading bank material into off-highway hauling units and to locate the delays associated with the operation, 27 large-capacity, rubber-tired, front-end loader operations were studied on both highway and non-highway construction projects. The loaders ranged in size from 5.5 to 15 cubic yards heaped, and the productive work time averaged 59 percent of the Total Available Work Time (TAWT). Minor delays (gasting less than 15 min) totalled 27 percent of the TAWT, and, minor delays were attributed to major delays. Weather delays were not included. Productive output was more dependent on an adequate payload per loading cycle than on a quick cycle time. Equipment and maintenance repair delays totalled over 65 percent of the major delay time. Minor delay time was largely due to hauling unit shortages at the load site, and the impact of these delays was dependent on the use of this time by the loader operator. Findings of this investigation are summarized. Based on the study, the conclusion is drawn that a greater in-depth evaluation of the loading operation by the contractor is needed to determine to what extent delay time can be decreased, and further evaluation of loader performance can be accomplished with minimum field data and minimum calculations.

Bernard, Da Ferragut, TR Neumann, DL

2A 082750

REPORT OF AGGREGATES AND WASTE MATERIALS WORKING GROUP
This report is concerned with five items: (A) The derivation of technical coefficients (given an an appendix) for estimating the consumption of aggregates by various construction sectors. A table gives estimates of the annual production of different types of aggregate and the amount used for different purposes; (B) determining the consequences of exploiting alternative aggregates to sand and gravel. It is concluded that crushed rock can be used in concrete; light-weight aggregates may also be used if design criteria are more stringent, lower grade and waste materials may be used as road fill and in sub-bases, and that an increase in the cost of aggregate has more effect on the overall cost of roads than of buildings; (C) reviewing test criteria in British Standards and other specifications which, in the light of present knowledge, are not considered to be unly restrictive; (D) surveying waste materials. The current production utilization and amount of stockpiled materials are summarized in a table. The major waste materials are discussed individually and a map shows their distribution. Details are given of an analysis of the social cost of using colloidal soil in road construction; (E) investigation of the part played by the cost of transport on the choice of aggregates. Various forms of transport are discussed including road, rail, water, conveyor belt and pipe-line systems. The report also includes details of a number of recommendations that are made for further research.

Building Research Establishment R&D Rept. No. CP 31/73, 1973, 12 pp, 1 Fig., 5 Tab., 4 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 208026)

2A 082889

GUIDE TO THE SELECTION AND TESTING OF GRAVEL FOR PAVEMENT CONSTRUCTION
This publication which covers the field in general terms, summarizes basic Australian practice in the selection and testing of gravels and soils for pavement construction, and includes references to testing equipment used and details of test procedures. In dealing with specific problems in particular localities, the procedures described may require to be supplemented by investigation and tests of more local application. The factors to be considered in the selection of a gravel give: the type of pavement, position of gravel in pavement, climate, traffic and the use of local materials. The composition of the gravel, grading, the fine aggregate and binder, coarse aggregate and maximum size of aggregate are some of the properties of gravel to be considered. The improvement of sub-standard gravel is also considered. The location and identification of gravel is discussed in detail. Details are given of tests determining quality and the control of quality during construction. Appendices are included which provide information on sampling equipment, general requirements for gravel for road pavements, grading requirements, and field identification procedures for fine-grained soils or fractures.


2A 082901

THE USE OF BY-PRODUCTS IN CONCRETE
This paper evaluates the use of industrial by-products and waste materials for use in construction. The following by-products are included in the evaluation: blast furnace slag, steel slag, colliery spoil, china clay waste, slate waste, waste from coal burning power stations, by-product calcium sulfate, residues from directly incinerated refuse, and several other miscellaneous wastes. The existing knowledge on the present utilisation of these materials as aggregates or cements in concrete is described and future prospects are discussed. For all materials the following stages constitute the technical assessment: (1) determination of physical properties; (2) chemical analysis; (3) mineralogical examination by microscopy and X-ray analysis to identify compounds present; (4) stability tests; (5) use in concrete as aggregate or cement followed by tests of the concrete for strength and durability; (6) assessment of the life of steel reinforcement in the concrete containing the by-product; and (7) determination whether the material can be used directly, or after heat treatment.

Gutt, W
Building Research Establishment CP 53/74, May 1974, 19 pp, 6 Fig., 11 Tab., 35 Ref.
CONSTRUCTION MATERIALS

2A 082906
STANDARD SPECIFICATIONS FOR CONSTRUCTION OF ROADWAY LANES AND BRIDGES ON FEDERAL HIGHWAYS PROJECTS

Specifications are presented for those items of work, materials, and construction methods that are generally applicable to direct Federal highway contracts, and which may also be adapted for use by other highway agencies. This publication, which is dualized in order to familiarize the user with the metric system, is patterned to the extent possible after the AASHTO Guide Specifications for Highway Construction in order to establish a nationwide uniformity and consistency of specifications and construction methods that are generally applicable to direct Federal designed to prevent early obsolescence and controversy in the administration of contracts, and to encourage increased production and decreased costs consistent with high quality work, cover various aspects of general requirements and construction details. Earthwork base courses, bituminous pavements, and rigid pavements are covered in detail, as well as bridge construction, incidental construction and materials.


2A 082908
STATE OF THE ART: PAVEMENTS

An outline is presented of pavement practice in relation to common pavement design, construction and maintenance. Various aspects of the subject are defined and consideration is given to the pavement system, general evaluation of the pavement, types of pavements and their characteristics, and pavements in highway construction. The specifications, which are designed to prevent early obsolescence and controversy in the administration of contracts, and to encourage increased production and decreased costs consistent with high quality work, cover various aspects of general requirements and construction details. Earthwork base courses, bituminous pavements, and rigid pavements are covered in detail, as well as bridge construction, incidental construction and materials.

Smith, AD
National Roads Board, New Zealand Bulletin No. 20, 1974, 72 pp

2A 083122
BS 63: PART 2: 1971 SPECIFICATIONS FOR SINGLE-SIZED ROADSTONE AND CHIPPINGS. PART 2. METRIC UNITS


TRRL

2A 083169
ABOUT PENETRATION INDICES OF ARGENTINA ASPHALTIC CEMENTS [Sobre el indice de penetracion de los cementos asfalticos Argentinos]

The object of this paper consists in verifying if asphaltic cements used in Argentina respond to the standards used by Pfeiffer and Van Doormal in their formula for the penetration index, established on the base of the properties of asphalts used in 1936. Evolution in industrial processes and the introduction of crudes of other origins after that date, and the standards IRAM-6694-(1957) fixing 2.0 and 0.5 as pi limiting values for Argentine asphalts for road construction vindicate this effort. The results show the need for a modification of the formula to preserve the meaning of the pi in the asphalts under consideration, i.e., for the index to be a convenient statement of thermal susceptibility to moderate temperature. On the other part the indices for each type and origin of asphalt in the investigation show no relation with the temperature needed to attain the necessary viscosity range for mixing, laying, and densification in conventional hot mixtures.

Labatorio de Investigaciones Vielas, Argentina Conf Paper 1971, pp 442-453, 3 Fig., 3 Tab., 3 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 207949)

2A 083268
FUEL USAGE IN ROAD CONSTRUCTION

THIS ARTICLE GIVES A GUIDE TO FUEL REQUIREMENTS (DIESEL FUEL AND PETROL) FOR VARIOUS ASPECTS OF ROAD CONSTRUCTION. BASED ON DATA SUBMITTED BY BETWEEN 400 AND 500 HIGHWAY CONTRACTORS TO THE US TRANSPORTATION RESEARCH BOARD. THE INFORMATION IS SET OUT IN A TABLE AND THE GREATER PART OF THE ARTICLE CONSISTS OF EXPLANATORY NOTES. FUEL REQUIREMENTS ARE GIVEN SEPARATELY FOR DIESEL FUEL AND PETROL, AND THREE FIGURES ARE GIVEN TO REPRESENT LOW, AVERAGE AND HIGH CONSUMPTION RESPECTIVELY. THE FIGURE BEING SELECTED ACCORDING TO SITE CONDITIONS ITEMS OF WORK FOR WHICH FIGURES ARE GIVEN ARE EXCAVATION (EARTH AND ROCK), AGGREGATES (ON SITE PRODUCTION AND IMPORTED), ASPHALT CONCRETE (PRODUCTION, HAUL AND PLACEMENT), PORTLAND CEMENT CONCRETE (PRODUCTION, HAUL AND PLACEMENT), STRUCTURES, AND MISCELLANEOUS. THE EXPLANATORY NOTES INCLUDE VARIATIONS WHICH APPLY UNDER PARTICULAR CIRCUMSTANCES SUCH AS UNDER LONG HAUL CONDITIONS, NEED FOR QUARRYING OPERATIONS SUCH AS DRILLING AND SLASTING AND THE USE OF NATURAL GAS FOR DRYING. THE FACTORS FOR STRUCTURES AND MISCELLANEOUS ARE BASED ON CONSUMPTION PER UNIT COST.


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 211526)

2A 083307
CODE OF PRACTICE FOR THE STRUCTURAL USE OF CONCRETE. PART 1. DESIGN, MATERIALS AND WORKMANSHIP. PART 2. DESIGN CHARTS FOR SINGLY REINFORCED BEAMS, DOUBLY REINFORCED BEAMS AND RECTANGULAR COLUMNS. PART 3. DESIGN CHARTS FOR CIRCULAR COLUMNS AND PRESTRESSED BEAMS.

Part 1 of this code of practice is presented under the following headings:- 1. General. 2. Design: objectives and general recommendations. 3. Design and detailing: reinforced concrete. 4. Design and detailing: prestressed concrete. 5. Design and detailing: precast and plain concrete construction. 6. Specification and workmanship: concrete. 7. Specification and workmanship: reinforcement. 8. Inspection and testing of structures and components. 9. Fire resistance. 11. Autoclaved aerated concrete. 12. High aluyna cement concrete. The design charts contained in Parts 2 and 3 of the code are intended to be used as an aid when analysing the cross-section of a member at the ultimate limit state. The charts are based on the assumptions laid down in Part 1, use being made of the parabolic-rectangular stress block
CONSTRUCTION MATERIALS

This article describes methods by which farming undertakings can improve the construction of rural roads by the use of agricultural machinery. The process basically is the cement stabilization of earth roads, and details of mix design and pavement thickness are given. Some recommendations are included, useful to farmers in the application of their own machinery to this purpose. The article is based on the construction of a rural road of soil-cement in Toledo, Spain, where apart from existing farm machinery available on the spot, only a vibrating roller (towed by a farm tractor) was used. [Italian, French/Italian]


ACKNOWLEDGMENT, Transport and Road Research Laboratory (IRRD 205541)

2A 083306
THE CONSTRUCTION OF RURAL ROADS BY THE USE OF AGRICULTURAL EQUIPMENT [Costruzione di Strade Rurali Con Impiego di Mezzi Meccanici di Tipo Agricolo]

This article describes methods by which farming undertakings can improve and build their own service roads by the use of agricultural machinery. The process basically is the cement stabilization of earth roads, and details of mix design and pavement thickness are given. Some recommendations are included, useful to farmers in the application of their own machinery to this purpose. The article is based on the construction of a rural road of soil-cement in Toledo, Spain, where apart from existing farm machinery available on the spot, only a vibrating roller (towed by a farm tractor) was used. [Italian, French/Italian]


ACKNOWLEDGMENT, Transport and Road Research Laboratory (IRRD 205541)

2A 083433
IMPROVEMENTS RELATING TO APPARATUS FOR TRANSPORTING LOADS

Details are given of an invention to transport loads on difficult terrain by means of inflatable elements arranged laterally. The elements are tubes of flexible material arranged to collapse when deflated so that their lower walls are raised clear of the ground when not in use. The apparatus creates a series of waves, caused by successive inflation and deflation of the tubes, and these waves progress across the whole undersurface of the device and result in a progressive movement relative to the ground of an attached sheet or board composed of a light alloy of reinforced plastic material. /TRRL/

Lewis, OT Lewis, JG Patent Office Patent No. 1302535, 1973, 10 pp. 13 Fig.

ACKNOWLEDGMENT, Transport and Road Research Laboratory (IRRD 206960)

2A 083432
'FEATURELESS' M62 SECTION PUTS MCALPINE-FAIRCLOUGH CONSORTIUM

Brief details are given of the construction of the M62 between Manchester and Liverpool and the problems associated with the geology of the area, particularly construction over deep saturated peat in an area which suffers from mining subsidence. The bridge construction (46 bridges on this stretch of the motorway) has been designed to allow for up to 0.45m of horizontal movement at the abutments, and because subsidence from mining advances in a wave, each bridge span is flexibly joined to the next with dowel bars. A major problem in the area of peat was the stabilization of the sides of the motorway which was accomplished by placing slag bunds. A portion of the motorway has been built over a disused runway, which was first covered with a 1.5m thick blanket of coal tip waste to cushion the effect of subsidence in the large runway slabs. The slabs were broken up by trenches at 15m intervals to further reduce the risk of the slabs punching through the motorway surface as a result of subsidence, and also to drain the runway surface. /TRRL/

New Civil Engineer No. 42, 1973, pp 26-28, 1 Fig., 4 Phot.

ACKNOWLEDGMENT, Transport and Road Research Laboratory (IRRD 206892)

2A 083579
COMPACTION OF ASPHALT CONCRETE PAVEMENTS

This research project was initiated in order to study the compaction of asphalt concrete pavements. It was determined that adequate densities were not being obtained with the California Standard Specifications and new Standard Special Provisions were written. A rolling procedure was developed for both thick-lift and thin-lift construction. Measurements were made of recently constructed pavements to determine the riding qualities and to determine some construction methods using different lift thicknesses. Standard Special Provisions were written to improve the final surface roughness by limiting the lift thicknesses. Research was also conducted on the use of nuclear gages to determine asphalt concrete densities and a method was written for the use of nuclear gages in conjunction with the qualification of rollers. /FHWA/

Study sponsored by California DOT, Division of Highways in cooperation with FHWA.


Contract D-05-26

Acknowledgment, Federal Highway Administration (P-0066) PURCHASE FROM NTIS Repr. PC, Microfiche PB-239051/AS

2A 083688
AMERICAN RAILWAY ENGINEERING ASSOCIATION-BULLETIN

Specifications are presented for the preparation of stone, slag and gravel ballast, which cover aspects of percentages of wear, and the resistance to abrasion. Terminology used in vegetation control is defined. Various aspects of locomotive standing facilities are considered. These include capacity, storage and service tanks, unloading, dryers air pressure, sand cocks, gravity loading lines, nozzles, platform, etc. Specifications are presented for design of plain and reinforced concrete members. Specifications for design of spread footings are also considered. Specifications are presented for highway grade crossings over railroad tracks, the construction of bituminous crossings, the construction of wood plank crossings, the construction of prefabricated sectional treated timber crossings and for the construction of tracks in a paved area.


2A 083693
COMMENTS ON CHEMICAL INJECTIONS [Comentario sobre las Inyecciones Quimicas]

During underground construction work in urban areas, it is necessary to take safety measures not only to ensure the safety of the workers but also to prevent any effects on buildings, structures and services located in the area surrounding the work site. One proposed procedure is the use of injection to form silica gels; details of this technique are given in this paper. It cannot be used when the permeability coefficient of the soil is lower than 10-4CU/sec; in that case, low viscosity products should be injected (e.g., organic resins). If the permeability is very high, cement injection with or without bentonite, should be used. An adequate reactive produce should be used. The drill holes must be sufficiently close for the grout to be satisfactorily injected. The radius of action of each drill hole may not be considered larger than 1 meter. Other kind of practical recommendation are included regarding the use of pipes, sleeves, injection pumps with lost tips, etc. [Spanish]

Lopez, M Materiales Maquinaria y Metodos Para la Constr No. 112, May 1974, pp 407-408

Acknowledgment, Transportation & Soil Mechanics Laboratory, Spain (IRRD 211431), Transport and Road Research Laboratory

2A 083715
INCREASING ENERGY COSTS WILL BOOST CONCRETE CONSTRUCTION

Two reasons are given for the use of concrete in construction in the current energy situation: concrete requires less energy to produce than any other major construction material; and concrete lends itself well to the design and construction of buildings that have excellent thermal characteristics.
Although portland cement itself requires much energy to produce, the other materials of cement-mineral aggregates and water require very little energy.

It is expected that the growth in concrete consumption will increase faster than the growth in gross national product and that total construction volume—plus patterns similar to that observed in Europe and Japan.

**Acknowledgment:** Transport and Road Research Laboratory (IRRD 211489)

**BIG PROGRESS MADE IN EARTH WORKS FOR ROAD CONSTRUCTION**

The topographical and climatic conditions and the problematic characteristics of road construction in Japan are reviewed. 

Construction of an underground road network for the congested part of Liverpool is described. The prototype system (with its limited capacity of 70 tph) was used to test the process and to lay down the pavement. Additional 2000 tons of new asphalt was required to complete the work since the new pavement was specified at 5.5 in. The 23 ft. wide subgrade was contoured with a Cat D8D grader, rolled with a 84 in. wide vibratory roller, and sprayed with an MC-70 asphalt prime load. Paving was done with a 11-ft wide paver using the passing lane surface for reference. A 8,000-lb pneumatic tire roller was used to complete the job. The lower course was put down in two widths, 11 ft. and 12 ft., each 4-in rolled thickness. Finish course of 1.5 in. was of plant mix asphalt and was put down in 11 ft. widths. While the old pavement was renewed and stockpiled, the crushers, screens, heating drum and conveyors making up the processing system were being erected. The basic crushing system is described, as well as the portable screening plant, the proportioning system, and the continuous mix pugmill.


**APPLICATION OF SCANNING ELECTRON MICROSCOPY OF BUILDING MATERIALS**

Scanning electron microscopy has been applied to the study of several building materials at the Building Research Station. This paper reviews the application of this method and also describes the sample preparation techniques. Materials examined include metals, cement hydration products, glass ceramics, structural ceramics, glass fiber reinforced plaster and cement and weathered plant surfaces. Conclusions are drawn as to the applicability of informative value of this method of studying the surface structure of materials. /TRRL/


**ACKNOWLEDGMENT:** Transport and Road Research Laboratory (IRRD 60607)

**LINKING UP THE LIVERPOOL LOOP**

The construction of an underground rail network linking four stations in Liverpool is described. The extension of existing rail services is aimed at reducing the congestion in Liverpool's center city. Large car parks are to be provided at stations to encourage people to travel into the city by train. The loop and link tunnels were driven through sandstone, which varies in compressive strength from 30-58 MN/m². Modifications to the Dosco tunnel liner used are described. Collie clay arch girders supported the white sandstone and the tunnel concrete lining was used sprayed concrete lining was suitable for the stronger sandstone. In the stations the 7.5m tunnel has extensive rib support. Construction details of the 5.1m external diameter tunnels for the 1.8 km link are given. The downhill tunnel passes through a disused tunnel, which was filled with water and had to be drained before work could begin. The tunnel had been formed in polystyrene. The contract is scheduled for completion in December 1976.


**LAND SLIDES ON THE TIJUANA-ENSENADA MOTORWAY**

[Deslizamientos en la Autopista Tijuana-Ensenada Autopista Tijuana-Ensenada]

This report presents results and conclusions of observations on the behaviour of seven landslides between kilometre 12 and kilometre 21 on the Tijuana-Ensenada Motorway. The observations were carried out over a period of 22 months (August 1967 to June 1969). The unstable region runs across a zone of slopes which rest on shale, sandstone and conglomerate, in which landslides occurred previously. It is parallel to the sea shore where erosion takes place. The seven landslides which occurred are graphically shown. Three other failures were observed during construction. Study findings showed that these slides must have been mainly caused by the reactivation of old landslides due to the weight of the embankments built on the slope and to the seepage of rainwater in the unstable mass. Details are given of the behaviour of the road.
CONSTRUCTION MATERIALS

PRIOR TO THE SLIDES, GEOLOGICAL CONDITIONS, OBSERVATIONS AND MEASUREMENTS TAKEN, AND GENERAL CONCLUSIONS. [Spanish]


ACKNOWLEDGMENT: Laboratoire Central des Ponts et Chaussées (IRRD 100615), Transport and Road Research Laboratory

2A 083965

ENGINEERING ECONOMY AND ENERGY CONSIDERATIONS, COST SAVING SUGGESTIONS

A list of cost saving suggestions, which could be implemented with little or no additional effort, were developed and evaluated by a task force of District Engineers and Division Heads of the Texas Highway Department. The suggestions have provided a basis for determining the future course of action in the project on "Engineering, Economy and Energy Considerations in Design, Construction and Materials", are presented under the following categories: suggestions for administrative considerations (contracting, time, payment, mobilization, detours, procurement and other); suggestions that have already been implemented; suggestions which may be implemented subject to comments shown; those that reflect good engineering; those relating to maintenance management; miscellaneous suggestions; and suggestions requiring development effort prior to implementation.


2A 083983

BRIDGE CONSTRUCTION PRACTICE

In an effort to provide information for the guidance of field engineers appointed to supervise the construction of highway bridges by direct labor, recommended practices are presented for construction of bridges in the more usual materials: timber, steel, reinforced and prestressed concrete. Most phases of bridge construction are covered and include the following: equipment of a bridge construction gang; camp and depot establishment; engagement and payment of labor-costing; job planning and control; job reports and measurements; supply, delivery to site and storage of materials, plant and equipment; provision for traffic; setting out of work; materials for permanent work; foundation work; substructure works; superstructure; handrails and protective treatment; immediate approaches; stream treatment; demolition and removal of old structure; maintenance of works; and cleaning up of site.

National Association of Australian State Road Auth 1974, 100 pp, 24 Figs., 6 App

2A 084068

MATERIALS EXPLORATION AND FIELD TESTING AT OROVILLE DAM

Design studies for Oroville Dam, a 725-ft high embankment dam now under construction, called for extensive material exploration because of the large quantities of materials required. The dam, which will contain 77 million cubic yards of material, is located on the Feather River, 5 miles northeast of Oroville, Butte County, Calif. Original concrete-aggregate exploration and subsequent impervious and pervious materials exploration required procedures and techniques that would provide representative samples of material for testing and a reliable analysis of the in situ characteristics of the areas. A 7000-acre tailings deposit, which was the result of gold dredging along the Feather River downstream from Oroville, was investigated as a source for concrete aggregate and later for transition and pervious embankment material. A unique hole excavator and several types of casing were used in the very loose tailing deposit during the concrete aggregate investigation, and an elaborate field grading procedure was followed. Later exploration was accomplished by dragline, bulldozer, and backhoe. Impervious core material explorations were confined to clayey gravels adjacent to the tailing deposit. Bucket augers were used to drill 30-in. diameter uncased holes for most of the impervious borrow exploration. Field grading equipment was improved and mechanized and over 100 holes were drilled; excavated material was logged; field graded and sampled. Through careful analysis and control of the exploration procedures and techniques, it was concluded that samples used for laboratory testing and from which design values were obtained are adequately representative of the requiring field grading, mechanization of equipment is recommended.

O'Neil, AL (California Department of Water Resources); Nutting, RG

ASTM Special Technical Publication No. 351, 1963, pp 96-107, 3 Fig., 7 Phot.

2A 084097

FIELD TESTING OF SOIL STABILIZING MACHINES

The use of mixed-place soil stabilisation for road construction has increased considerably during the last few years, and a number of mixing machines designed specifically for this type of work are now available. The relative merits of these machines have been the subject of much discussion and controversy, and this report describes a series of tests carried out by the Main Roads Department, Queensland, in an attempt to provide some data on which the relative capabilities of some of these machines might be assessed. In order to give even a moderate coverage of the various combinations of the three main variables, viz. materials to be mixed, speed of travel of mixing machine and number of mixing passes, an extensive and expensive testing programme would have been necessary. It must therefore be emphasized that the results and conclusions to be drawn from this rather limited experiment apply only to the particular conditions of the test.

Wilson, PG (Queensland Department of Main Roads, Australia);

Gray, PJ (Queensland University, Australia) Australian Road Research Vol. 1 No. 6, June 1963, pp 38-43, 6 Fig., 3 Phot.

2A 084689

LONG LINE PRODUCTION OF BUILDING ELEMENTS IN UNITED STATES

The trend in the production of prestressed building elements in the United States is toward wider, deeper, and longer members. The pursuit of this concept requires larger plants, heavier equipment, and greater investment. The objective is to reduce labor and material costs. Longer spans and wider members have been introduced, without increasing the material quantities required per square foot, by improving and updating all design. Even when material quantities are increased slightly by the use of longer wider members the reduction in labor costs for production and erection results in overall economy. The present trend toward larger units probably will continue until a method is developed for the mass production and assembly of small elements into compact building units.


2A 090105

STRENGTH COEFFICIENT OF MATERIALS

The study investigates the relationship of strength to thickness and type of material for six different construction materials; two bituminous paving materials, the same two aggregates without asphalt and two gravels typical of those normally used for base or subbase materials. Testing was conducted at a test site where each material was placed in thicknesses of 3 to 24 inches in three inch increments. In addition to normal laboratory and construction test procedures, plate bearing, Benkelman beam and Dynaflect tests were performed. Coefficients of strength were determined for the test materials and examples of design based upon these coefficients are shown.

Crawford, RA Anderson, DW

South Dakota Department of Transportation, Federal Highway Administration Final Rpt. SD-61370(7), Dec. 1973, 49 pp

ACKNOWLEDGMENT: NTIS

PURCHASE FROM: NTIS Repr. PC. Microfiche

PB-238164/8ST

2A 090192

DESIGN AND ECONOMIES OF BITUMINOUS TREATED BASES IN TEXAS

Types of tests, test criteria and types of materials suitable for bituminous stabilization have been defined. A review of layer equivalency is included as well as current cost data for both stabilized and unstabilized base courses.

Prepared in cooperation with Texas A and M Univ., College Station., and Texas Highway Dept., Austin.

Epps, JA Gallaway, RM

Texas Transportation Institute, Federal Highway Administration, Texas A&M University, Texas Highway Department Iustrm Rpt. TTI-2-6-73-14-1F, July 1974, 96 pp

117
CONSTRUCTION MATERIALS

ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
PB-239046/6ST

2A 090197
LINEAR ELASTIC LAYER THEORY AS A MODEL OF DISPLACEMENTS MEASURED WITHIN AND BENEATH FLEXIBLE PAVEMENT STRUCTURES LOADED BY THE DYNAFFECT
Presented in the report are the results of an investigation of the capability of linear elastic theory to predict measured displacements on the surface, within, and beneath flexible pavement structures. In measuring predictive capability, the yard stick used was replication error. Sources of data were an NCHRP project, the AASHTO Road Test, and the Texas Transportation Institute's Flexible Pavement Test Facility. Only the Texas source, which employed a vibrating surface load (the Dynaffect) and specially designed transducers lowered into small-diameter measurement holes, furnished both horizontal and vertical displacements. These were measured at various depths ranging from zero to 65 inches beneath the pavement surface, and at horizontal distances ranging from 10 to 216 inches.

Prepared in cooperation with Texas Highway Dept., Austin, and Texas Transportation Inst., College Station, Report on 'A System Analysis of Pavement Design and Research Implementation.'

Srivastava, PH, Michalak, CH

ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
PB-239244/7ST

2A 090304
COMPARATIVE PERFORMANCE OF STRUCTURAL LAYERS IN PAVEMENT SYSTEMS, VOLUME III. DESIGN AND CONSTRUCTION OF MESL
This report describes design and construction procedures for membrane-encapsulated soil layers in airport pavement systems based on analyses of results of recent tests of full-scale accelerated traffic test sections. Included are descriptions of material and equipment requirements and recommended test methods. The procedures are applicable of both rigid and flexible airport pavement systems. Recent material developments and subsequent testing have demonstrated the structural integrity of MESL-type construction. It is believed that substantial savings can be realized using MESL's in airport pavements because of less strict material quality requirements and lower maintenance requirements due to the waterproofing protection provided by the MESL.

See also Volume 1 dated Jun 74, AD-785 024.

Mammitt, GM, II
Waterways Experiment Station, Federal Aviation Administration Final Rpt. AEWES-TR-S-74-5, Dec. 1974, 43 pp

Contract DOT-FW71-WAI-218

ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
AD/A-005893/3ST

2A 090562
USERS' MANUAL FOR MEMBRANE ENCAPSULATED PAVEMENT SECTIONS (MEPS)
This User's Manual describes the design and construction techniques for installing Membrane Encapsulated Pavement Sections (MEPS). This concept has been developed and implemented by the Corps of Engineers in response to a need by the Army for a rapid and stable road building method in areas where conventional materials are not readily available. Suitable in-place or borrowed soil can be effectively used in the MEPS System in place of conventional aggregate bases or stabilized sub-bases. Construction costs can often be competitive with standard designs and no special equipment or training is required.

Webster, SI
Waterways Experiment Station, Federal Highway Administration Final Rpt. June 1974, 34 pp

ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS NTIS Price, RM$2.25
PB-240355/8ST

2A 090610
POROUS FRICTION SURFACE COURSE
A study was conducted on the use of porous friction courses for airport pavements as a means of alleviating aircraft hydroplaning. The study consisted of a laboratory investigation of material requirements and mix design development and of a field study of construction control, construction processes, and long-term performance. The laboratory results were correlated where possible with the field observations. Satisfactory performance was obtained with a recommended aggregate gradation. A procedure for obtaining a design asphalt content and field mixing temperature, minimum field permeability values, and laboratory procedures for conducting permeability tests are described. A standard recommended guide specification is also included as an appendix.

White, TD
Waterways Experiment Station, Federal Aviation Administration Intrm Rpt. Feb. 1975, 119 pp

Contract FA-71-WAI-218

ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS NTIS Price, RM$2.25
AD-A009012/6ST

2A 090679
THE USE OF WASTE AND LOW-GRADE MATERIALS IN ROAD CONSTRUCTION: 1. GUIDE TO MATERIALS AVAILABLE
A considerable amount of work has been done on the utilization of waste materials in road construction but the information so obtained is scattered among a large number of publications. The main purpose of this Report is to bring this information together so that an assessment can readily be made of the suitability of any particular waste material for roadmaking. The Report therefore considers the extent to which the road construction industry can use low-grade and waste material. It discusses the types and quantities of each material that are available, the purpose to which each material can be put in the various stages of road construction and the tests needed to ensure that the materials meet the required specifications. Materials discussed include: colliery shale, spent oil shale, wastes from coal-fired power stations, quarry wastes, chalk, incinerator waste, and blast furnace and steel slags.

Sherwood, PT

ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS NTIS Price, RM$2.25
PB-240353/8ST

2A 090681
ARCHITECTURAL CONSTRUCTION MATERIALS. PART 2. CONCRETE AND CEMENTS (A BIBLIOGRAPHY WITH ABSTRACTS) (Rept. for 1964-May 75)
Concrete/cement construction materials for architectural applications are investigated in this bibliography of Government-sponsored research reports. Structural design and performance are reviewed. (Contains 127 abstracts).

See also Part 1, NTIS/PS-75/389.

Habercom, GEJ

ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS NTIS Price, 0/MTS25.00 NTIS/PS-75/390/5ST

2A 090682
ARCHITECTURAL CONSTRUCTION MATERIALS. PART 1. NON-CONCRETE (A BIBLIOGRAPHY WITH ABSTRACTS) (Rept. for 1964-May 75)
Non-concrete construction materials for architectural applications are investigated in this bibliography of Government-sponsored research reports. Structural design and performance are reviewed. (Contains 189 abstracts).

See also Part 2, NTIS/PS-75/390.
CONSTRUCTION MATERIALS

Habercom, GEJ

ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS NTIS Price, $/MF$25.00
NTIS/PS-75/399/7ST

2A 090683
CONSTRUCTION MANAGEMENT (A BIBLIOGRAPHY WITH ABSTRACTS)
The report includes management studies on the physical, social, and
environmental factors of the construction industry. Cost and design studies
are also included for military and civilian construction of buildings, houses,
mobile homes, tunnel excavation, and roads. To aid the manager in planning
and control, construction codes, data management, and contract administra-
tion research are also cited. (Contains 103 abstracts).

Supersedes COM-73-11798.

Grooms, DW
National Technical Information Service Biblog Apr. 1975, 108 pp

ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
NTIS/PS-75/253/5ST, DOTL/NTIS

2A 090732
ON THE THEORY OF GROUND ANCHORS (Technical rept)
The findings of a literature review of anchor design are presented to give a
synopsis of the numerous theoretical and empirical techniques available for
predicting anchor capacity. The review revealed that anchor capacity is
related to anchor configuration, soil characteristics and depth of anchor
embedment and that the mode of soil failure as a result of anchor loading
is dependent upon soil type and state as well as on the ratio of the depth
of anchor embedment to anchor diameter. As a result it was found that no
single equation can be used to predict anchor capacity under all soil
conditions or anchor embedment depths.

Kovacs, A, Blouin, S, McKelvy, B, Colligan, H
Cold Regions Research and Engineering Lab Hanover, N H,
(DA-1-T-062112-A-130) CRREL-TR-258, Jan 75, 80p

ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS NTIS Price, $/MF$2.25
AD/A-006582/1ST

2A 090752
INVESTIGATION OF THE DESIGN AND CONTROL OF ASPHALT PAVING MIXTURES, VOLUME III, APPENDIX D: TRAFFIC TESTS. APPENDIX E: FINAL LABORATORY CORRELATION TESTS
The appendix presents a description of the loading equipment, the tracking
procedure, and the results of tests and observations made during and after
the traffic tests on the asphalt stability test section. Analyses of the test
results are also included. Previously announced as PB-093 232.

Waterways Experiment Station Tech Memo AEWES-TM-3-254-VOL-3,
May 1948, 507 pp

ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
AD/A-006523/5ST

2A 090758
LOAD-DEFLECTION BEHAVIOR OF LIME-STABILIZED LAYERS
The static and dynamic load-deflection response of soil-lime pavement layers
was investigated. Soil-lime mixture layers 6, 9, and 12 in thick were
compacted over a stiff subgrade (k=450 psi/in.) and a soft subgrade (k=50
psi/in.). The soil-lime layers were statically and dynamically loaded after
curing periods of 2, 14, 28, and 56 days. Supplemental subgrade soil and
soil-lime mixture property data were also developed. The load-deflection
data are summarized and analyzed. Various pavement behavior theories are
evaluated to determine their capability to predict the load-deflection
behavior of soil-lime pavement layers.

Suddath, LP, Thompson, MR
Army Construction Engineering Research Laboratory, (DA-4-A-

ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
AD/A-006015/2ST

2A 090759
THE D-645-2 COMPLEX OF EQUIPMENT FOR PREPARING ASPHALT CONCRETE MIXES
The D-645-2 complex is intended for preparing asphalt concrete and
bitumen-mineral mixes which are used in road building and for other types
of construction. It is designed so that when necessary the formula for the
mix can be changed easily. The article gives the order of preparation of the
mixes and describes the various units of the complex. The equipment was
tested under unfavorable weather conditions and proved to be entirely
satisfactory. Its adoption in industry will effect large economic savings.

Trans of Stroitelnnyi i Dorozhnnye Mashiny (USSR) n7 p8-11 1972.

Barbaev, SV, Zabolotnyi, VM Mendeleev, AI, Gurbanov, JM
Army Foreign Science and Technology Center FSTC-HT-23-11092-73,
Apr. 1973, 9 pp

ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
AD/A-005952/7ST

2A 090789
DS-70 AGGREGATE FOR CRUSHING SOIL
The DS-70 aggregate is additional equipment for the D-709 soil-mixing
installation and is intended for crushing weak (kaolinite) clays with moisture
of up to 12%. The aggregate contains a bar screen, a mill, and a conveyor.
When changing to different soils, the aggregate need not be removed from
the D-709 installation.

Trans of Stroitelnnyi i Dorozhnnye Mashiny (USSR) n8 p2-3 1972.

Karanovskii, Y
Army Foreign Science and Technology Center FSTC-HT-23-1394-73,
July 1974, 7p

ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
AD/A-005477/5ST

2A 090801
REVIEW OF CONSTRUCTION EQUIPMENT AND METHODS FOR PAVEMENTS
The investigation reported herein was conducted to review methods and
equipment being used by industry in the construction of pavements and to
recommend changes to Corps of Engineers guide specifications to incorpo-
rate new methods and equipment. Literature reviews were conducted, and
visits were made to construction sites and equipment manufacturers.
Observations and measurements were taken on pavements constructed with
slip-form pavers, and a separate report was written on the results. As a result
of the overall investigation, the pertinent guide specifications will be revised
to allow the use of slip-form pavers for portland cement concrete pavements
in airfield construction and to add methods of testing for quality of mixture
and for determining mixing times.

Rone, CL
AEWS-Misc-Paper-S751, Jan. 1975, 15 p

ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
AD/A-005007/0ST

2A 090845
CONCRETE-POLYMER MATERIALS FOR HIGHWAY APPLICATIONS. PROGRESS REPORT NO. 3
For abstract, see NSA 31 03, number 08069.

Kukacka, LE Fontana, J Romano, AJ Steinberg, P Mike, RG
Brookhaven National Laboratory, (BML 50417) Prog. Rpt.
FHWA-RD-74-17, May 1974, 132 pp

RESPONSIBLE INDIVIDUAL: Mike, RG (HRS-22)
CONSTRUCTION MATERIALS

Contract P.O.2-1-0926
ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
BNL-50417

2A 091372
CONSTRUCTION MONITORING OF SOFT GROUND RAPID TRANSIT TUNNELS, VOLUME I: A DEFINITION OF NEEDS AND POTENTIAL DEVELOPMENTS

The Urban Mass Transportation Administration (UMTA) Tunneling Program Concentrates its efforts on reducing tunneling costs, minimizing environmental impact and enhancing safety as it applies to the planning, organization, design, construction and maintenance cycles of rapid transit tunnels in the urban environment. This study investigates the area of construction monitoring of rapid transit tunnels in soft ground. Soft ground tunnel construction monitoring has the potential to reduce construction costs, safety hazards and environmental impacts. Monitoring can diagnose face stability and ground movement problems, and allow appropriate preventive or remedial action. Monitoring provides data for prediction of ground movements and allows the compilation of useful legal documentation. Such data are also required for improving design and prediction methods.


Schmidt, B Dunnicliff, CJ
Parsons, Brinckerhoff, Quade and Douglas Inc., Transportation Systems Center, Soil and Rock Instrumentation, Incorporated Final Rpt. 3-V1 DOT TSC-UMTA-75-9-V1, UMTA-MA-06-0025-74-1, Nov. 1974, 185p

Contract DOT/TSC-661
ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
PB-241536/2ST, DOTL NTIS

2A 091373
CONSTRUCTION MONITORING OF SOFT GROUND RAPID TRANSIT TUNNELS, VOLUME II: APPENDIXES

The Urban Mass Transportation Administration (UMTA) Tunneling Program Concentrates its efforts on reducing tunneling costs, minimizing environmental impact and enhancing safety as it applies to the planning, organization, design, construction and maintenance cycles of rapid transit tunnels in the urban environment. This study investigates the area of construction monitoring of rapid transit tunnels in soft ground. Monitoring practices now in use do not usually allow full utilization of the data for the project from which they were gathered. Deficiencies in present practices are pointed out, and a systematic approach to monitoring is presented. Information presented will aid owners, designers, specification writers and instrumentation engineers. A computer program for data storage, interpretation and retrieval is proposed. An interim quality control specification for instrumentation procurement is presented, and instrumentation hardware improvements are suggested.


Schmidt, B Dunnicliff, CJ
Parsons, Brinckerhoff, Quade and Douglas Inc., Transportation Systems Center, Soil and Rock Instrumentation, Incorporated Final Rpt. 3-V2 DOT TSC-UMTA-75-9-V2, UMTA-MA-06-0025-74-1, Nov. 1974, 104p

Contract DOT/TSC-661
ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
PB-241537/OST, DOTL NTIS

2A 091403
FEDERALLY COORDINATED PROGRAM OF RESEARCH AND DEVELOPMENT IN HIGHWAY TRANSPORTATION, VOLUME 4, IMPROVED MATERIALS UTILIZATION AND DURABILITY

The program of materials research is primarily designed to concentrate on a limited number of problems in order to bring about significant pay-offs within a short period of time. Another criterion is the need to be responsive to the public's growing concern with environmental pollution. The highway industry can make a significant positive contribution toward alleviating this problem, particularly in our major cities, by devising procedures for converting industrial and household wastes into useful highway products. The FCP projects provide a coordinated effort in bringing about short range gains in materials research as well as continued development of new basic knowledge needed for long range improvements.

Paper copy also available in set of 7 reports as PB-242 057-SET. PCS42.00.

Federal Highway Administration FHWA/RD-FCP-005, Jan. 1975, 202 pp
ACKNOWLEDGMENT: NTIS, Federal Highway Administration (RO005)
PURCHASE FROM: NTIS Repr. PC, Microfiche
PB-242062/8ST

2A 091494
FEDERALLY COORDINATED PROGRAM OF RESEARCH AND DEVELOPMENT IN HIGHWAY TRANSPORTATION, VOLUME 5, IMPROVED DESIGN TO REDUCE COSTS, EXTEND LIFE EXPECTANCY AND INSURE STRUCTURAL SAFETY

Under this program category, coordinated research is undertaken to provide for (a) improved protection against the natural hazards of earthquake, wind, and flooding; (b) improvements in highway tunneling technology for future highways to increase construction rate and safety; (c) technical information to develop methods for flaw detection in structural members and bridge failure criteria for use in the national bridge safety inspection program; (d) new methodology for the design of flexible pavements to deal with measuring and relating materials properties to the performance of pavements under load-associated and environmental stresses; (e) exploitation of new materials and improved methods in structural rehabilitation and serviceability enhancement of damaged pavement systems by innovative patching of layered systems and new overlay design techniques; and (f) the examination of investment strategy for pavements expected to carry high traffic volumes to determine whether higher initial costs are justified as a trade-off for minimizing maintenance.

Paper copy also available in set of 7 reports as PB-242 057-SET. PCS42.00.

Federal Highway Administration FHWA/RD-FCP-006, Jan. 1975, 278 pp
ACKNOWLEDGMENT: NTIS, Federal Highway Administration
PURCHASE FROM: NTIS Repr. PC, Microfiche
PB-242063/6ST

2A 091495
FEDERALLY COORDINATED PROGRAM OF RESEARCH AND DEVELOPMENT IN HIGHWAY TRANSPORTATION, VOLUME 6, CONSTRUCTION, MAINTENANCE, IMPLEMENTATION, AND MANAGEMENT

The Federally Coordinated Program emphasizes the development and transfer of research results into practice; e.g., bridging the gap between research and operations. The objective of this category is to stimulate and expand the application and practical use of the products of highway research and development. To achieve this objective, the program will emphasize the development of an environment that is conducive to nationally coordinated and cooperative implementation efforts by the Federal Highway Administration, State highway agencies and other highway organizations. It will also emphasize systematic management and the assessment of the success of implementation including the benefits realized.

Paper copy also available in set of 7 reports as PB-242 057-SET. PCS42.00.

Federal Highway Administration FHWA/RD-FCP-007, July 1973, 58 pp
ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
PB-242064/4ST

2A 091506
EVALUATION OF FULL-SCALE EXPERIMENTAL CONCRETE HIGHWAY FINISHES

Results on an evaluation of two sets of full-scale experimental concrete test sections are summarized. Eighteen experimental concrete finishes were
CONSTRUCTION MATERIALS

evaluated in terms of skid resistance under standard trailer water conditions and under simulated rainfall conditions. In addition the change in texture depths and skid values with time were measured. Results indicate that (1) texture depths of 0.060 in. or greater can easily and economically be constructed with 1/8 in. metal tines spaced closer than 1/2 in. apart, (2) under normal traffic conditions all concrete textures can be expected to wear-down approximately 25 to 35 percent during the first 1/2 year and then remain relatively unchanged for a prolonged period, (3) skin measurements made under standard trailer water conditions may not be indicative of real life conditions in wet weather, (4) low skid values could be obtained in almost any rainfall in which the pavement is completely wetted, and (5) under simulated rain conditions deep transverse texturing will result in the greatest improvement in skid value.

Ledbetter, WB Meyer, AH Ballard, DE
Texas Transportation Institute Final Rpt. TTI-2-6-70-141-4F, Sept. 1974, 81 pp
ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche

2A 092025
FEASIBILITY OF USING SEWAGE SLUDGE IN HIGHWAY EMBANKMENT CONSTRUCTION
A laboratory evaluation of the feasibility of using sewage sludge in construction of a highway embankment was conducted. Mixtures composed of lime, fly ash, waste calcium sulfate and up to 17% sewage sludge were evaluated. The effect of lime type, fly ash source and the relative proportions of lime, fly ash and waste calcium sulfate on compressive strength of compacted specimens was measured. Two samples, one sandy and the other clayey, were used to replace 30, 50 and 70% of the fly ash in selected formulations. All samples with the soil replacement exceeded the minimum strength gain criterion. Selected formulations were further evaluated for volume change, durability, permeability and leachability. Analysis of the leachate from the permeability tests indicated that the heavy metals present in the sewage sludge—cadmium, chromium, mercury and zinc—were retained in the mixture. However, lime and gypsum did increase the pH and calcium and sulfate ion concentrations in the leachate.

RESPONSIBLE INDIVIDUAL: Ormsby, WC (HRS-23)
Contract FH-11-8122
ACKNOWLEDGMENT: NTIS, Federal Highway Administration
PURCHASE FROM: NTIS Repr. PC, Microfiche
PB-242260/8ST

2A 092427
STRUCTURAL OVERLAYS FOR PAVEMENT REHABILITATION
California's research on the use of deflection measurements for asphalt concrete overlay design has resulted in a revision to the California overlay design method. Deflection reduction characteristics and tolerable deflection levels of asphalt concrete were revised based on the performance of highway projects under study since 1960. An evaluation of the design method compares predicted versus measured deflections on 69 reconstructed highways. Pavement deflections were measured using a traveling deflectometer which provides a dynamic-type measurement while traveling along the roadway at one-half mile per hour. The results are discussed.
Prepared in cooperation with Federal Highway Administration, Washington, D.C.
Bushey, RW Baumeister, KL Matthews, JA Sherman, GB California Department of Transportation, Federal Highway Administration, (HPR) Intrm Rpt. CA-DOTTL-3128-3-7412, July 1974, 24 pp
ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
PB-244579/9ST

2A 092498
SUGGESTIONS FOR TEMPORARY EROSION AND SILLATION CONTROL MEASURES
The manual was prepared as an aid to field personnel engaged in the construction of highways in Latin America. It provides suggestions on the most efficient ways of providing emergency care against erosion and sedimentation by prompt treatment of the slopes. The booklet contains 24 pages of diagrams of various types of problems and methods of controlling them. The report was designed for distribution to the governments of Latin American countries through the cooperation of the Agency for International Development.
Text in Spanish.
Office of Policy, Plan and International Affairs 1975, 24 pp
ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
PB-245004/7ST

2A 092529
THE USE OF WASTE AND LOW-GRADE MATERIALS IN ROAD CONSTRUCTION: 2. COLLIERY SHALE
The use of lower-grade and waste materials as alternatives to naturally occurring aggregates in the construction of roads helps to conserve the supplies of good quality aggregates and assists in problems arising from the disposal of unwanted materials. This Report is one of a series that is aimed at bringing together the information that is available on each of the major waste products that have roadmaking potential. It deals with colliery shale and it considers the extent to which shale can be used in road construction.
The Report discusses the types and quantity of shale that are available, the purposes to which it can be put in the various stages of road construction and the tests needed to ensure that shales meet the required specifications.
Sherwood, PT Transport and Road Research Lab., Crowthorne, (England).
TRRL-LR-649, 18, 1975, 25p
ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS NTIS Price, /MF$2.25
PB-243740/8ST

2A 092531
CONCRETE (RIGID) HIGHWAY PAVEMENTS. VOL. 3. 1974-JULY 1975 (A BIBLIOGRAPHY WITH ABSTRACTS)
Concrete (rigid) pavement construction, construction materials, and mechanical properties of concrete pavements are evaluated in reports generated under Government sponsored research in highway engineering. (Contains 61 abstracts) See also NTIS/PS-75/075, Bridges: Construction and Construction Materials; NTIS/PS-75/518, 519, and 520, Airfield Pavements; and NTIS/PS-75/672, 673, and 674, Flexible Highway Pavements. See also NTIS/PS-75/678.
ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
NTIS/PS-75/679/1ST

2A 092532
CONCRETE (RIGID) HIGHWAY PAVEMENTS. VOL. 2. 1971-1973 (A BIBLIOGRAPHY WITH ABSTRACTS)
Concrete (rigid) pavement construction, construction materials, and mechanical properties of concrete pavements are evaluated in reports generated under Government sponsored research in highway engineering. (Contains 131 abstracts) See also NTIS/PS-75/076, Bridges: Construction and Construction Materials; NTIS/PS-75/518, 519, and 520, Airfield Pavements; and NTIS/PS-75/672, 673, and 674, Flexible Highway Pavements. See also NTIS/PS-75/679.
ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
NTIS/PS-75/678/3ST

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2A092533
CONCRETE (RIGID) HIGHWAY PAVEMENTS. VOL. 1. 1964-1970
(A BIBLIOGRAPHY WITH ABSTRACTS)
Concrete (rigid) pavement construction, construction materials, and mechanical properties of concrete pavements are evaluated in reports generated under Government sponsored research in highway engineering. (Contains 204 abstracts) See also NTIS/PS-75/076, Bridges: Construction and Construction Materials; NTIS/PS-75/518, 519, and 520, Airfield Pavements, and NTIS/PS-75/673, 673, and 674, Flexible Highway Pavements. See also NTIS/PS-75/678.

Habercom, GEJ

ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
NTIS/PS-75/677/5ST

2A092534
FLEXIBLE HIGHWAY PAVEMENTS. VOL. 3. 1975 (A BIBLIOGRAPHY WITH ABSTRACTS)
Flexible pavement construction, construction materials, and mechanical properties of flexible pavements are evaluated in reports generated under Government-sponsored research in highway engineering. (Contains 41 abstracts) See also NTIS/PS-75/076, Bridges: Construction and Construction Materials; NTIS/PS-75/518, 519, and 520, Airfield Pavements; and NTIS/PS-75/677, 678, and 679, Concrete Pavements. See also NTIS/PS-75/673.

Habercom, GEJ
National Technical Information Service Bibliog. Aug. 1975, 46 pp

ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
NTIS/PS-75/674/2ST

2A092535
FLEXIBLE HIGHWAY PAVEMENTS. VOL. 2. 1970-1974 (A BIBLIOGRAPHY WITH ABSTRACTS)
Flexible pavement construction, construction materials, and mechanical properties of flexible pavements are evaluated in reports generated under Government-sponsored research reports in highway engineering. (Contains 299 abstracts) See also NTIS/PS-75/076, Bridges: Construction and Construction Materials; NTIS/PS-75/518, 519, and 520, Airfield Pavements; and NTIS/PS-75/677, 678, and 679, Concrete Pavements. See also NTIS/PS-75/674.

Habercom, GEJ
National Technical Information Service Bibliog. Aug. 1975, 304 pp

ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
NTIS/PS-75/673/4ST

2A092536
FLEXIBLE HIGHWAY PAVEMENTS. VOL. 1. 1964-1969 (A BIBLIOGRAPHY WITH ABSTRACTS)
Flexible pavement construction, construction materials, and mechanical properties of flexible pavements are evaluated in reports generated under Government-sponsored research in highway engineering. (Contains 245 abstracts) See also NTIS/PS-75/076, Bridges: Construction and Construction Materials; NTIS/PS-75/518, 519, and 520, Airfield pavements, and NTIS/PS-75/677, 678, and 679, Concrete Pavements. See also NTIS/PS-75/673.

Habercom, GEJ
National Technical Information Service Bibliog. Aug. 1975, 250 pp

ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
NTIS/PS-75/672/6ST

2A092577
TECHNICAL AND ECONOMIC EVALUATION OF RECYCLED INDUSTRIAL SECONDARY PRODUCTS FOR THE PREPARATION OF SYNTHETIC HIGHWAY BUILDING AGGREGATES
This study investigated and tabulated data relating to the supply and proposed use of lime fly ash sulfate sludge compositions as a substitute for conventional road building materials. It was found that this would be economically feasible and environmentally beneficial. This would solve pollution problems and at the same time provide highway construction material within the state of West Virginia.

IU Conversion Systems, Incorporated, Appalachian Regional Commission ARC-73-40/RPC-772, July 1974, 73 pp

ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
PB-242576/7ST

2A092584
A MODEL STUDY OF SPILING REINFORCEMENT IN UNDERGROUND OPENINGS
The objective of this research was to contribute to the development of rational design approach in the use of spiling reinforcement in underground construction. By investigating the mechanisms of spiling reinforcement, through physical and numerical models, its contribution as an immediate stabilization as well as its contribution to the permanent stabilization of a circular tunnel were ascertained. From case histories and other investigations, where spiling had found application, the rock mass characteristics were assessed. On the basis of physical model laws, and the rock mass characteristics a suitable modeling material was developed. A model test chamber for three dimensional studies, and an instrumentation system were designed. Physical model tests with and without spiling reinforcement were performed. A numerical model was developed to aid in the interpretation of the physical model test results.

Report on project 'Rational Design of Tunnel Supports'.

Corbin, GE; Brekke, TL
California University, Berkeley, Army Corps of Engineers Intrm Rpt. MDR-TR-2-75, Feb. 1975, 278 pp

Contract DACW-45-74-C-0026

ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
AD-A012816/5ST

2A092588
AIRFIELD PAVEMENT CONSTRUCTION: SLIPFORM PAVING METHOD [Final rept. Jul 71-Jun 73]
This report presents the results of a study conducted to evaluate the use of slipform paving equipment for the construction of airfield pavements. Nine construction projects were observed and smoothness measurements made on eight of these projects. Currently used equipment and construction practices are presented and analyzed; problem areas and corrective measures are discussed. Results from the smoothness measurements are presented and considered in terms of current construction requirements and the effect of the surface smoothness on the functional performance of the pavement. Although the elimination of fixed side forms is the most appealing feature of the slipform method, it also causes the most complications.

Parker, FJ
Army Engineer Waterways Experiment Station, Vicksburg Miss 5-18 AEWES-Misc-Paper-S-7, 18, June 1975, 76p

ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS NTIS Price. /MF$2.25
AD-A012769/6ST

2A092616
REPORT OF INTERAGENCY CONFERENCE OF COORDINATION OF RESEARCH ACTIVITIES (8TH) HELD AT ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS. ON 13-15 NOVEMBER, 1973
This publication summarizes the proceedings of the Eighth Interagency Research Coordination Conference held at the U. S. Army Engineer...
CONSTRUCTION MATERIALS

Waterways Experiment Station (WES), 13-15 November 1973. Conference agenda and session reports include the following: General agenda and schedule of technical sessions; Report of executive session; Agenda and report of hydraulic structures session; Agenda and report of soil mechanics session; Agenda and report of rock mechanics session; Agenda and report of earthquake engineering session; Agenda and report of concrete and structural technology session; Agenda and report of power session; Agenda and report of finite element analyses session; Agenda and report of shotcreting session; Special reports—Coordination of water quality research; Recreational waste management.

Waterways Experiment Station. Nov. 1973, 103 pp

ACKNOWLEDGMENT: NTIS PURCHASE FROM: NTIS NTIS Price

AD-A011991/7ST

1A 092644

LOGGING ROADS AND PROTECTION OF WATER QUALITY

The report is a state-of-the-art reference of methods, procedures and practices for including water quality consideration in the planning, design, construction, reconstruction, use and maintenance of logging roads. Most of the methodology also is applicable to other forest management roads. The report is divided into three parts. The first part provides general perspective on physical features and conditions in EPA region X which are relevant to water quality protection and logging roads. The second part outlines specific methods, procedures, criteria and alternatives for reducing the degradation of water quality. Topic coverage in this part includes road planning, design, construction and maintenance including the use of chemicals on roads. Silvicultural activities are one category of water pollution from point sources described in Public Law 92-500. Of all silvicultural activities, logging roads have been identified as the principal source of man-made sediment. Prepared in cooperation with Arnold, Arnold and Associates, Seattle, Wash., and Dames and Moore, Seattle, Wash.


ACKNOWLEDGMENT: NTIS PURCHASE FROM: NTIS NTIS Price

PB-243703/6ST

2A 092998

LONG TERM SETTLEMENT STUDY AT BRIDGE APPROACHES, (NORTH MAXWELL)

This report evaluates the use of lime treatment as a means to reduce differential settlement which frequently occurs between bridges and their approach embankments. Experimental and control sections consisted of a twin bridge site on Interstate 5, north of Maxwell, California. The entire 35 feet of the experimental section was treated with 2% lime, by dry weight of the soil. Due to the minor embankment compression actually measured, there is no evidence of potential benefit from embankment stabilization with lime.

Yee, WS

ACKNOWLEDGMENT: NTIS PURCHASE FROM: NTIS NTIS Price

PB-244663/1ST

2A 093188

GERMAN STANDARD DIN 1045-CONCRETE AND REINFORCED CONCRETE STRUCTURES: DESIGN AND CONSTRUCTION

This Standard applies to loadbearing and stiffening components made of plain or reinforced ordinary or heavyweight concrete with closed texture. It also applies to components with flexurally rigid reinforcement, see clause 2.1.3.7, to hollow-wythe and to reinforced concrete structures with glass filler elements. The use of materials for plain and reinforced concrete and of components and construction methods which depart from this Standard will, under the building regulations, require permission from the appropriate highest-building inspection authority or from the authority designated by the latter, unless a general certificate of approval or a test mark has been issued. Steel girders in concrete which have a web depth constituting a substantial proportion of the thickness of the structural component should be designed in accordance with DIN 1050 or DIN 1073 so that they can resist the loads alone. If steel girders and concrete are joined together by a shear-transmitting connection so as to co-operate structurally, the component should be designed in accordance with DIN 1078 or DIN 4239. Trans. of Deutscher Normenausschuss (DNA). German Committee for Reinforced Concrete. Berlin, 1972 81p. Price to members $74.81.


ACKNOWLEDGMENT: NTIS PURCHASE FROM: NTIS NTIS Price

THE/TRANS-120

2A 093189

FRENCH CODE FOR REINFORCED CONCRETE-CC BA 68


ACKNOWLEDGMENT: NTIS PURCHASE FROM: NTIS NTIS Price

THE/TRANS-110

2A 093224

RESIN BOUND AGGREGATE MATERIAL SYSTEMS

Data are presented on composition, strength, modulus of elasticity and thermal expansion for polymer concrete material systems. Resin systems included polyesters, epoxies, and vinyl esters. Fine and coarse aggregate fillers in volume fractions up to 0.85 were incorporated into the resin binders. Fiber reinforcement of various types, lengths, and contents was incorporated into several mixes. By a judicious selection of resin modifiers and filler materials a wide range of densities and strengths may be obtained. Material property data on coefficients of thermal expansion, bond strength, water absorption, and effect of elevated temperatures have been obtained.

Nass, DJ

ACKNOWLEDGMENT: NTIS PURCHASE FROM: NTIS NTIS Price

AD-A014141/6ST

2A 093434

SPlicing OF PRECAST-PRESTRESSED CONCRETE PILES

A broad range of splices for precast-prestressed concrete piles were evaluated, based largely upon information furnished by fabricators, designers, and proponents of the various splices. Basic considerations included size range, field time for splicing, approximate cost, availability, and construction usage. Data on the strength of the splices was obtained from tests during the study, from experience and tests conducted by others, and from theoretical and analytical studies. The cement-dowel splice was tested under hard and soft driving conditions. Study results indicate that the Herkules splice, the Anderson sleeve splice, and the cement-dowel splice would be most effective in fulfilling the needs of practical applications for highway and bridge construction in Louisiana.

Prepared in cooperation with Louisiana Dept. of Highways, Baton Rouge, Research and Development Section, Rept. no. 71-5C.


ACKNOWLEDGMENT: NTIS PURCHASE FROM: NTIS NTIS Price

PB-245605/1ST, DOLT NTIS

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CONSTRUCTION MATERIALS

2A 093621
EFFECTS OF THE CLARY SCREED AND TUBE FLOAT ON RIGID PAVEMENT CONSTRUCTION

Effects of the Clary screed and the tube float, used as finishing devices on portland cement concrete pavement placed with a slipform paver, were examined on six construction projects. Alternate sections were finished with and without the Clary screed on three projects, and on three others with either none, two, four, or six tube float passes. Pavement roughness was measured with a California profilograph and surface mortar samples were tested for compressive strength. The screed, used without additional water, resulted in reduction of roughness and was not considered detrimental to the surface mortar. The tube float, normally used with a fog-spray of water, had little effect on roughness, and resulted in a substantial reduction in quality (compressive strength) of the surface mortar. Both devices helped close the pavement surface.

Amsler, DE; Bryden, JE

HP&R 25-5
ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Rept. PC, Microfiche

2A 093712
PROBLEMS OF THE NORTH, NUMBER 16, 1972

A partial listing of topic areas includes: Basic aspects of increasing efficiency of resource allocation in the North of the U.S.S.R.; Building in the North; Cost structure and evaluation of engineering solutions in the North; Some ways of reducing the cost of developing new machinery for the North; Ways of developing local food production and exploitation of biological resources in the North; Increasing the efficiency of production in the European North of the U.S.S.R.; The economic efficiency of the oil and gas industry of the Komi A.S.S.R.: Integrated development of building materials production and the construction industry in the European North; Comparative efficiency of thermal and atomic power generation in the Northeast; Role of ferrous metallurgy in the development of the resources of the far-eastern North. Methods of economic development and construction in the Canadian North: Problems and new concepts of mid-Canada development; The oil industry of Alaska: Improving the cross-country performance of vehicles under Arctic conditions.

Trans. of Problemy Severa (USSR) n16 p3-254 1972. See also AD-784 569.

National Research Council of Canada L Vol. 2 Z Z, Z, 422 pp

ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Rept. PC, Microfiche

2A 093757
EXPANSION JOINTS (A BIBLIOGRAPHY WITH ABSTRACTS) [Rept. for 1964-Sep 75]

Expansion joints relative to such widely separated applications as highways and spacecraft are reviewed in these Government-sponsored research reports. Highway and bridge applications are examined in Part 1. Miscellaneous applications such as railroads, underwater equipment, space vehicles, and artificial limbs, are investigated in Part 2.

Habercom, GEJ

ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS NTIS Price, /MF$25.00

2A 094326
TECHNIQUE FOR LINING SHAFT [Patent Application]

The patent application relates to a method and apparatus for lining large diameter, deep boreholes in the earth, which provides a relatively thick lining of cement. The boreholes are drilled with mud and the process of lining is carried out with the mud in place. A slip form is provided having a cylindrical outer wall of the diameter corresponding to the desired inner diameter of the liner. This is supported on a long central pipe through which cement can be pumped through side pipes and through openings in the wall of the slip form. A base unit is provided with an internal diameter substantially equal to that of the slip form. A petal basket of flexible material is provided to seal against the wall of the borehole.

Government-owned invention available for licensing. Copy of application available NTIS.

Cobbs, JH
Department of the Interior, Washington, D.C. PAT-APPL-580 111, 18, Filed 22 M. 20p

ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS NTIS Price, /MF$2.25

2A 094330
BRIDGES: CONSTRUCTION AND CONSTRUCTION MATERIALS (A BIBLIOGRAPHY WITH ABSTRACTS) [Rept. for 1970-Oct 75]

Bridge design, construction, construction materials, and the structural/mechanical properties are investigated in these Government-sponsored research reports. (This updated bibliography contains 223 abstracts, 119 of which are new entries to the previous edition).

Supersedes NTIS/PS-75/076.

Habecon, GEJ

ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS NTIS Price, /MF$25.00

2A 095267
RAPID EXCAVATION AND TUNNELING CONFERENCE, PROCEEDINGS, 1974

Proceedings (in 2 volumes) of the 1974 Rapid Excavation and Tunneling Conference (R.E.T.C.), held at San Francisco, California on June 24-27, 1974, that was sponsored by the Am Soc of Civ Eng and the Am Inst of Min, Metall and Pet Eng, contains 115 papers (some as abstracts only). Main topics covered by the papers were: civil applications and planning; site investigation; planning construction; small size tunnels; soil and rock mechanics; safety; environmental aspects; tunnel supports; materials handling; mining applications; shafts; legal aspects; engineering geology; tunneling machinery; as well as special techniques. Individual papers are provided with bibliographic references. Selected papers are indexed separately. This is a 2 volume report.

Pattison, HC; D'Appolonia, E Rapid Excavation and Tunneling Conf, 2nd Proc June 1974, 1843 pp

ACKNOWLEDGMENT: EI
PURCHASE FROM: American Inst of Mining, Metallurg & Petrol Engrs 345 East 47th Street, New York, New York, 10017 Repr. PC

2A 095273
PREDICTION OF SETTLEMENTS DUE TO TUNNELING IN SOIL: THREE CASE HISTORIES

Decisions regarding underpinning, real estate acquisitions and tunneling methods have in the past usually been made on the basis of conservative judgment. It now appears possible to inject a measure of rationality into this judgment, and as more case histories are recorded and digested, our confidence in the use of rational semi-empirical methods of prediction will improve. Monitoring of construction performance is required for construction control, reduction of costs, and increase of safety.


ACKNOWLEDGMENT: EI
PURCHASE FROM: American Inst of Mining, Metallurg & Petrol Engrs 345 East 47th Street, New York, New York, 10017 Repr. PC

124
2A 095274

SUBSIDENCE OVER SOFT GROUND TUNNEL
Knowing the potential causes of and being capable of reducing subsidence during a tunneling operation is important, as well as means of forecasting the magnitude and distribution of settlements prior to tunneling. This paper describes the existing soil and ground water conditions encountered, as well as the construction procedures used in advancing a machine-mined tunnel in soft ground. Settlement data obtained from a comprehensive instrumentation program during the construction phase of the tunnel further substantiates findings in soft ground. Settlement data obtained from a comprehensive instrumentation program performed during tunnel construction are presented. A favorable comparison is made between the data obtained for the tunnel in question and that published for other soft ground tunnels. This comparison makes it possible to apply a mathematical expression (the error function) to approximate the subsidence profile. An overall look at soil responses to construction practices and shield dimensions further substantiates findings that the magnitude of subsidence obtained in soft ground tunneling is directly related to the soil encountered and techniques used to reduce the magnitude of source disturbance in the area of tunneling.


ACKNOWLEDGMENT: EI
PURCHASE FROM: ESL Repr. PC, Microfilm

2A 095278

PRE-FORMED LININGS IN TUNNELLING PRACTICE
Based on a detailed description of the applications for preformed metallic and concrete segmental lining in Europe and North America paper concludes that the use of pre-formed segmental linings instead of in situ placed linings in tunnels will predominate where the physical characteristics of the ground require the placing of a support system quickly after excavation and where economic considerations show that a permanent lining can be achieved in a single process. These linings are more usefully employed in soft ground, possibly water bearing, varying from sands and gravel through cohesive clays, mudstones and chalks rather than hard rock conditions although even in regard to the latter the choice must depend on the degree of competence of the rock. A reduction in lining thickness in some grounds may be achieved by allowing the newly excavated cavity at a tunnel face to redistribute ground stress before placing the permanent lining. Because of the time element, and the need to protect the tunnel, either a temporary flexible support is required or pre-formed linings must be devised which will partially collapse through frangible packings to take up the initial deformations of the ground. In the former case a permanent lining would eventually be formed to encompass the temporary work, while the latter in a single construction perhaps provides the more economic solution.


ACKNOWLEDGMENT: EI
PURCHASE FROM: American Inst of Mining, Metallurg & Petrol Engrs 345 East 47th Street, New York, New York, 10017 Repr. PC

2A 095557

RESOURCES AND ECONOMICS
"Asphaltic Bitumin in Australia", which is the first paper in this session, discusses the history of bitumen supply, examines the interaction between bitumen specifications, availability, cost and price, and shows that small changes in specifications can cause large changes in availability and cost. This necessitates a continuing review of specifications to ensure the maximum economy of resources. Bitumen examination must give consideration to the whole road structure. A plea is made for the adoption of specifications based on fundamental engineering units. This will enable the designing of road structures on rational engineering principles. The availability of local materials is discussed as well as the possibility of upgrading desired characteristics of bitumen binders with materials such as sulphur, rubber and plastics. The second paper "Strategies and Economics in Using Bituminous Materials" starts from the purpose of road pavements and service to the user, and identifies the kinds of pavement management strategies most appropriate in a condition of rapid change, and what the consequences are if efficient use is to be made of bituminous materials. It is deduced that most efficient construction and maintenance choices will be made if pavements are continually monitored and the final selection of pavement treatment is made as late as possible. This implies that initial pavement design and construction must be consciously chosen to allow maximum freedom of choice when such maintenance or rehabilitation becomes necessary. By corollary, changes in design approach and in selection of bituminous and associated non-bituminous materials follow. In the field of economic choice for particular works, complementary changes in the balance between materials choice, design input and quality control result.


Andrews, JH (Queensland Main Roads Department, Australia) Dec. 1974, 35 pp, 10 Fig., 4 Tab., 5 Ref., 6 App.

2A 095558

BITUMINOUS MATERIALS
Specifications for paving bitumens, in addition to tests to indicate contamination, should control deformation response over the whole temperature and rate of loading ranges encountered by the material in use, and also indicate its tendency to harden or otherwise deteriorate during handling and service. Deformation response from the highest handling temperature to the maximum pavement temperature is predominantly viscous and specification of viscosity limits at 70 and 130 deg C gives control of response in this temperature range. The simple assessment and specification of deformation response in the lower part of the service temperature range remains a problem but the effect of temperature can be assessed by a 'constancy' measurement in the lower part of this range. This could either be an 'apparent' viscosity measured on the sliding plate viscometer at 25 deg C, a penetration test at 15 deg C or the Frass brittle test. The California Rolling Film Oven test is preferred as a means of assessing hardening and deterioration in handling. Increase in viscosity at 60 or 70 deg C gives a measure of hardening and a low ductility after treatment gives an indication of either breakdown in the structure of the bitumen or of one with an unacceptably high temperature susceptibility in the service temperature range.

Conference on the Efficient Use of Bitumens, Asphalts and Tars as Paving and Construction Materials, Sydney, Australia, 2-3 December 1974; Session 3.

Kerr, D (Department of Mines and Energy, Australia); Major, NG (Ministry of Works and Development, New Zealand) New South Wales University, Australia Dec. 1974, 21 pp, 1 Fig., 7 Ref.

2A 095559

BITUMINOUS SEALS
The design procedure based on estimated void content and average least dimension of an aggregate layer is presented in this paper on sprayed bituminous seals. Factors considered in this process (which is extensively used for single application and surface treatments which serve as seal coats), include nominal aggregate size, shape, crushed or screened products, spreading rate, aggregate texture and surface condition, binder, cutting and flushing effects of underlying pavement surface, pavement temperature and traffic compactive effects. Emphasis is placed on hot cut bitumen binders, and some reference is made to emulsified binders, slurry seals and seal coat combinations. The paper sets forth the fundamental propositions and discusses in detail the selection of aggregates. Basic assumptions, design procedures, adjustment of residual cold spray rate and recent design references are detailed. Discussions are presented on theoretical voids assumption and field control of binder viscosity. The functions, and selection of primers are discussed, and the control of processes (management training, plant, materials, records, safety, traffic control, and the neatness of the job) is described.

Conference on the Efficient Use of Bitumens, Asphalts and Tars as Paving and Construction Materials, Sydney, Australia, 2-3 December 1974; Session 3.

Dickinson, EJ (Australian Road Research Board) New South Wales University, Australia Dec. 1974, 17 pp, 7 Fig., 11 Ref., 1 App.

ASPHALT PAVING
The various aspects are reviewed which influence the selection of the type and properties of the surfacings and materials, as well as their design, construction and rehabilitation. These are discussed within the framework...
of the structural requirements which include factors such as load dependent characteristics permeability and wear resistance. The operational requirements covered here include resistance to skidding and aquaplaning, spray reduction, improved riding quality, and reduction of tire-road noise. Characteristics of the most commonly used asphaltic surfacings namely, the dense-graded (continuous and gap-graded mixes) and open-graded types are examined. The design methods used are briefly reviewed and examples are given of criteria applicable in South Africa. The discussion of the materials used for asphalt surfacings, directs attention on aggregates, binders, bitumens and tars. Reference is made to the modification of the latter two matrices to improve their performance. Important construction aspects are reviewed, the requirements of quality assurance are discussed, and comments are made on the performance of the types of surfacing described. Factors that need to be considered when surfacings are maintained are noted. Aspects such as process control, and statistical methods of quality assurance are covered, as well as the critical states with regard to maintenance.


Kuehn, SH (National Institute for Road Research, South Africa) New South Wales University, Australia Dec. 1974, 26 pp, 4 Fig., 7 Tab., 18 Ref.

2A 095561
TARS AND THEIR APPLICATION
The nature of coal tars and their variation in composition arises from differences in the rank and type of coal carbonised, and the pyrolysis conditions used. Conventional tars from gas work and coke oven, sources are contrasted with low-temperature tars produced by static, fluidised, or entrained-bed techniques. Characterization of road tars and pitches is discussed with reference to viscosity of road tar and the softening point of pitch. The use of these materials in road construction is summarized. The main advantages of tar over bitumen are better adhesion to stone, greater skid resistance, and better resistance to fuels and mineral oils. Tar, however, has the disadvantage of higher temperature susceptibility. Tar-bitumen mixtures are useful in improving adhesion, anti-stripping properties and skid resistance of bitumen, and in lowering the temperature susceptibility of road tar. Pitch-bitumen mixtures could improve the skid-resistance of hot-rolled asphalt. Tar-polymer mixtures exhibit properties superior to those of tar. Natural and synthetic rubbers have been blended into road tars. Addition of polyvinyl chloride has proved useful for special purposes. Good performance has been noted in low-volatile tars which are manufactured by raising the ratio of anthracene oil II to anthracene oil I from 0.7 to between 1.3 and 3.0. The use of tar for paving is foreseeable to increase as the supply of petroleum dwindles. Conventional coke oven tar will be a major source, polynvinyl chloride, the cheapest of synthetics, costs about $200 per ton and does not have the desired properties. Synthetic petroleum processes are briefly reviewed. Chemical products made directly from brown coal are theoretically possible. Such products may be used (possibly) to form three dimensional chemical links in the road itself (analogous to concrete setting). Product costs for various synthetic liquid hydrocarbon products are discussed.


Siemon, SR (Melbourne University, Australia) New South Wales University, Australia Dec. 1974, 4 pp

2A 095574
HIGHWAY MATERIALS AS AGGREGATE-BINDER COMPOSITES
For many years engineers and scientists in geology, soil mechanics, and paving technology have contributed their efforts to improve the quality and economy of materials used in highway construction. Yet there has been a tendency to neglect the fact that the materials the specialists study possess a common denominator: All are aggregate-matrix composites. This paper provides a tentative classification of the materials involved in these 3 fields to support the claim that they can be organized by the systems approach. Unfilled binders, such as clay and asphalt cement, occur at one extreme of the composite spectrum; unbound fillers, such as clean sand and rock base, occur at the other. Examples are cited from particulate, viscoelastic, and graphic models that have interdisciplinary acceptance in displaying the rheological behavior of highway materials. In education, it is not enough that the student be taught how much different one conventional paving material is from another. More use should be made of those phenomenological tools and physical testing procedures that will enable the student to use the diverse combinations of fillers and binders being created to meet pressing economic and ecological needs.

Alexander, RL (California State University, Long Beach) Transportation Research Record No. 155, 1974, pp 124-131, 3 Fig., 1 Tab., 29 Ref.

Purchase from: TRB Publications Off. PC

2A 096024
CHEMICAL AND PHYSICAL PROPERTIES OF SABKHA-TYPE MATERIALS
Saline-earth materials, known in the Arabian peninsula as sabkhas, are used locally for road construction because of the lack of conventional road-building materials in the area. The identification and selection of sabkhas that are suitable for road construction present many problems because the moisture environment to which they are subjected greatly affects their field performance. This report describes an investigation into the chemical and physical properties of these materials and suggests tentative criteria for the selection
of sabkha for road construction on the basis of its chemical composition and particle size distribution. However, more experience of the performance of the material in controlled road trials is required before firm criteria can be established. A method for the quantitative chemical analysis of sabkha is also given. [Author/\textit{TRRL/}]

Russell, RBC
Transport and Road Research Laboratory TRRL SR 79 UC, 1974, 24 pp, 8 Fig., 2 Tab., 3 Phot., 13 Ref.

\textbf{ACKNOWLEDGMENT:} Transport and Road Research Laboratory (IRRD 211756)

\textbf{PURCHASE FROM:} Transport and Road Research Laboratory Crowthorne, Berkshire RG11 6AU, England Orig. PC

\textbf{2A 096026}
\textbf{MEASUREMENT OF GROUND MOVEMENTS DURING A BENTONITE TUNNELLING EXPERIMENT}

The report describes the ground movement and pore-pressure measurements carried out during the construction of an experimental tunnel at new cross, London using the bentonite tunnelling process. The measurements confirmed the ability of this process to limit ground settlements in reasonably dense cohesionless soils to values similar to those produced by conventional tunnelling methods in London clay. [Author/\textit{TRRL/}]

Boden, JB \textit{McGaul, C}
Transport and Road Research Laboratory TRRL LR 653, 1974, 20 pp, 9 Fig., 2 Phot., 4 Ref.

\textbf{ACKNOWLEDGMENT:} Transport and Road Research Laboratory (IRRD 211764)

\textbf{PURCHASE FROM:} Transport and Road Research Laboratory Crowthorne, Berkshire RG11 6AU, England Orig. PC

\textbf{2A 096037}
\textbf{USE OF SOLID BY-PRODUCTS FOR IMPROVING CONSTRUCTION}

Possible solutions for the use of solid waste products in construction are examined together with their quantities and costs. Details are given of previous research results. Techniques utilised in outer space studies were applied to evaluate new types of construction materials such as beer bottles, tyres, plastic containers, and animal matter for road construction use. [\textit{TRRL/}]

Bynum, D \textit{(Texas Engineering Experiment Station;)} \textit{Evertson, JF Fleslht, HO Ray, DR (Texas A&M University) Materiaux et Constructions, \textit{Essais et Recherches Vol. 5 No. 28, 1972, pp 221-229, 63 Ref.}}

\textbf{ACKNOWLEDGMENT:} \textit{Laboratoire Central des Ponts et Chaussées, Transport and Road Research Laboratory (IRRD 100917)}

\textbf{2A 096078}
\textbf{MOVEMENT OF MATERIALS [El Movimiento de los Materiales]}

Machines for handling materials on site can be divided into two groups. The first group, dealing with the short-distance continuous transport, comprises fixed conveyors, articulated bucket chains, screw feeders, pneumatic conveyors and vibratory equipment. The second group comprises earthmoving equipment and vehicles such as trailer-type lorries and dumpers. If the movement is vertical or nearly vertical, lifting machines are used; for example; lifts, hoists, cranes, etc. The operation of the various types of equipment listed is described. [\textit{TRRL/} [Spanish]]

Garcia, HE \textit{ATEMCOP} No. 28, May 1972, pp 11-21, 8 Fig., 7 Phot.

\textbf{ACKNOWLEDGMENT:} \textit{Transportation \&Soil Mechanics Laboratory, Spain, Laboratoire Central des Ponts et Chaussées, Transport and Road Research Laboratory (IRRD 100899)}

\textbf{2A 096249}
\textbf{CONSTRUCTION OF THE I-40 REINFORCED EARTH EMBANKMENT}

The materials construction procedures and techniques used in building reinforced earth structures are described, and the site conditions on the 4-mile section of Interstate 40 are briefly reviewed. Three basic reasons for failure are given which relate to the permeable colluvial veneer, the impermeable, underlyIng clay shale, the differences in permeability, and the perched water. The successful functioning of the Reinforced Earth depends on sufficient friction between the soil and the reinforcing strips to prevent slipage, and sufficient density of reinforcing strips in the soil mass to prevent failure. Galvanized steel or aluminum strips are used as the reinforcement in the soil mass. The essential elements of the construction consisted of facing elements, granular backfill, reinforcing strips, and cork or polyfoam filler.

This article was taken from the Proceeding's of the 56th Annual Tennessee Highway Conference, Knoxville, April 25-26, 1974.

Trolinger, WD (Tennessee Department of Transportation)
Tennessee University, Knoxville Bulletin No. 40, Jan. 1975, pp 24-32, 4 Fig.

\textbf{2A 096289}
\textbf{NATIONAL COAL BOARD COLLIERY SHALES-SOME TECHNICAL AND ENVIRONMENTAL CONSIDERATIONS IN THEIR DEVELOPMENT AND USE}

"Colliery shale" which is a general term describing minerals associated with coal consists of clay minerals (50-80 percent), pyrite (0-10 percent) and a residue of quartz. The desirability is indicated for describing the material as minestone and the material from older tips where combustion has occurred as "burnt shale". Characteristics of these two classes are identified. Current use of colliery shales may be generally extended to from screened burnt shale on running tracks and tennis courts through the range of road uses from fill to land reclamation and sea defences. The results of research indicate that stabilized minestone provides a material suitable either as CBOM or as sub-base. Other uses include various hard standing areas such as pathways, car parks, etc., as well as low and medium strength masonry blocks. Work is in progress on the use of heat-treated minestone as an aggregate.


Behrens, \textit{S} (National Coal Board Minestone Executive, England)

\textbf{PURCHASE FROM:} Planning and Transport Res and Computation Co Ltd 167 Oxford Street, London W1, England Orig. PC

\textbf{2A 096290}
\textbf{NEW DEVELOPMENTS IN GROUND CONSOLIDATION TECHNIQUE}

The vibroflotation methods are described (which consist essentially of surface vibration or rolling) in which a metal tube is inserted into the ground which has within its lower end an electric motor driving an eccentric weight, by this means imparting vibrations into the ground as the tube was inserted to a required depth. Limitations encountered when dealing with sands of high silt or clay content are discussed. Treatment of the ground by the "stone column" process is described, as well as treatment by the Dynamic Consolidation process. The latter process (which is suitable for large areas where the ground is of non-cohesive granular materials, partially, saturated clay fills & older deposits of refuse and other debris) consists of facing elements, granular backfill, reinforcing strips, and cork or polyfoam filler.


Trolinger, WD (Tennessee Department of Transportation)
Tennessee University, Knoxville Bulletin No. 40, Jan. 1975, pp 24-32, 4 Fig.
CONSTRUCTION MATERIALS

2A 096291

REINFORCED EARTH ON M62 MOTORWAY

A new technique is outlined for reinforced earth structures (made up of soil, reinforcement and facing unit) in which the vertical reinforcing member is incorporated with the horizontal reinforcement and the facing is a non-structural unit. On the basis of economy, galvanized mild steel traps were chosen for the horizontal reinforcement. A block of 100 straps supporting a section near the middle of the wall was made of glass fiber roving impregnated with polyester resin as an additional experiment. The facing unit was a hexagon based pyramid, 125 mm deep and measuring 600 mm across the flats. A glass reinforcement cement was used for the facing unit. Bunter sandstone from a borrow pit on site was used as the fill material. A discrete gap was formed between each facing unit. Details of construction are briefly described. Construction was in layers with the facing keeping pace with the fill. The maximum area of wall completed including backfilling by 2 men in one day is 60 sq. m. Three general categories of problems have risen with the use of new construction techniques and materials. These problems are related to: the internal stability of the wall and the adequacy of the present design methods and assumptions, the problem of corrosion or damage of the materials forming the structure, and the general behaviour of the wall and its capacity to accommodate differential settlements and externally imposed stresses, and the internal strain movements of the wall. Comparisons are made of reinforced earth construction costs using the new method and the costs using the French methods.

Presented at Seminar X (Road Design 1: General Topics) of the PTRC Summer Annual Meeting, Warwick University, England, 8-12 July 1974.

Jones, C J F (West Yorkshire Metropolitan County Council, Eng) Planning and Transport Res and Computation Co Ltd PTRC/P/108, July 1974, pp 246-255, 3 Fig, 8 Ref.

PURCHASE FROM Planning and Transport Res and Computation Co Ltd 167 Oxford Street, London W1, England Orig. PC

2A 096371

SOIL STABILIZATION TEST AT THE SWEDEN BRIDGE IN VIENNA-A NEW APPLICATION OF RADIO NUCLIDES IN BUILDING (Badenverfestigungsversuch Bei Der Schwedenbuecke In Wien Ein Neues Anwendung Von Radionucliden In Der Bauwirtschaft)

As part of the preliminary work for the construction of the underground railway tunnel tubes under the Danube canal, experimental injections were made to stabilize the soil, but these were not successful. Following this an attempt was made to develop a control procedure for routine injections using radioactive marking substances. Based on measurements made of filter rate (through the inspection equipment) are described in detail. The results of the four tests showed that the method used appears to effect a workable control of injections for stabilization and possible also for support. /TRRL/ [German]

Rank, D Nusthaumer, W Osterreichische Ingenieur Zeitschrift Vol. 16 No. 10, Oct. 1973, pp 311-318, 8 Fig.

ACKNOWLEDGMENT: Road Safety Board, Austria, Federal Institute of Road Research, Inzel, W Ger, Transport and Road Research Laboratory (IRR 301715)

PURCHASE FROM ESL Repr. PC, Microfilm

2A 096407

ASPHALT PAVING IN 1974

This discussion of the prudent use of asphalt, reviews engineering design considerations, engineering construction methods, techniques and specifications, as well as the engineering of maintenance. Full depth asphalt pavements, planned stage construction, and soil-asphalt mixes are economical design factors. The placement of asphalt mixes in thick lifts will achieve both greater density and fewer lifts. Lower mix temperatures coupled with greater density, can produce high performance pavements. Further, the use of high performance mixes (to pug out mix at 250 deg F and haul it in insulated trucks) and the substitution of other asphalt products for cutback asphalts also require attention. The utilization of the correct maintenance techniques are advocated, and the areas of surface preparation treatment, surface preparation, rejuvenation and heater planning are also considered.

This paper was presented at the Twenty-Third Annual Arizona Conference on Roads and Streets.

Boring, JE (The Asphalt Institute, Phoenix) Arizona University Proceeding Apr. 1974, pp 102-106

PURCHASE FROM Arizona University Transportation and Traffic Institute, Tucson, Arizona, 740418 Repr. PC

2A 096435

CONVENTIONAL CHIP SEALS AS CORRECTIVE MEASURES FOR IMPROVED SKID RESISTANCE

Chips seals are used to improve the surface friction or skid resistance of streets and highways. Their desirability is discussed. Properties including aggregate gradation, type, size, and mineralogy and surface texture are reviewed; bituminous binder type, viscosity, and amount are discussed and related to field efficiency. Relations of factors associated with the binder and the aggregate are evaluated. Also evaluated are design, construction, and performance to improve skid resistance of the finished surface.

Gallaway, BM Epps, JA (Texas Transportation Institute) Transportation Research Record No. 523, 1974, pp 97-109, 10 Fig., 2 Tab., 64 Ref.

PURCHASE FROM TRB Publications Off Orig. PC

2A 096663

TUNNEL CONSTRUCTION IN ARTIFICIALLY FROZEN SOIL [TUNNELBYGGNAD I FRYST JORD]

This is a description of a tunnel construction project in Gothenberg, Sweden, especially two parts of the tunnel, driven through soil. The freezing of the soil, a sandy silt and a till were performed by means of evaporation of freon gas in steel pipes surrounding the tunnel tube. The pipes had the same strength as the respective part of the tunnel and were installed parallel to the tunnel tube in a circle, 700 mm outside the tube. Thus a layer of frozen soil about 1 m. thick, surrounded the tunnel tube. /TRRL/ [Swedish]

Groenblad, G Karlsson, L Bognasindustrin Vol. 44 No. 20, 1974, pp 22023, 1 Fig., 2 Phot.

ACKNOWLEDGMENT: National Swedish Road & Traffic Research Institute, Transport and Road Research Laboratory (IRR 2105345)

PURCHASE FROM National Swedish Road & Traffic Research Institute Fack, S-581 01 Linkoping 1, Sweden Repr. PC

2A 096693

STATISTICAL STUDY OF DISORDERS IN DEEP EXCAVATIONS [Etude statistique des desordres dans les fouilles a grande profondeur]

The decomposition of soil is classified into two types: powdery soil of low cohesion, and slightly powdery cohesive soil. Six statistical curves are proposed which express the percentage between the number of disorders and the number of excavations studied. Some observations of an experimental nature are presented to facilitate the discussion on the shape of the different curves. See IRRD abstract no. 100334. /TRRL/ [French]

Presented at the 5th European Conference on Soil.

Collin, B Dulfour, C Sociedad Espanola de Mecanica del Suelo y Cemento Conf Paper 1972, pp 445-459, 7 Fig.

ACKNOWLEDGMENT: Transportation & Soil Mechanics Laboratory, Spain, Laboratoire Central des Ponts et Chaussées, Transport and Road Research Laboratory (IRR 100346)

PURCHASE FROM Sociedad Espanola de Mecanica del Suelo y Cemento Laboratorio del Transporte y Mecanica del Suelo, Alfonso XII, Madrid, Spain Repr. PC

2A 096715

PAVEMENT STRESSES AND MECHANICAL TRIAXIAL TESTING OF PAVEMENT MATERIALS

The potential of the simple triaxial test for investigating the non-linear mechanical behaviour of bitumen-bound and unbound granular pavement materials and soils is discussed in relation to the stress regimes encountered in practice. The discussion is based on the use of the stress invariants as measures of the magnitude and nature of the stress system. The triaxial test imposes severe limitations on the possible values of the invariants, which make it impossible to use the test to simulate many of the stress regimes encountered in pavements. In general, the limitations imply a unique relation between the invariants, independent choice of which is generally impossible. Within a limited region, however, the relation is not unique, and some scope
The screed which is identified as the heart of the paving operation, smooths out irregularities in the mix with a floating action, while its weight provides the first stage of compaction of the pavement. The screed's sensitivity and expanded clay or gravel construction projects on highways serving average daily traffic volumes of 1000 vehicles per lane and greater shall be provided with a plant mix seal mix. Study data have prompted regulations which require that a slag, aggregate, and the fact that PMS surfaces that contain excessive fines seemed stabilised. It is best to lay BG by a spreader if the subgrade is strong enough, otherwise a grader must be used. The first course must then be at least 15 cm. The pavement is more even when laid by spreader; 20 cm can however be spread by grader and remainder by spreader. If the subgrade is strong enough then it is best to lay 25 cm course with a spreader, while on weak subgrades 2-3 courses are more suitable. /TRRL/ [Swedish]

Acknowledgement: Transport and Road Research Laboratory (IRRD 200932)

Purchase from: Verlagsgesellschaft Rudolf Mueller Stolberger Strasse 84, D-5000 Koeln-41, West Germany Orig. PC

2A 096962

SOIL STABILIZATION FOR THE CONSTRUCTION OF THE HAMBURG- FLENSBURG-KIEL MOTORWAY [Bodenverfestigung Bein der Bab Hamburg-Flensburg /Kiel] Most of the motorway subgrade consists of uniform, frostproof fine sand. By means of cement stabilization it provides a good support for the bituminous roadbase. Since coarser road materials are not available in Schleswig-Holstein, the method was also very economical. The contract specifications for the 15 cm thick stabilized layer are described, including compressive strength after 28 days (50-125 kg/sq.cm); compaction (103% Proctor density); difference in level (between 1 and -4 cm). In addition, the mixing and compaction equipment is described and illustrated. /TRRL/ [German]

Engelmann, KH Strassenbau-Technik Vol. 25 No. 18, Sept. 1972, pp 53-56, 9 Fig.

Acknowledgement: Transport and Road Research Laboratory (IRRD 200932)

2A 096986

CONSTRUCTION GUIDE FOR SOILS AND FOUNDATIONS This book is intended to provide contractors and subcontractors with the practical aspects of foundation construction. It discusses soils, soil behaviour and the construction of foundations, emphasizing that the soil is as much a part of the overall structure as are the components of the superstructure. Potential problems in specifications, contracts, soils data, etc., are pointed out and some solutions offered. Special emphasis is given to: the importance of obtaining all available information on subsurface, rock, and groundwater conditions; the difficulties in the installation of specialized foundation elements such as piles, caissons and underpinning; and the necessity for the proper engineering of all temporary construction, excavation slopes, sheeting and bracing, and other measures to prevent property damage. /TRRL/
USE OF MINING AND METALLURGICAL WASTES IN CONSTRUCTION

With the depletion of natural industrial mineral resources, such as construction aggregates, and the increasing emphasis on the protection of the environment from expanding waste generation, it is critical that the utilization of various secondary products and wastes as construction materials be examined. The increased use of mining and metallurgical wastes in construction will decrease the demand on the available natural resources and help to solve many perplexing disposal problems in industrial areas. Trends in the utilization of mining and metallurgical waste in construction have been determined from general waste recycling surveys of North American and British construction agencies, supplemented by literature surveys. This information is being incorporated into a database on waste utilization that is continually updated. In some cases laboratory studies on particularly promising secondary products and wastes, such as taconite tailings, slags, spent pickle liquors, fly ashes, waste limes, etc., have been conducted. Some of these studies, and other examples of potential waste recycling in construction, are presented to indicate the trends in utilization, some of the techniques developed for particular applications, the general economics involved and requirements for future research.

Emery, JJ
McMaster University, Canada Paper 18, June 1974, 12 pp, 6 Tabs., 35 Ref.

APPLICATIONS OF THE FINITE ELEMENT METHOD TO GEOTECHNICS AND TRANSPORTATION ENGINEERING

The potential uses of the finite element method are described with particular reference to problems in geotechnics and transportation engineering, and several research projects are outlined. The details are given of the numerical techniques in which, instead of considering the structure or continuum as a whole, the behavior of each constituent part is studied and then combined to predict the behavior of the whole. The technique can be extended to two (basic element is a triangle) and three (basic element is a tetrahedron) dimensional analyses. Problems in both structural and nonstructural types can be solved with a minimum of oversimplifying identifications. The major advantages of the method stem from its simplicity in handling nonhomogeneous, nonuniform, and nonlinear media with irregular shape and cross-section, which are typical of natural geologic and soil formations. Care must be exercised in selecting input data for finite element analyses. The finite element method can be used in geotechnics and transportation engineering as a tool for design and analysis, monitoring and control of construction, location of instrumentation analysis, analysis of laboratory specimens, and field evaluation of material parameters. The need is indicated for the development of constitutive laws for describing material properties.

Proceedings of the Ohio River Valley Soils seminar held October 5, 1973. This conference was sponsored by the Kentucky Soil Mechanics and Foundations Group of the American Society of Civil Engineers.

Huang, YH (Kentucky University) American Society of Civil Engineers 14 pp, 14 Fig., 18 Ref.

TRENDS IN THE UTILIZATION OF WASTES FOR HIGHWAY CONSTRUCTION

A study involving the characterization and potential utilization of (municipal, mining and metallurgical) wastes and secondary products is reported which placed emphasis on information retrieval (to determine previous and current effort in this area), obtaining information on particular wastes that show promise, laboratory characterization and usage studies, and design implementation and field studies. Emphasis is placed on metallurgical wastes and examples are given of application of this approach to secondary products and wastes such as slags and taconite tailings. A computerized waste utilization data bank was developed which has been made (to increase its efficiency) a subset of a general Civil Engineering Reference Program (GERF). Trends in blast furnace and steel slag usage are tabulated. Steel slag has a high unit weight (120 lb/cu ft average) and a potential expansive behavior. Quick test procedures to measure the expansion potential have been developed and are being used in the investigation of the effects of steel slag types, age, acid treatment, gradation changes etc. on expansion. Nickel slag has been successfully used as subbase and base course material in highway construction and has established itself as the best ballast used on the CN system. An extensive study was made of steel slag bituminous mixes and some of the more important characteristics are tabulated. Comments are made on their skid resistance, dynamic moduli, and high compacted weight. Steel slag precoated chippings and slurry seals are also considered. Current research is reported on fine-grained self-cementing pelletized blast furnace slag for use in stabilized base construction. The applications in highway construction of spent pickle liquors and sulphite liquors are discussed. The utilization of tailings in tailings is discussed, and research on the use of taconite tailings in bituminous concrete is outlined.

Emery, JJ Kim, CS McMaster University, Canada Paper 19, 19 pp, 7 Tab., 56 Ref.

CORROSION OF REINFORCEMENT IN REINFORCED CONCRETE AND REINFORCED BRICK CONSTRUCTIONS

The paper presents the results of an investigation into the causes of corrosion of reinforcement in reinforced concrete and reinforced brick constructions. It suggests permissible limits for the salt contents of the different constituents of concrete, and discusses briefly some of the methods of prevention of corrosion. /Author/ TRANSL./

Rajagopalan, KS Rengswamy, NS Balasubramaniam, TM Chandrasekaran, S (Central Electrochemical Research Institute, India) Indian Concrete Journal Vol. 48 No. 5, May 1974, pp 163-170, 8 Fig., 10 Tab., 17 Ref.

UNDERPASS THRUST AT BRENT CROSS FLYOVER

The thrusting of precast concrete tunnel boxes beneath the three-level flyover approaches at Brent cross is reported and claimed to be the largest thrust in the UK to date. The need for thrust boring was found to be essential, in order to meet the condition that access to the shopping centre should not interfere with the heavy traffic flow at the existing interchange. Details of the excavations required, materials used and methods employed in construction are given, together with diagrams and photographs, and the overcoming of the problem of pockets of soft material located in the line of thrust is described. The work was coordinated by Cementation Projects Ltd., and the other companies that were involved are listed. /TRANSL./

Highways and Road Construction Vol. 43 No. 1781, Jan. 1975, pp 10-12, 2 Fig., 3 Phot.

ACKNOWLEDGEMENT: Transport and Road Research Laboratory (IRRD 212067)
CONSTRUCTION MATERIALS

2A 097343
MOTORWAY PLANS AND DESIGN IN HUNGARY
This article gives a brief account of Hungary's programme for motorway construction, which is planned to total over 500 km by 1985. The M7 motorway from Budapest to the Yugoslav frontier is first discussed, which forms part of the European road E96. The design initially gives 2 x 2 traffic lanes, but will eventually provide 2 x 3 lanes with provision for further widening. Brief details are given of the pavement design (concrete overlying a bituminous gravel and stabilized soil), of bridge design and of surface water drainage. The first phase of construction has required the haulage of 4 million cu. m of earth and 200000 cu. m of replaced material. Similar information is then given for the M1 motorway which has a common origin with the M7 and runs to meet the Austrian section of the European road E5 at Hegyeshalom. The pavement structure is included to a roughened asphalt concrete wearing course, a rolled asphalt base course, a bituminous gravel base and a cement stabilized sub-base. The article includes a map showing the long-term plan for a high-speed highway network in Hungary. /TRRL/.

Highways and Road Construction Vol. 42 No. 1780, Dec. 1974, pp 13-14, 1 Fig., 5 Phot.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 212064)

2A 097346
AGGREGATES. ASPHALT PENETRATION MACADAM
[Agregados. Macadam betuminoso por penetracion]
This specification covers the quality and gradation of crushed stone, and gravel suitable for use in the construction of asphalt penetration macadam pavements, with asphalt bitumen, liquid asphalt or asphalt emulsion as binder. /TRRL/ [Portuguese, French]

National Civil Engineering Laboratory, Portugal Standard E295, Mar. 1974, 3 pp, 4 Tab.

ACKNOWLEDGMENT: National Civil Engineering Laboratory, Portugal, Transport and Road Research Laboratory (IRRD 211887)

PURCHASE FROM: National Civil Engineering Laboratory, Portugal Avenida do Brasil, Lisbon 5, Portugal Orig. PC

2A 097352
GUIDELINES FOR SAMPLING IN PHYSICAL SOIL TESTS ASSOCIATED WITH ROAD CONSTRUCTION [Merkblatt uber die Probenahme der Bodenphysikalischen Versuche im Strassenbau]
The guidelines have been drawn up by the Subcommittee on "Sampling", of the Working Committee on "Testing Technology" of the Working Group "Subsoil-Subgrade". They deal with principles to be observed during the sampling of granular and cohesive soils, and with the further processing of the soil samples and the cohesiveness of the sample. The various methods and the technical data related to them are summarized in a table. /TRRL/ [German]

Research Association for Road Communications, W Gr Standard 1972, 27 pp, 5 Tab., 17 Phot.

ACKNOWLEDGMENT: Research Association for Road Communications, W Gr, Transport and Road Research Laboratory (IRRD 300962)

2A 097356
SIGNIFICANCE OF THE PHYSICAL AND CHEMICAL PROPERTIES OF SM SLAGS FOR THEIR USE IN ROAD CONSTRUCTION [Bedeutung der physikalischen und chemischen Eigenschaften von SM-Schlicker fuer eine Verwendung im Strassenbau]
The study carried out enables defective Siemens-Martin slags to be eliminated, contributes to a useful knowledge of the slags and indicates a new source of raw material for road construction. After an analysis of chemical and mineralogical composition, the slag is tested for the occurrence and influence of lime and iron decomposition, blistering and insufficient crystal structure. Treatment with soft burnt lime means that these defects do not affect the slag as a construction material, and they are suitable for use in roads. /TRRL/ [German]

Schwiete, M-E Kroenert, W Deckert, K
Westdeutscher Verlag No. 2218, 1972, 104 pp, Tabs., Photos., 120 Ref.

ACKNOWLEDGMENT: Research Association for Road Communications, W Gr, Transport and Road Research Laboratory (IRRD 300976)

2A 097364
THE TRANSPORT OF FRESH CONCRETE THROUGH PIPES—PREREQUISITES FOR THE PERFECT PUMPING OF CONCRETE THROUGH PIPES HAVING SMALL DIAMETERS
[Die Foerderung des frischen Betons Durch Rohre—Voraussetzungen fur das Steiernfreie Pumpen von Beton Durch Rohre mit kleinen Durchmessern]
This book presents the results of numerous individual studies carried out at the institute for construction operations and construction machinery, Technical University of Berlin, and on a series of construction sites in Berlin and in the Federal Republic of Germany. An evaluation of the tests shows that the pumping of concrete in the rheological sense is a "plug flow" process. A disturbance-free operation can only be expected if the concrete is saturated with cement paste. The work examines all the factors which influence the pumping of concrete, explains the theoretical relations and illustrates the results in tables. The book is intended as an aid to the engineer to enable him to judge whether a concrete having a certain granular structure and a defined binder and consistency can be transported through small-diameter pipes. /TRRL/ [German]


ACKNOWLEDGMENT: Research Association for Road Communications, W Gr, Transport and Road Research Laboratory (IRRD 300990)

2A 097365
The 1972 edition replaces the 1964 edition. It has been adapted to changes in particle sizes and limit values. For practical application time limits are set for the changes in the rules. After definition of concepts the specifications and recommendations deal with subsoil principles, surfacing thickness, materials and mixture, construction of the surfacing, requirements of the surfacing and tests. A final table summarizes the new requirements and correct values in accordance with TV/Bf 3/72. /TRRL/ [German]

Research Association for Road Communications, W Gr Standard 1972, 34 pp, 28 Tab.

ACKNOWLEDGMENT: Research Association for Road Communications, W Gr, Transport and Road Research Laboratory (IRRD 300978)

2A 097389
SLURRY SEAL
The results are reported of two inspections of slurry seal projects in Ohio. The first was conducted to observe the condition and evaluate the performance of Slurry Seal on highway shoulders. Both inside and outside sealed shoulders were inspected after 4 winter seasons. The overall condition of the seal was considered at least as good as the results obtained with chip and seal and is expected to continue functioning without major maintenance. The method does not result in waste of aggregate, and surface drainage characteristics were good. The second inspection reports on the relatively new use of slurry seal on Ohio highways. Comments are made on the equipment and materials used, the work itself, field observations, and method of performance. The maintenance of quality control is covered, and the maintenance of traffic through the project is described.

Moli, LC Schimmelteny, RC


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CONSTRUCTION MATERIALS

PCC PAVEMENTS FOR LOW-VOLUME ROADS AND CITY STREETS

In an effort to provide information that may be utilized in decision-making by interested individuals (highway officials, design and construction engineers and others), detailed information is offered on planning, designing and constructing Portland cement concrete pavements for light traffic conditions. The accumulated experience of 20 years of highway agencies in several states and cities was utilized in developing this report. The data indicate that PCC pavement has a good probability of maintaining extremely low maintenance costs and a satisfactory level of service over a long period. The planning of the paving project is detailed and the importance of emphasized in a realiable forecast of traffic that will use the road over its projected service life. Subgrade conditions, exposure elements affecting performance, materials availability, and utilities in the pavement area are considered as well as equipment and construction expertise, pavement design life, costs, serviceability, performance, project size and funding. The physical characteristics required for acceptable performance of any pavement are listed, and aspects such as data development for design, geometric design and control of other design features are considered. Mixture proportions and thickness design are also discussed. Plans to handle local traffic during construction are important. Observations are made regarding subgrade preparation, materials handling, placing, vibrating and finishing. Various aspects of surface maintenance are discussed, as well as deicing chemicals, drainage and enforcement of load limits. A check list is provided as an aid to determine if the use of concrete pavement can offer the best long-term solution. Suggestions are made for reducing costs and upgrading quality. Research needs are identified.


Contract HR 20-5

ACKNOWLEDGMENT: NTIS
PURCHASE FROM: TRB Publications Off. Repr. PC, Microfiche, NTIS

BENEFICIAL USES OF SULPHUR IN SULPHUR-ASPHALT PAVEMENTS, VOLUME 2: TASK 2: LITERATURE SEARCH AND PATENT REVIEW

In an effort to exploit the available technology and evaluate the technical and economic potential of aggregate-asphalt-sulphur composites for use as highway pavement materials, the literature and patents were reviewed and a comprehensive bibliography and data bank was established. The work presented here is the result of the second phase of a study which attempts to provide a preliminary comparison of the engineering characteristics of sand-asphalt-sulphur with conventional asphaltic concrete pavements. Each article and patent was abstracted to provide a quick reference summary capability. The annotated bibliography on sulphur-asphalts is presented. This literature review will continue to be updated.

Sponsored by Bureau of Mines and the Sulphur Institute.

Gallaway, BM Saylak, D

BENEFICIAL USES OF SULPHUR IN SULPHUR-ASPHALT PAVEMENTS, VOLUME 3: TASK 3: PRELIMINARY DESIGN, CONSTRUCTION AND QUALITY CONTROL PROCEDURES

This effort, which represents the third phase of a study to provide a preliminary comparison of the engineering characteristics of sand-asphalt sulphur (S-A-S) with conventional asphaltic concrete pavements, presents a user manual and sets forth some preliminary specifications and recommended procedures for selecting an optimum mix design and constructing highway pavements with S-A-S composites. The manual on "Recommended Practices" explains the engineering, economic and ecological basis of the specifications and offers recommendations for the accomplishment of these requirements. Considerable information on sulphur is included, and details are presented on the preparation of paving mixtures, especially emphasizing tolerances and the effect of variations on the properties of the finished pavement. Paving equipment is reviewed. The manual on "Construction Specification" provides the basis for a contract agreement between the constructor of the highway demonstration facility and the sponsor of the project. The "Quality Control" manual relates largely to the paving materials and to the sampling and testing of these materials and compositions thereof. Raw materials, pavement mix design, and field sampling and testing are covered.

Sponsored by Bureau of Mines and the Sulphur Institute.

Gallaway, BM Saylak, D

RESEARCH INTO THE COMPACTION OF BITUMINOUS MATERIALS

After pointing out that good compaction increases durability, reduces deformation and increases stiffness and strength, the authors discuss present specifications and the methods used to measure the state of compaction. Studies of a number of factors that affect the state of compaction are reviewed: these include aggregate type, stiffness of working platform, binder content, compacting effort (including correlation between roller passes and level of compaction and their distribution across the laid width), traffic, roller speed, temperature, thickness of construction. Methods of increasing compaction on the nearside are laying the hard shoulder and nearside lane together and modifying the pattern of rolling operations. The relation between compaction and pavement performance is studied and a detailed investigation made of the deflection of the macadam base and its foundation, the dynamic modulus of the macadam and the tracking of cores at elevated temperatures. It is concluded that improving compaction improves pavement performance, and that it is possible to construct more economic macadam bases by reducing binder content and improving compaction. For the covering abstract of the seminar see IRRD abstract no 212145, /TRRL/

Lister, NW Powell, WD (Transport and Road Research Laboratory) Asphalt and Coated Macadam Association Conf Paper 1974, 54 pp. 23 Fig., 2 Tab., 14 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 211446)

AGGREGATES, WATERBOUND MACADAM [Agregados, Macadame Hidraulico]

This specification covers the quality and grading of crushed stone and crushed gravel suitable for use in the construction of waterbound macadam pavements. /TRRL/ [Portuguese]

National Civil Engineering Laboratory, Portugal Standard E 294, Mar. 1974, 2 pp. 2 Tab.

ACKNOWLEDGMENT: National Civil Engineering Laboratory, Portugal, Transport and Road Research Laboratory (IRRD 211866)
PURCHASE FROM: National Civil Engineering Laboratory, Portugal Avenda no do Brasil, Lisbon 5, Portugal Orig. PC

HIGHWAY CONSTRUCTION USAGE FACTORS FOR CEMENT, BITUMENS, CONCRETE PIPE AND CLAY PIPE

In an attempt to aid producers, manufacturers and suppliers of cement, bitumens, concrete pipe and clay pipe, usage factors are presented here in terms of units of the various materials per million dollars of construction cost. These factors, when multiplied by the number of millions of dollars for either a federal-aid or non-Federal-aid highway construction program, will result in reasonably accurate estimates of material requirements. The data employed in the development of usage factors are quantities of the major materials used and reported by contractors upon completion of highway construction projects on the Federal-aid Primary System. Investigations indicate that for comparable standards of design, material usage factors on non-Federal-aid work do not differ appreciably from those developed for Federal-aid construction. Estimated construction expenditures for all public highways are tabulated. A table is also presented of estimated national average secondary road factors.

Federal Highway Administration 1975, 5 pp. 5 Tab.
CONSTRUCTION MATERIALS

2A 098477
SOLID WASTE IN HIGHWAY CONSTRUCTION

The use has been demonstrated of mixtures of three power plant wastes (flyash, bottom ash and calcium sulphate) in paving parking areas. The parking area of Dulles International Airport, Washington, D.C. was paved with 3 inches of a compacted mixture of sulfate, lime, fly ash and aggregate on a compacted subgrade. About 75,000 tons of this mixture was placed at the rate of 1,000 tons per acre. The areas to be used for passenger car parking were given a bituminous seal primarily to retain poisture for curing, but which also served as the final surface. Two inches of conventional bituminous concrete was used to surface traffic lanes and bus parking areas.

Details are given of the materials used as well as the construction procedures. The processing is also discussed of incinerator residue through grinding, further hydration and fusion to form a slag-type aggregate. A research and development process is described which involves a stepwise approach to effecting the fusion of incinerator residue and together with the minimal use of supplemental thermal energy. The 4 sequential steps are: reduce the residue particle size to minus 1/16 inch by hammer milling; burn out remaining combustibles in a rotary kiln while simultaneously permitting all noncombustible particles to heat up to 1,600 deg F; fuse the noncombustible particles by permitting them to fall from the kiln into a pile that is heated to a relatively mild temperature of 2000 deg F where low melting gasses and oxides envelope unmelted high melting metals and oxides; cool the fused matrix at a controlled rate as it flows from the fusion furnace and is picked up on a moving grate conveyor leading to a crusher. Another approach to using incinerator residue is also outlined. Laboratory work indicates that satisfactory bituminous mixtures can be made with residue as the major portion of the aggregate, and field application of such mixtures used in black base construction has been made. Economic considerations, however, pose a serious deterrent to the use of waste products in highway construction.

Halstead, WJ (Federal Highway Administration) APWA Reporter Vol. 41 No. 6 June 1975, pp 14-12

2A 098641
LARGE-SCALE MODEL TEST OF DRILLED PIER IN SAND

A technique is presented for assessing the magnitude of skin friction for pier foundations in sand. The technique employs the results of interface direct shear tests between sand and the construction material: the results are presented in hyperbolic equation form. The test pier was 16 in. (407 mm) in diameter and 15 ft (4.6 m) long. The test pier was heavily instrumented with Carlson stress meters, electrical resistance strain gages, and calibrated hydraulic rams on the top and bottom of the pier. Comparisons of predicted and measured values of skin friction are shown. Bonded resistance strain gages on the vertical steel reinforcement are the most reliable instrumentation method. The magnitude of skin friction for "point bearing" piers in sand in prototype installations may approach 20%-30% of the total load capacity. /ASCE/

Clemence, SP (Missouri University, Rolla); Brumund, WF (Georgia Institute of Technology) ASCE Journal of the Geotechnical Engineering Div Proceeding Vol. 101 No. GT6, ASCE #11369, June 1975, pp 537-550, 6 Fig., 4 Tab., 32 Ref., 2 App.

2A 099298
DESIGN FOR FROST DURABILITY

Factors responsible for impairment of durability are identified, and means by which protection may be provided are described. The conditions of high moisture content, prevented or retarded moisture flow and excessive cooling rate occur often in combination and are particularly dangerous. Provision of more camber, a higher crown or a steeper slope is needed to achieve good drainage of horizontal surfaces. In design, allowance has to be made for poor workmanship to prevent the formation of puddles. Waterproofing of concrete pavement eliminates the principle mode of moisture penetration. Success, however, hinges upon the provision of good drainage of roadbed and dryness of the material at the time of curing. The presence of soluble chemicals in the pores should be avoided because they cover the vapour pressure of the liquid and therefore, for a given relative humidity, increases the degree of saturation. Frost protection in autumn and winter construction activities must be achieved by improving the properties of the building materials. "Hard-dried" bricks should be utilized if there is any likelihood of freezing. The dangers of frost action in concrete may be reduced by densification of the material to reduce the water-cement ratio of the mix.


PURCHASE FROM National Research Council of Canada Montreal Road. Ottawa, Ontario K1A 0R6, Canada Orig. PC

NRCC 14592

2A 099465
APPLICATIONS OF FIBRE REINFORCED COMPOSITES IN MARINE TECHNOLOGY

A review is made of existing marine applications of fiber-reinforced composite. Problems arising in the design of marine-type composite structures, including evaluation and selection of materials, structural analysis, bucking behavior and performance of connections, are discussed with particular reference to large, high-performance GRP hulls. Suggestions are made on items of research and development needed in this field. The greatest scope for increased application of fiber-reinforced composites in the marine field appears to lie in construction of medium-size hulls in the 20 to 40 m range, including particularly fishing boats, together possibly with large patrol boats and service vessels for the offshore gas/oil industry. While design studies for larger ships have indicated that GRP tankers, tugs, ferries and ferries of up to 80 m might prove economically viable, present cost figures suggest that GRP is unlikely to compete with welded steel construction in ships of over 50 m unless a special requirement arises, e.g. for carriage of corrosive cargo or, in the case of minesweepers, for a non-magnetic hull.


Smith, CS (Naval Construction Research Establishment) IPC Science and Technology Press Limited Proceeding Apr. 1974, pp 54-69, 70 Ref.

ACKNOWLEDGMENT: EI
PURCHASE FROM ESL, Repr. PC, Microfilm

2A 099621
TECHNICAL DAYS DEVOTED TO ROADS IN CORSICA-PART 2-LIGHTLY-TRAFFICKED ROADS [Journees techniques de la route de Corse-Deuxieme partie- Les routes economiques]

This article comments on papers dealing specifically with the constructional and administrative problems of lightly-trafficked roads. The first paper by remillon stresses the drawbacks of applying to lightly-trafficked roads paving study and strengthening methods used for heavily-trafficked roads. Proposals are put forward for the extensive utilization of local materials with a view to realizing large savings in construction costs. The second report by ceintrey recommends the use of non-conventional materials for the construction of low-cost roads, and emphasizes the need for close cooperation between laboratory and in-situ tests when developing new construction techniques. The last two papers by carter and lanore outline the experience of both authors in the administrative aspects of lightly-traf­ficked road construction in two departments of france (morbihan and doubs). Discussions of the papers are appended. /TRRL/ [French]

Remillon, M (Viafrance); Ceintrey, M Cartier Lanore Revue Generale des Routes et des Aerodromes Vol. 43 No. 484, Feb. 1973, pp 41-47, Figs., 2 Tab.

ACKNOWLEDGMENT: Laboratoire Central des Ponts et Chaussees, Transport and Road Research Laboratory (IRRD 101054)

2A 099743
TREATMENT OF SOFT FOUNDATIONS FOR HIGHWAY EMBANKMENTS

For the objective appraisal of all applicable construction alternatives, the present authors' plans include special foundation investigations. Right-of-way for some soft foundation construction alternatives may exceed usual requirements, and construction alternatives involving subsoil stabilization by consolidation require surcharge loading periods. The high costs of such additional investigations are, however, offset by the potential savings in construction costs. The applicable construction alternatives include (a) elevated structure, (b) embankment fill supported by piles, (c) excavation of soft soils and replacement by stable fill materials, (d) subsurface excavation with or without sand drains, and (e) no treatment whatsoever relying instead on specially detailed field investigations and design studies to achieve...
uniform settlements. Each alternative can be evaluated based on factors such as construction cost, maintenance, ecological and environmental effects, fill availability, and disposal area availability. Where subsoil stabilization involves vertical sand drains, the type of drain influences the design procedures. Where nondisplacement drains are used, field permeability tests are desirable because they result in a somewhat higher field coefficient of consolidation that will reduce the estimated consolidation time. Field permeability values should be reduced to account for effects of embankment loading. Extensive field instrumentation should be required where subsoil stabilization of the consolidation is used. Where subsoil consolidation techniques are used, field test sections are desirable to achieve maximum economy. Field test sections are also useful in ascertaining the technical feasibility of consolidation techniques where elevated structures or other techniques were preferred. The quality and amount of field inspection are especially important and can be related to the post construction behavior of the types of construction discussed.


PURCHASE FROM: TRB Publications Off Orig. PC

2A 09752

SITE PAVING WITH FULL-DEPTH ASPHALT CONCRETE:
FIRST STEP IN BUILDING CONSTRUCTION
The details are described of a cost-saving construction sequence which provides a guarantee that it can proceed without interruption by rain, snow or muddy conditions. The procedure consists of the construction upon a prepared subgrade, of a 4 to 6 in. thick, hot-mix asphalt concrete base course over the entire area that will ultimately be parking areas, service roadways, and buildings. Upon completion of all construction, a final wearing course is placed upon the hot-mix asphalt base. The prerequisites for site paving are set forth, and details are given of the composition of mixes, thickness, the asphalt bearing course, final asphalt concrete wearing course, and the excavation for structures.

Annales Agronomiques CL-12, May 1975, 4 pp, 2 Tab.

2A 125074

CHANNEL: FRENCH MINERS FIGHT CASCADE AS BRITISH MOLE BARES TEETH FOR PILO
The author gives an account of progress that has been made (up to the end of 1974) with the channel tunnel. Progress that has been made by the French near Calais, where trouble has been encountered in the access tunnel (descenderie) through the ingress of 120 litres of water per second is described. Extensive grouting of basement and cement has failed to waterproof the tunnel, and neither a small alpine roadheader nor a large Demag roadheader has been able to perform satisfactorily. A Robbins mole is now being tested and in order to bring it into use as soon as possible, an additional tunnel is being planned. Details are given of the progress made by the British near Dover, where both access tunnels (one 400m and the other 287m plus a 100m viaduct) and a 180m long assembly chamber have been driven, the latter 40m beneath the channel. The priestley 50m long tunnelling machine has also been assembled ready to commence work. Brief details are given of the proposed 3 phases of construction of the tunnel and the article includes information on the different conditions and policies in France and Britain. /TRRL/


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 212673)

PURCHASE FROM: Institution of Civil Engineers 26-34 Old Street, London ECIV 9AD, England Repr. PC

2A 125099

CRYOGENIC TREATMENT OF SHAFTS AND TUNNELS
One of the geotechnical processes able to contend with unstable or saturated soil conditions in civil or mining engineering, is that of soil-freezing. In this technique, a temporary conversion of the interstitial soil moisture forms a strong and impermeable frozen soil membrane around the excavation zone. With the development of cryogenic techniques, nitrogen is available in liquid form offering a rapid means of soil freezing. Typical applications of the technique include shaft deepening tunnel faces, sealing gaps in cofferdams and wherever temporary structural support is needed. Two examples are given of the use of soil freezing on a sewer tunnelling project in Edinburgh. /TRRL/

Harris, GP (Forbury Limited) Tunnels and Tunneling Vol. 6 No. 5, Sept. 1974, pp 69-70, 2 Phot.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 212703)

PURCHASE FROM: ESL Repr. PC, Microfilm

2A 125132

A CLIMATIC INDEX OF WEATHERING AND ITS APPLICATION IN ROAD CONSTRUCTION
Weathered rocks are the predominant natural road building materials in southern Africa and their performance depends very much on the type of rock and the climatic environment in which such rocks weather. Climatic conditions which lead either to the predominance of disintegration, due to physical weathering, or to decomposition, due to chemical weathering, are defined in terms of an n value which is expressed as twelve times the computed free-water evaporation during the warmest month divided by the total annual precipitation. The particular feature of the formula is the use of climatic parameters for one particular month as well as for the whole year. The impact of the n value on weathering, on soil formation and on secondary transformations of soils (pedogenic materials), as well as on human activities in engineering and agriculture, are briefly described and the n value is compared with the moisture index I of Thornthwaite. /Author/TRRL/

Weinert, HH (National Institute for Road Research, South Africa) Geotechnique Vol. 24 No. 4, Dec. 1974, pp 475-488, 4 Fig., 2 Tab., 22 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 212651)

2A 125162

This report summarizes replies obtained from 18 countries. It comprises nine chapters. Chapter 3 deals with the stabilisation of pavements in tropical and subtropical countries. It is mainly concerned with the technical arrangements to be made for the design and construction of pavements stabilized with cement, lime or bitumen. Chapter 4 considers the use of non-traditional materials for the construction of pavements, special binders (lime, slag, fly-ash, emulsion, fillers) laboratory tests, and in-situ tests for studying the performance of non-traditional materials. Chapter 5 deals with the behaviour of pavements under traffic and their strengthening under subtropical and tropical conditions. It shows the need for a detailed knowledge of traffic characteristics, the influence of the climate and that of the nature of the materials. Visual observations and deflection measurements under load are used to evaluate the need for strengthening. The subject of chapter 6 is corrosion prevention in subtropical and tropical countries and emphasis is laid on the wide variety of means of preventing erosion. Chapter 7 studies the influence of secondary roads on the economic and social development. Chapter 8 examines the maintenance costs of roads with a daily traffic volume less than 100 vehicles. In chapter 9 the problems of the total cost of the transport of 1 tonne of freight to the user as a function of the type of vehicles is discussed, but there exist too few data on transport costs as a function of vehicle axle load. The number of the covering abstract of the conference is irrd abstract no. 100978. /TRRL/ [French]


ACKNOWLEDGMENT: Laboratoire Central des Ponts et Chaussees, Transport and Road Research Laboratory (IRRD 100967)

2A 125180

COMPOSITION AND PHYSICO-MECHANICAL PROPERTIES OF BITUMEN [Constitution et proprietes physico-mecaniques des bitumes]
Following details of the manufacture of bitumen used in road construction from the distillation of petroleum, a study is presented of the composition
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of bitumen: asphaltene, malthene (resin, ore), carboid and carbene, and of molecular masses (comprised between 600 and 1200). Separation methods are reviewed by means of solvents, chromatography, and other techniques. Analytical methods are described: the physico-mechanical properties of bitumen are investigated from the rheological point of view: standard empirical tests, ductility and adhesion. The relation between composition and properties of bitumen is studied together with the evolution of bitumen in time by means of ageing tests and direct and indirect laboratory simulated ageing test methods. The evolution on bitumen on actual road is also investigated. The covering abstract of the conference is IRRD abstract no. 101124. /TRRL/ [French]

Taken from Journees d’information bitumes et enrob es bitumine.

Ajoy Bicheron Durrieu Gaestel (Exxon International Incorporated); Grignard Lamathe Lesage (Petroles BP); Marvillet Quedeville (Shell Oil Company); Ramond Roger Stern (Petroles BP)

Laboratoire Central des Ponts et Chaussées Conf Paper 1972, pp 21-139, Figs., Tabs., Refs.

ACKNOWLEDGMENT: Laboratoire Central des Ponts et Chaussées, Transport and Road Research Laboratory (IRRD 101126)

2A 125182

STUDY OF THE BEHAVIOUR OF METAL ALLOYS IN CONTACT WITH CONSTRUCTION MATERIALS [Étude du comportement des alliages métalliques au contact des matériaux de construction]
The authors define the nature and characteristics of concrete and use those data to conduct electro chemical tests and assess their results with a view to evaluating the resistance to corrosion of different metal alloys, which can come into contact with concrete. /TRRL/ [French]

Pequin, P Longuet, P Zelwer, A Memores Scientifiques de la Revue de Metallurgie Vol. 70 No. 5, May 1973, pp 365-375, 10 Fig., 3 Tab., 20 Ref.

ACKNOWLEDGMENT: Laboratoire Central des Ponts et Chaussées, Transport and Road Research Laboratory (IRRD 101118)

2A 125241

AERIAL PHOTOGRAPHY: INTERPRETATION AND LOCALIZATION OF CONSTRUCTION MATERIAL DEPOSITS [Foto interpretation y localizacion de materiales riales]
The authors recall that the interpretation of aerial photographs must rest on key factors which give an exact knowledge of regional characteristics: shape of slopes, width of valleys, drainage, erosion, colour of the soil, etc. The authors stress the limits and future possibilities of aerial photography in civil engineering. /TRRL/ [Spanish]

Romero, L Britos, J Vialidad-Corriences No. 6, Oct. 1971, pp 43-46

ACKNOWLEDGMENT: Transportation & Soil Mechanics Laboratory, Spain, Laboratoire Central des Ponts et Chaussées, Transport and Road Research Laboratory (IRRD 101097)

2A 125272

SETTLEMENT IN THE VICINITY OF SHIELD-DRIVEN TUNNELS [Asentamientos en la vecindad de tunel perforado con escudo]
Results are given of measurements of settlement taken in the proximity of shield-driven tunnels. A relation is established between settlement and the nature of the terrain, the driving process and the tunnel lining used. Attention is drawn to the consequences of shield driving for neighbouring structures. /TRRL/ [Spanish]


ACKNOWLEDGMENT: Transportation & Soil Mechanics Laboratory, Spain, Laboratoire Central des Ponts et Chaussées, Transport and Road Research Laboratory (IRRD 100877)

PURCHASE FROM: Universidad Nacional Autonoma de Mexico Palacio de mineria, Apartado Postal M-6987, Mexico 1, D.F., Mexico Orig. PC

2A 125273

TUNNELS AND TERRAIN [Los Tules y el Terreno]
The author recalls the necessity for preliminary geological investigations in all civil engineering projects. To supplement these investigations, it is recommended to use geophysical investigation techniques such as electrical and seismic methods. The problems of tunnel boring in different types of terrain are briefly reviewed, and several examples of tunnels in Spain are given: tunnels in granite, volcanic rock, metamorphic rock, slate, quartz, sand; puzzling stone with a high content of siliceous materials, limestone and dolomite, limestone conglomerate and heterogeneous rock. /TRRL/ [Spanish]

Saez, A Materials Maquinaria y Metodos para la Constru No. 88, Jan. 1972, pp 7-14

ACKNOWLEDGMENT: Transportation & Soil Mechanics Laboratory, Spain, Laboratoire Central des Ponts et Chaussées, Transport and Road Research Laboratory (IRRD 100817)

PURCHASE FROM: Materiales Maquinaria y Metodos para la Construc Maignon, 20 Barcelona 12, Spain Orig. PC

2A 125292

RIGID POLYURETHANE FOAM. THERMAL INSULATION MATERIAL USED IN CONSTRUCTION [Las espumas de poliuretano rígido como material para aislaniento termico en la construccio]
Rigid polyurethane foam is an excellent thermal and sound insulation material for use in construction, which weighs very little. This foam contains two liquid ingredients: resin and prepolymer. The three methods of manufacture are described: direct proportioning by hand, continuous or intermittent-production machines, or spraying machine. Details are given of the physical and chemical characteristics of the product together with standards for the selection of the machine best suited to each particular case. The foam can be used for finishing concrete surfaces and metal parts in chemical plants for example. It can also be utilized in the repair of pavements damaged by deicing salts. A very thin layer of polyurethane foam affords very good insulation and high strength. /TRRL/ [Spanish]


ACKNOWLEDGMENT: Transportation & Soil Mechanics Laboratory, Spain, Laboratoire Central des Ponts et Chaussées, Transport and Road Research Laboratory (IRRD 100861)

2A 125294

SAFETY IN THE CONSTRUCTION OF BITUMINOUS SURFACINGS [Seguridad de la construcion de pavimentos asfalticos]
The construction of bituminous surfacings requires three types of safety measures: measures relating to the material used, to the plant, and to the equipment. Practical recommendations are proposed for the safety of different operations: transport, sampling, cleaning and maintenance of the equipment, operation of plants, etc. /TRRL/ [Spanish]

Perezes, AS Almenas No. 61, Apr. 1972, pp 43-46

ACKNOWLEDGMENT: Transportation & Soil Mechanics Laboratory, Spain, Laboratoire Central des Ponts et Chaussées, Transport and Road Research Laboratory (IRRD 100979)

2A 125295

PLASTIC MATERIALS IN CONSTRUCTION [El plastico en la construccion]
The main results of research into macromolecules were the development of synthetic resins, on which plastic materials are based. A study is made of plastic materials used in construction moulding, etc. The materials are classified into thermoplastic and thermoset materials. The main applications of plastic materials in the field of construction are cited, especially those of polyethylene and polyethylene foams. /TRRL/ [Spanish]

Palomas, E Materiale Maquinaria y Metodos para la Construc No. 93, June 1972, pp 555-569, 5 Tab., 4 Phot.

ACKNOWLEDGMENT: Transportation & Soil Mechanics Laboratory, Spain, Laboratoire Central des Ponts et Chaussées, Transport and Road Research Laboratory (IRRD 100874)

135
2A 125300

STEEL UNIT JOINTS BY MEANS OF EPOXY GLUE AND HIGH-STRENGTH BOLTS (Polaczenia Elementow Stalowych z Zastosowaniem Zywic Epoksydowych i Srub Sprzazajacych)

Results are presented of tests on glazed bolted and mixed joints. It was found that the strength of mixed (glued and bolted) joints is greater by at least 50% than that of ordinary joints. /TRRL/ [Polish]

Falkowski, J., Pancerz, Z. "Zastosowanie elektromagnetycznej metody na przykładzie testów układów z przyczepami." W: Zeszyty Naukowe, 1972, pp. 271-275, 6 Fig., 3 Tab., 14 Ref.

ACKNOWLEDGMENT: Laboratoire Central des Ponts et Chaussées, Transport and Road Research Laboratory (IRRD 101081)

PURCHASE FROM: Wydawnictwa Czesnopism Technicznych NOT Przedsiębiorstwo Naczelnego Organizacji Techn. ul Mazowiecka 12, Warsaw, Poland

2A 125306

CRITICAL DEGREE OF SATURATION-A TOOL FOR ESTIMATING THE RESISTANCE OF CONSTRUCTION MATERIALS TO FROST (Degre Critique de saturation-un outil pour l'estimation de la resistance au gel des materiaux de construction)

The theoretical and experimental study of the effect of frost on porous and brittle construction materials showed the existence of critical degrees of saturation. The critical degree of saturation is a constant of the material which has a well defined value for a given type and quality of the material under study. It was shown that deterioration occurred after frost if the actual degree of saturation exceeded the value of the critical degree of saturation. It is possible to select a material as a function of its resistance to frost by comparing, for different materials, the critical degree of saturation and the degree of saturation actually reached under given conditions. The use of the critical degree of saturation helps to eliminate the lack of correlation existing in some cases between results obtained during frost tests and results obtained during utilization of the material. /TRRL/ [French]


ACKNOWLEDGMENT: Laboratoire Central des Ponts et Chaussées, Transport and Road Research Laboratory (IRRD 101077)

2A 125384

PENETRATION MACADAM AS A SURFACE TO MINIMIZE THE REFLECTED CRACKS FROM SOIL CEMENT BASE

This report on the stabilization of inferior materials for road base covers cement and lime stabilization, and describes experience which indicates that penetration macadam surface can minimize cracks. Penetration macadam can also prevent failure at the crack plane due to slab pumping action, and self-sealing can be expected with the right amount of applied bitumen. Design criteria are set forth and the construction method is detailed.

Ranaanand, N. "Thai Department of Highways Res. Rept. No. 6, June 1973, 13 pp, 8 Fig., 3 Tab., 6 Ref.

2A 125398

FIELD EVALUATION OF AN ASPHALT STABILIZED SAND PAVEMENT DESIGNED USING THE ELASTIC LAYERED SYSTEM

The preparation, design and construction are detailed, and the testing, design and performance evaluation are described of a research test road developed to determine thickness and mixture design procedures for stabilizing native sands with bituminous products. The test road includes two asphalt materials (asphalt and liquid asphalt), and three thicknesses (90, 130, and 200 mm) of stabilized material based on predicted design lives. The data acquisition system measured three variables-length term static and dynamic strains in the subgrade, subbase and stabilized sand pavement), temperature and traffic. The basic components of the measuring system were wire and induction coil strain sensors which utilize the principle of an electromagnetic couple between sensor pairs. The general sequence of installation of the data acquisition system included installation of the extensometers, the sensors in the extensometers, the sensors located under the pavement and temperature sensors in the pavement, and the sensors at the surface of the pavement. The dynamic test results recorded on magnetic tape as analog data was converted to the digital form. A fully automated data processing procedure was developed using a computer program to interpret all the data and to produce all the digitized outputs such as maximum strains and loading rate. The evaluation of the data is detailed. The results presented here cover only one year of a study planned of 10 years. This preliminary report will be followed by periodic reports including an interim report after 5 years of field evaluation.

Stuart, E. III (Forest Service); Miyaoa, Y. (Ministry of Roads, Japan); Skok, E.L., Jr. (Minnesota University, Minneapolis); Wencz, N.C., Hickock (Eugene A) and Associates. "Association of Asphalt Paving Technologists Proc Conf Paper Vol. 43 1974, pp 77-109, 17 Fig., 6 Tab., Photos., 10 Ref.

PURCHASE FROM: Minnesota University, Minneapolis 155 Experimental Engineering Building, Minneapolis, Minnesota, 55455 Orig. PC

2A 125400

THE CONSTITUTION AND QUALITY OF PAYING GRADE ASPHALTS PRODUCED BY AIR BLOWING DISTILLATION RESIDUES OF KUWAIT AND "LIGHT ARABIAN" CRUDE OIL

The constitution and physical behavior of asphalts from Kuwait and light Arabian crude oil were studied, the manner in which they were affected by blowing at high temperature with air was investigated, and improved methods for refinery blowing operation are suggested. The Kuwait residue gives satisfactory paving grade materials but improved resistance to hardening is obtained if the blowing is done at the lowest practicable temperature. This is because the reduction of the temperature changes the nature of the chemical reactions taking place; polymerization takes place rather than intramolecular condensation. The light Arabian residue gives paving grade materials with less satisfactory performance than those from the former source, and lack naphthenic structures. After blowing, this shows a high "shear susceptibility" and low ductility particularly after treatments simulating the coating of hot aggregate. The chemical reactions taking place are mainly by intramolecular condensation and reduction of the blowing temperature does not produce any significant improvement in resistance to hardening.


PURCHASE FROM: Minnesota University, Minneapolis 155 Experimental Engineering Building, Minneapolis, Minnesota, 55455 Orig. PC

2A 125485

THE A31 NANCY-METZ-THIONVILLE MOTORWAY, SECTION 1 WITHIN THE DEPARTMENT OF MEURTHE ET MOSELLE

[L'Autoroute A31 Nancy-Metz-Thionville. 1-Partie comprise dans le Departement de Meurthe et Moselle]

The a31 motorway, which will link nancy, metz and thiouville, is in the process of completion. It was built in sections the order of which was governed by local traffic requirements. Details are given of the section in the meurthe et moselle, its alignment, earthworks, and the solutions adopted in difficult terrain and in the proximity of mines. The associated structures are described together with the asphaltic concrete pavement, which comprises a gravel-slag roadway. Costs are quoted, and statistical data on traffic and safety are included. Mention is made of the labour force needed. /TRRL/ [French]


ACKNOWLEDGMENT: Central and Regional Labs of Bridges & Highways, Tr. Transport and Road Research Laboratory (IRRD 100911)

2A 125512

FORECASTING SERVICEABILITY LOSS OF FLEXIBLE PAVEMENTS

Pavement performance data collected in Research Project 2-8-62-32. "Extension of AASHO Road Test Results," are analyzed in this study. Serviceability loss of three flexible pavement types due to fatigue, swelling, shrinkage and thermal cracking are correlated to many environmental, traffic, time, design and construction material variables. A "two-step constrained select regression procedure" is developed to examine the effect that each variable has on pavement serviceability loss. Stochastic reliability
The paving of gravel roads with an average daily traffic (ADT) over 15 is a least cost method for reducing suspended particulate in the air in Seattle. It is also a good business investment when the ADT exceeds 100. In a study done in Seattle's Duwamish Valley the impact of road dust on air quality was measured by obtaining dust emission factors for vehicles traveling at 10, 20, and 30 mph on gravel as well as dusty paved roads. Nineteen miles of gravel roads and 110 miles of dusty paved roads contributed 2700 tons/year of particulate, of which 700 tons were below 10 microns. Paving or oiling such roads will produce benefits of $3,881,000 yearly in household cleaning, health care, sewer, vehicle operation, and road maintenance costs as well as an increase in property values.


2A 125827

SUBSURFACE EXPLORATION FOR UNDERGROUND EXCAVATION AND HEAVY CONSTRUCTION


American Society of Civil Engineers 1974, 404 pp

ACKNOWLEDGMENT: EI

Purchased from ASCE Rep. PC

2A 126194

GROUND WATER AND URBAN PLANNING. REPORT FROM STEGA 1966-73 [Grundvatten och Byggande. Stegas Arbete 1966-73] Knowledge of groundwater conditions is essential in designing building structures, particularly foundations are complex and at great depth. Dropping in the water table can lead to serious damage to ground and buildings. This project comprised questionnaire surveys, groundwater measurements in reference areas, damage due to settlement near Stockholm, measurements of water table and settlements in new development areas, groundwater problems near tunnels and deep excavations, a computer model for groundwater, a land cost index, effect of groundwater on vegetation, and bacterial decomposition of foundations. In Stockholm, new projects, serious settlements occurred in an area built on postglacial clay; piles buckled and there was corrosion. In another Stockholm area, settlement damage is so extensive that repair costs amount to 50% of property value. Several tunneling projects are in progress in this area. Water table conditions before and after construction were studied in two model areas. Some tunneling and deep excavation projects were investigated. A drop in water table can affect vegetation; timber piles which had always been below the water table suffer bacterial decomposition. The group compiled building geological maps comprising geological and geotechnical data and also

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2A

2A 125554

DEVELOPMENTAL TRENDS IN SWEDEN IN THE ROAD CONSTRUCTION PROCESS [Naagra Utvedtlingstendenser Inom Vaegbyggnadensprocesser i Sverige]

Traffic policy and traffic safety targets are supplemented by sub-targets in the form of standard criteria for the service functions of a road. These criteria must be compiled with at all stages of planning and construction at lowest cost. Demands for economy in road construction necessitate a review of present standard criteria. Construction and maintenance costs must be optimised. Scarc resources must be carefully managed on the grounds of economy, environmental considerations and the scarcity of natural construction materials. This scarcity demands flexibility in planning and design. Modern aids such as computers must be utilised to consider all variables. There must be better knowledge of the properties of construction materials, groundwater and climatic conditions, and systematic investigations of rock materials which will be used more extensively. An analytical model is being constructed which can be used for all pavement types and will permit evaluation of alternative constructions. Stabilisation must be further examined. Reinforcement and improvement will increase at the expense of new construction, and standard criteria must therefore be established.

Studied tyres cause extensive wear; surface dressing is a promising remedy. In view of high bitumen costs, the viability of concrete roads must be examined. Reinforcement and improvement will increase at the expense of new construction, and standard criteria must therefore be established. Studied tyres cause extensive wear; surface dressing is a promising remedy. In view of high bitumen costs, the viability of concrete roads must be examined. Reinforcement and improvement will increase at the expense of new construction, and standard criteria must therefore be established. Studied tyres cause extensive wear; surface dressing is a promising remedy. In view of high bitumen costs, the viability of concrete roads must be examined. Reinforcement and improvement will increase at the expense of new construction, and standard criteria must therefore be established. Studied tyres cause extensive wear; surface dressing is a promising remedy. In view of high bitumen costs, the viability of concrete roads must be examined. Reinforcement and improvement will increase at the expense of new construction, and standard criteria must therefore be established.
CONSTRUCTION MATERIALS

2A 126291
CONCRETE PRACTICE
This publication which provides guidance to those concerned with construction and day-to-day supervision of concrete work, deals with materials, mixes, properties of concrete, site production, reinforcement, prestressing, formwork, curing, finishing, testing and accuracy of construction. A list of relevant British Standards, Codes of Practice and other publications are also included. Typical properties required by, or inherent in concrete materials (cements, aggregates, water, and admixtures) are outlined. The specifications, workability, strength, grades, permitted margins, and design of concrete mixes are detailed. Prescribed/standard mixes, nominal mixes, effect of mix constituents, batching and trial mixes are reviewed. The strength, deformation and durability (permeability, frost resistance and resistance to chemical attack) of concrete are considered, and the series of operations which must be performed on the raw materials in order to turn them into the finished product are discussed. There are also chapters on access, storing materials, batching, mixing, transport, placing, and compacting. Construction joints and counting in cold and hot weather are also discussed. The details are outlined of prestressed concrete formwork, curing, finishing and testing of concrete and concrete materials. Comments are made on sources of inaccuracies, the setting out measuring operation, the accurate adjustment of precast components and the dependence on formwork of the accuracy of in-situ construction.

Barnbrook, G. Dore, E. Jeffery, AH Keen, R. Parkinson, JD Sawtell, DL Shacklock, BW Spratt, BH Cement and Concrete Association May 1975, 63 pp, 34 Fig., 21 Tab., Refs.

ACKNOWLEDGMENT
PURCHASE FROM: Cement and Concrete Association 52 Grosvenor Gardens, London SW1W 0AQ, England Repr. PC

2A 126292
REPORT ON EMISSIONS FROM ASPHALT HOT MIXES
A comprehensive analysis was performed of 8 sets of samples of emissions originating from petroleum asphalt during the hot-mix process for preparation of asphalt. Samples were collected on 4 days at two locations involving four asphalt cements of varying characteristics from three refineries. All gaseous substances, vapors and particulates associated with asphalt including hydrocarbons, carbon monoxide, nitrogen dioxide, volatile sulphur compounds, ozone, aldehydes, phenols, metals and polynuclear aromatics were identified using recognized sampling techniques and analytical procedures. The results of these analyses indicate that no significant air pollution or employee health problems can be expected or associated with these emissions. The gaseous substances and particulates were at extremely low concentrations, and were well within the current OSHA standards for workplace conditions. Despite the exaggerated sampling conditions, the asphalt emissions compare favorably with national air quality standards promulgated by EPA. Test data indicate no significant difference in the amount or composition of emissions from asphalt from different sources or in different hot mix plants. The results suggest that the TLV limit for asphalt (petroleum) fumes is too limiting and not accurately defined. The results also indicate that health hazards will not result from polynuclear aromatics in emissions from hot-asphalt paving mixes. Substantial difference is noted between petroleum asphalt and coal tar, and it is suggested that these two materials be not placed in the same category by regulatory agencies.


Puzinauskas, VP Corbett, LW (Exxon Research and Engineering Company)
Asphalt Institute May 1975, 20 pp, 7 Fig., 8 Tab., 12 Ref.

2A 126333
JOINT EFFORT TO IMPLEMENT RESTRICTED PERFORMANCE SPECIFICATIONS IN PENNSYLVANIA
One of the key elements in the Pennsylvania Department of Transportation program for the implementation of statistically based restricted performance specifications for highway construction material is concerned with the necessary education of department and industry personnel. This paper discusses the experiences of Pennsylvania Department of Transportation and Pennsylvania State University in the past 2 years in their joint effort to provide the first phase of the training required. The background information for the series of training courses and for the development of a quality-control manual, the guidelines that were set up for the courses, and the objectives of each course session are discussed. The experiences and insight gained as a result of the first 5 courses in the series are discussed by relating some of the observations that participants made about the course itself and also about the proposed program of implementation that Pennsylvania Department of Transportation will follow. The objective of the paper is to share these experiences with other state departments of transportation that are at similar stages in the implementation of these types of specifications.

Willenbrock, JH (Pennsylvania State University, University Park) Transportation Research Record No. 529, 1975, pp 60-74, 2 Ref.

PURCHASE FROM: TRB Publications Off Orig. PC

2A 127336
QUALITY CONTROL OF BITUMINOUS PAVING FROM THE BEGINNING
The origin of modern controls and the resulting variability was studied in an effort to develop a better understanding of control systems. Practices with short-term asphalt in 1900 are mentioned and paving in built-up tar pavements is reviewed. The paper discusses the effect that temperature controls of bitumen aggregate, mixing, and mix at the plant; weather and limitations. Detailed plant requirements; machine laydown; detailed roller and rolling requirements; and smoothness requirement. Variability by design is considered and variability in construction is discussed. Patent
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2A

pavement, gradation and bitumen content, gradation, asphalt content and density of modern pavements are detailed. The limitation of variability is discussed. It is urged that controls should distinguish between satisfactory and unsatisfactory pavements. Satisfactory control can be maintained without excluding good construction and unnecessarily increasing costs. Controls should be tailored to accommodate the characteristics of different mixtures, the requirements of the pavement, and the conditions encountered in construction. Either the conventional process control system or the newer end result specifications can be made to function satisfactorily for modern construction.


2A 127237

ACTUAL APPLICATION OF END RESULT SPECIFICATIONS AND THE ROLE OF COMMERCIAL TESTING LABORATORIES IN APPLYING THEM

This report explains what an end result specification may consist of; how it can be applied; and what role commercial testing laboratories can play in applying it. The end result specification as applied on asphaltic concrete mixtures in Louisiana is outlined, and the duties and responsibilities of technicians is discussed. Sixteen projects were evaluated in the study of the effects of end result specifications. It was found that the standard deviation for the percentage of pay per project as based on 100 percent of contract unit price was 1.99 percent at a 95 percent confidence level. This indicates the contractor should receive at least 95 percent pay at least 95 percent of the time. The total tons of mix evaluated was 544,348 of which 7,223 tons of mix or 1.3 percent resulted in the contract unit price. Approximately 30,211 tons of mix or 5.5 percent resulted in the contractor receiving 95 percent of the contract unit price. There were no penalties at 50 percent or remove. There was total of 724 lots involved in all of the projects, of which 64 lots resulted in penalties. Approximately 93.7 percent of the falling lots were due to deficiencies in roadway density and only 6.3 percent due to deficiencies in Marshall Stability. End result specifications appear to be a satisfactory and workable means of defining the responsibilities of all the persons involved, as well as ensuring a quality end product on asphaltic concrete projects.


2A 127474

DOUBLE-TUBE TREMIE USES AMBIENT WATER TO PROTECT MIX

The tremie system described here used a clip valve and surrounding water to empty the tremie tube and keep dry-between discharges. The double tremie system consists of an outer pipe with slits along its walls that permit water to flood the system's annular space between the two tubes, and an inner plastic tube of textured 2-mm-thick PVC, reinforced with nylon fiber to increase the tube's strength and life. The equipment is designed for placing concrete underwater over a wide area by repeated resetting of a small number of pipes without endangering the quality of the finished concrete. As falling concrete inflates the plastic tube, a dip valve in its bottom end opens to discharge mix. When concrete stops falling, water enters the outer pipe through the slits and squeezes remaining concrete from the inner tube. The bottom valve immediately seals the tube after final mix is discharged. With the tube squeezed flat and the valve closed, the tremie system can be repositioned for continued concrete without fear of introducing water that might soften or segregate the mix. Details are outlined of the successful placing of 33,000 yd. of concrete underwater for a dry-lock flooring using the double-tube method. Three double-tube tremies mounted on a 90-ft-long, 40-ft-wide raft assembled from plugged steel pipes handled the concrete. Nine men handled the tremie pipe; six others attended pumps and slicklines, and each 740-yd load was placed in a 10-hr shift.

Cryogenics Vol. 57 No. 9, Sept. 1975, pp 54-55, 4 Fig.

2A 127501

STANDARDISED FLEXIBLE PAVEMENT DESIGN FOR RURAL ROADS WITH LIGHT TO MEDIUM TRAFFIC

An empirical approach to pavement design is presented together with introductory notes on the standard specifications of the Rhodesian Ministry of Roads and Road Traffic. Definitions are presented and aspects such as design economics, essential geology, expansive soils, collapsing soils and drainage are covered. The specifications also cover soil grouping classification for design purposes, compaction, climate, design traffic, and construction materials. Other aspects included in the specifications are: termite workings and rock bars, and barriers; surfacing; urban roads; use of symbols for roadbed and subgrade preparation; and design cuts and fills. The preparation of the roadbed and subgrade and the pavement design of minor rural roads with single land surfacing and major rural road with at least 2 bituminous traffic lanes are detailed Tables and figures are presented and design examples are described.

Mitchell, RL Vander Merwe, CP Geel, HK Ministry of Roads and Road Traffic, Rhodesia SR 1 June 1975, 70 pp, 11 Fig., 3 Tab., Photos., Refs.

PURCHASE FROM: Ministry of Roads and Road Traffic, Rhodesia Coghlan Building, Fourth Street, Salisbury, Rhodesia Orig. PC

2A 127502

WRAPPING IT UP WITH NYLON FABRIC FORMS

Techniques with nylon fabric forms are described which are adaptable to erosion control, underwater concreting, encasing piles, lining tunnels, protecting surfaces and other uses. These nylon forms are flexible containers that can be filled by pressure injection with fluid fine-aggregate concrete. They permit controlled bleeding of mix water through the fabric, which reduces the water cement ratio. This causes rapid stiffening, produces high strength, and provides exceptional durability. The double-wall fabric comes in two designs: a quilted type capable of withstanding hydraulic pressure, and another type with a uniform cross-section for use where the primary objective is impermeability and a low coefficient of hydraulic friction.

Concrete Construction Vol. 20 No. 9, Sept. 1975, pp 389-390, 9 Fig.

2A 127514

UNSURFACED EARTH AND GRAVEL ROADS REFERENCES

Three hundred and ninety references are presented here which are drawn from the period of the late forties to the present (1975). The references cover the field of unsurfaced earth and gravel roads, and highway maintenance. The construction and maintenance of dirt roads, soil aggregate roads, forest roads, dustproofing, water proofing, oiled gravel roads, and chemical stabilization of roads are some of the subjects covered. References are provided on low-cost roads, asphalt pavements, engineering materials, soil movements, the use of shale and various aspects of materials engineering. Among many other topics information is also provided on predictive models for vehicle operating, road capability studies, the influence of geology on forest road construction, insulation, mountain roads, and rural road administration.

Forest Service 1975, 30 pp, 390 Ref.

2A 127527

PAVEMENT DESIGN AND THE DECISION-MAKING PROCESS

The history of pavement design is briefly reviewed, and development in and future prospects for utilizing systems engineering in the decision-making process is discussed. Pavement design has evolved from the use of standard sections of different categories of soil, climate, and traffic conditions to that of empirical relationships between structural designs, materials, traffic, climate, and subgrade conditions based on test programs such as the AASHO Road test. Recently, interest has been expressed in the concept of total cost analysis. A Systems Analysis Model for Pavements (SAMP5) is one approach to considering initial construction, operation, and user costs in the decision making process. The SAMP6 program (an improvement of SAMP5) requires 12 classes of variables: program control and miscellanea; environmental (2) and serviceability (3) traffic and reliability (2); constraint; traffic delay; maintenance; cross-section, cost model and shoulder; tack coat, prime coat, bituminous materials; wearing surface, overlay, pavement material; and shoulder layer material. The SAMP6 program operation normally considers between 1,000 and 2,000 different trial designs. The output of the SAMP6 is provided in 3 parts: summary of input data; summary of the best design strategy for each material and larger combination; and the best design strategy in order of increasing total cost per square yard of traffic lane. Illustrations of the application of SAMP6 include a comparative study of the economics of staged construction and planned rehabilitation versus the "no-overlay" or strong initial construction ap-

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Drake, WB; Berrier, I.H; Greene, WB; Fielding, RV
National Crushed Stone Association, National Sand and Gravel Association, National Slag Association 1974, X-1-XIII-4, 7 Fig.

2A 127532
IMPORTANCE OF ACTUAL BEHAVIOR IN SHAPING DESIGN CRITERIA

This paper which describes the Corps of Engineers continuing program of pavement condition evaluation, stresses the need to examine the performance of full scale pavements to verify design criteria, and lists 14 modifications to the Corps' CBR design system. The elements of behavior or design are discussed and include the analytical model which describes the manner in which the parameters controlling design interact; the constitutive behavior which relates the stress, strain or equivalent behavior of the individual elements or materials of which the pavement is constructed; and the terminal condition description considered to represent failure. The CBR test was adapted as a means of assessing the strength of materials in flexible pavements. To provide the comparisons between full scale pavements and traffic performance as predicted by the design method, the Corps of Engineers undertook two efforts. The first which gives immediate comparisons, in the full scale accelerated traffic tests, many of which have been conducted to establish or extend the CBR design methods. A survey program was undertaken to provide information on the behavior of pavements in serving their intended purpose. Actual pavement characteristics in relation to design considerations (layer thickness, characteristics of materials, strength, bituminous surfacings and stabilized layers, subgrade capability of comprehensively selecting optimum strategies and updating decisions as conditions change.


Ahlavan, RG (Waterways Experiment Station)

2A 127535
PANEL DISCUSSION ON PERFORMANCE OF PAVEMENT WITH GRADED AGGREGATE BASES

Experiences in four states which make extensive use of graded aggregates for all classes of highways are discussed, and case histories of specific projects are described by the representatives from Maryland and North Carolina. Virginia’s ongoing program of evaluation of typical pavements and the installation of a number of experimental sections on heavily travelled segments of primary highway are detailed, and the development and successful use of graded aggregate, which has generally composed two thirds or more of the total depth of flexible pavement structures in Kentucky is reviewed. The Kentucky system (in which the top 1/3 is asphaltic concrete) is producing very good riding quality properties and a substantial base. The Kentucky system (in which the top 1/3 is asphaltic concrete) is producing very good riding quality properties and a substantial base. The Kentucky system (in which the top 1/3 is asphaltic concrete) is producing very good riding quality properties and a substantial base. The Kentucky system (in which the top 1/3 is asphaltic concrete) is producing very good riding quality properties and a substantial base. The Kentucky system (in which the top 1/3 is asphaltic concrete) is producing very good riding quality properties and a substantial base.


Martin, JP (General Crushed Stone Company)
National Crushed Stone Association, National Sand and Gravel Association, National Slag Association 1974, pp XIV-1-10, 1 Fig.

2A 127664
SURFACE TREATMENT TIPS

In an effort to highlight essential factors vital to achieving consistent quality results, and to aid those engaged in surface treatment construction, information is presented which, although applicable to all types of surface treatment, is primarily concerned with those treatments that consist of a sprayed application of asphalt covered with a layer of aggregate of uniform size as practicable. Important aspects of equipment, materials, job planning, the surface treatment operation, and multiple surface treatments are noted. The distributor should be equipped with a calibrated dipstick marked in gal. per inch (litre/cm) of length, to check the quantity of asphalt in each load, and the amount used for each application. The distributor should also be equipped with an accurate thermometer so that temperature of the asphalt can be determined at the time of application Common problems associated with the asphalt distributor are described and solutions are suggested. The aggregate spreader and rollers are also described. Characteristics of asphalt required for good surfaces are noted, and recommendations with respect to the grades of asphalt to be used and the application rates for asphalt and aggregate under various conditions are noted. Comments are made regarding pre-job planning and work schedule. The preparation of the surface, spraying the asphalt, spreading the aggregate and rolling are the surface treatment operations detailed here. The success of multiple surface treatments depends upon the mixing of particles, and the distribution of the asphalt through the mass. Helpful tips are given.

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2A 127566

MATERIALS OPTIONS WITH RESPECT TO ENERGY RELATED SHORTAGES

The energy shortage has forced assessment of alternative highway material sources such as coal tars, non-petroleum based materials, resins, and recycled substances. The use of emulsions, of sulfur as a binder, more insitu stabilization and binders from wood resins is also investigated.

Halstead, WJ American Highway & Transportation Magazine Vol. 54 No. 3, July 1975, pp 18-19

2A 127758

DAMAGE DUE TO VIBRATION [Skadlig Inverkan av Vibrationer]

The report contains six lectures held at a symposium arranged by the Swedish Geotechnical Institute. The items are: 1. Ground vibrations and their harmful effects - influence of vibratory compaction equipment. 2. Ground vibrations generated by trains - their influence on buildings and people. 3. Road traffic-induced vibrations. 4. Safe rock blasting. 5. Vibrations-damage and responsibility. 6. Relation between traffic-generated vibrations, their frequencies, particle motion displacements, velocities and vehicle speeds. See IRRD Abstracts Nos. 214778 to 214782 for summaries. /TRRL/ [Swedish-English]

Swedish Geotechnical Institute Conf Paper No. 56, 1974, 95 pp, Figs., 5 Tab., 14 Phot., Refs.

ACKNOWLEDGMENT: National Swedish Road & Traffic Research Institute, 7

PURCHASE FROM: Swedish Geotechnical Institute Banergatan 16, S-115-26 Stockholm, Sweden Repr. PC

2A 127900

THE SUSPENSION BRIDGE: ITS HISTORY AND DEVELOPMENT

This paper traces the history and development of the suspension bridge, by chronological examples, from primitive beginnings to the present day. Brief details are given of structures which represented major advances in the technique of suspension bridge design and construction, or in the adoption of new materials. The author states, that with present technology, and when justified economically, spans of 2000M or more could be considered today. Notes are given describing erection methods used for various phases of the construction of recent bridges. These include tower erection and the design of temporary footbridges for the construction of the main cables, details of anchorages and main cable saddles, the spinning of main cables, the design of the suspended deck and roadway surfacing. The effect of different bridge designs on the erection methods are emphasized. /TRRL/

Knox, HSG Society of Engineers Journal of Vol. 65 No. 1, 1974, pp 55-71, 4 Fig.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 214347)

2A 127999

STEPPING OUT ACROSS SIBERIA

This article draws attention to the special problems of construction in arctic conditions, particularly the problem of summer thawing, of the permafrost which leads to ground heave and displaces piled foundations. An outline is presented of the method used to form structural foundations for the railway which was begun in December 1974. A deep hole is drilled into the ground, a prefabricated ferro-concrete pile is lowered into it, and concrete is poured into the narrow free space remaining inbetween. The concrete forms a strong bond between the pile and the surrounding, still-frozen soil. However, larger structures require far more extensive foundation works with subsequent subsidence problems if undertaken during the summer season. Mention is made of the use of refrigeration piles, and of the hydraulic method of transport of the ballast required for the project. /TRRL/


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 215164)


2A 127903

DUBAI BUILDS A MAJOR DESERT HIGHWAY

This article describes the construction of a 9 M wide transpeninsular highway beginning in Dubai, and eventually linking with Shinas. Details are given of the Dubai drydock facility being built by the Costain-Taylor Woodrow joint venture, which requires 2.4M M3 of rock for the breakwaters and 1.2M tons of aggregate for concrete; the aggregates are brought in from quarries. A new road is being constructed between these quarries are part of the drydock contract. The first section of the concrete embankment and desert, and the second through gravel plains and foothills of the mountains. The first section requires a subbase the second does not. A hard surface is now completed all the way to Hatta, and the 150,000 M3 of subbase was obtained from 5 borrow pits along the route. Flood water courses are traversed by 18 Irish bridges and 9 culverts. Mention in made of the shortage of water and the difficulty of finding labour due to the existive conditions.

/TRRL/

Walford, D Highways and Road Construction Vol. 43 No. 1786, June 1975, p 21, 2 Phot.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 214491)

2A 127926

IMMERSED-TUBE TUNNELS

This article gives a general account of the use of immersed tube tunnels with particular reference to the Hong-Kong cross harbour tunnel designed by British engineers and the proposed Tees tunnel which is likely to be the first of its developed in the USA does not closely match the envelope this type of tunnel and the conditions under which it can be constructed. The two alternative types, steel shell and the European developed concrete box, are discussed. The former developed in the usa, does not closely match the envelope required by traffic and hence has to be located at a greater depth. However if ventilation is required the segmental spaces can be used for this purpose. Steel shell construction is also favoured by a combination of low material costs combined with high labour costs. The Hong Kong bridge is of the steel shell type, is 1536 metres long and has four lanes. The tube comprised two steel shells linked by diaphragms and keel concrete, later filled with tremie concrete. The units, weighing about 6,000 tons, varied in length from 99 to 113 metres. They were placed by an all purpose screed and lay barge using laser beam for alignment. The proposed Tee's tunnel is of rectangular concrete box construction, 915 metres long and with four lanes. It will normally be self ventilating, but fans can be used under exceptional traffic conditions. The article outlines the proposed method of construction which involves manufacture of the units on a casting bed and their subsequent placement by means of a lowering dock. /TRRL/

Culverwell, DR (Freeman Fox and Partners) Consulting Engineer Vol. 39 No. 4, Apr. 1975, pp 47-53, 3 Fig., 4 Phot.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 214484)

2A 127929

FIELD SUPERVISORS&DUTIES AND RESPONSIBILITIES. VOLUME I, CONTRACT ROADWORKS

This publication which is intended to help those responsible for the supervision of roadworks on the general design and construction of the same is published in two volumes. Volume I deals with construction. It is intended primarily for engineers who have supervision of roadworks carried out by contract, covers general aspects, supplemented by instructions from the engineer) are set forth for sampling and responsibility. 6. Relation between traffic-generated vibrations, their frequencies, particle motion displacements, velocities and vehicle speeds. See IRRD Abstracts Nos. 214477 to 214482 for summaries. ITRRL/ [Swedish-English]

Swedish Geotechnical Institute Conf Paper No. 14, 1975, 24pp, 1 Fig., 1 Tab., 2 App

Svenska Vagforeningen May 1975, 24pp. 1 Fig., 1 Tab., 2 App
FLYASH PAVEMENTS, RUNWAYS TO TAKE OFF?
Considerations of energy, ecology and economics have prompted an examination of available technology for the use of flyash as a paving component. The economics of usage, however, varies and flyash use must be custom-engineered. Two example projects are described: the airport project at Newark, New Jersey, and the Port of Portland project. At Newark flyash was used as both aggregate and cementitious components. Costs for the flyash and lime were about half that of cement. Only half the manpower required with conventional methods was needed on this project. At the Port of Portland, flyash was not cheap and pozolzan (volcanic ash) was used. A brochure on the state-of-the art and a user manual on the use of flyash is being prepared by the Federal Highway Administration. It is emphasized that the properties of flyash must be clearly understood in order that cost savings may be effected.

Fairweather, V  ASCE Civil Engineering  Vol. 45 No. 8, Aug. 1975, pp 57-58

BRIDGE DECKS
This is the second of two articles on short span bridges. The first, in the July issue, described cost-cutting ideas in design. This article focuses on bridge decks: expansion joints, open steel grid deckig, timber decks, the Iowa Method of deck construction (a very low permeability concrete overlay), waterproof membranes, plastic and wax sealing of deck concrete, and various approaches to protecting the rebars from corrosion-galvanizing, epoxy coating, stainless cladding, etc. /ASCE/


PLASTIC PIPES, PROS AND CONS
A comprehensive examination has been undertaken of the criteria for thermoplastic piping for residential plumbing systems. Four thermoplastics that are widely used for residential plumbing are: acrylonitrile-butadiene-styrene (ABS) and polyvinyl chloride (PVC) for drain, waste, and vent systems; chlorinated PVC for hot-and cold-water distribution systems; and polyethylene (PE) for underground water service piping. These corrosion-resistant, lightweight piping have some potential disadvantages, the most serious of which is the potential it offers for spread of fire, smoke, and toxic gases in a burning building. Five endurance tests have been performed and it is concluded that drain-waste-vent piping systems with lateral penetration sizes of 5 centimeter diameter or less should meet the I-hour fire resistance test in wood-stud-and-gypsum-board walls provided the hole around the piping where it penetrates the wall is sealed and the studspace is of sufficient depth so that the piping hubs do not penetrate the walls. Provided certain precautions are taken, plastic piping for residential plumbing can be an effective substitute for metallic piping in selected wall and chase construction.

Dimensions NBS  Vol. 59 No. 9, Sept. 1975, 3 pp, 1 Fig., 6 Ref.

PROPERTY SPECIFICATIONS OF ROCK AS BUILDING MATERIAL [Varoodeclaration av Byggnadsmaterialet Berg]
With the increased number of underground construction projects as a background, the author points out the need for acquiring improved knowledge of the properties of rock before design work begins. General characteristics of igneous, metamorphic and sedimentary rocks are briefly described. It is not enough to classify the technical properties of the mineral components of the various types of rock. To give a complete picture of the rock masses it is necessary to describe their imperfections due to external processes, mainly disintegration, cracking and crushing. /TRRL/ [Swedish]

Morfeldt, CO  Vag-Och Vattenbygaren  No. 8-9, 1974, pp 19-22, 2 Fig., 4 Phot.

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USE OF THE FLY-ASH FROM THE THERMO ELECTRIC POWER STATION IN KOSOVE FOR THE STABILIZATION OF SOIL IN ROAD CONSTRUCTION [Leteki Pesop Termoelektroane Kosovo u Izrudi Kolovoznih Podloga Kompleksnom Stabilizacijom Tit]
This report outlines the use of fly-ash as a binder when lime is added to it. This binder added to clayey soil ensures satisfactory stability of roadbases. /TRRL/ [Yugoslav]


ACKNOWLEDGMENT: National Swedish Road & Traffic Research Institute, Transport and Road Research Laboratory (IRR-L-101191)

EXPERIENCES WITH AND CONSTRUCTION OF LIGHT-WEIGHT AGGREGATE CONCRETE STRUCTURES IN THE NETHERLANDS [Experience et realisations de structures en betons de granulats legers aux pays-bas]
The study days organized by the Association Francaise du Beton (French concrete association), 15 and 16th November 1972, the following papers were presented. Influence of the strain/stress chart of lightweight concrete on the behaviour of structures; observations on the cost of lightweight concrete; lightweight concrete; techniques of laying structural lightweight concrete in the Netherlands; use of lightweight structural concrete in the construction of buildings; use of lightweight structural concrete in the construction of bridges in the Netherlands. /TRRL/ [French]


ACKNOWLEDGMENT: Central and Regional Labs of Bridges & Highways,Fr, Transport and Road Research Laboratory (IRR-L-104157)

RECYCLED MATERIALS REJUVENATE RURAL ROAD
In an effort to rejuvenate county roads at low cost, a rural road has been ripped up, its 2700 tons of asphalt materials crushed and reprocessed and then used to repave within the existing right-of-way. The $98,000 experimental work to repave the 1-mile segment consisted of 3 stages. In the first stage, the 22-ft wide surface was ripped, crushed in place, the asphaltic material was windrowed and then hauled 12 miles to the asphalt plant where they were stockpiled. A Cat 14 grader with rippers and a Cat DW 20 equipped with Hyster compactor wheels were used. The second stage consisted of subbase preparation using materials already in place in right-of-way. The 4-in. thick calcium chloride treated base was ripped and windrowed and pushed to each side. In this way, elevation was reduced about a foot as the width of the road was increased. Foreslopes were changed from between 1:1-2:1 and 1:1 to 3:1. When completed the new pavement will be 22 ft wide with 6-ft shoulders on each side. The base materials consisted of 25 percent clay and 75 percent gravel, and had once been treated with calcium chloride. The third stage included processing the recycled materials through a drum mixer at a conventional hotmix plant. It was found necessary to add virgin asphalt. The experimental mile was divided into 4 test sections: 1/2 mile had an additional 2-1/2 percent new asphalt; next quarter mile had 3-1/2 percent added; next eight mile had 4-1/2 percent; and the last eight had 4-1/2 percent with 30 percent of minus 3/4 inch limestone. Further details and plans for the future are outlined.

Roads and Streets  Vol. 118 No. 10, Oct. 1975, 2 pp, 3 Fig.

RECYCLING OLD PAVEMENTS CAN BE ECONOMICAL FOR COUNTY ROADS
No Abstract


NEW APPROACHES TO CONCRETE FORMING
The main thrust of this program has been to change concrete forming operations from the traditional stick-built system, with its heavy reliance on labor and material, to one that utilizes prefabricated components shipped to the project site. The prefabricated forming systems are either selected and purchased by a special forming staff from systems and methods available on

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the open market, or from the company's own shop which can build specific components based on designs submitted for a particular application. The selection of forming systems has been made a function of management at the company level. The "New Approaches Program" has led to savings in labor costs. Reducing material expenses, increasing productivity at the project site and improving job estimate reliability are other benefits.


2A 128798
DEMONSTRATION PROJECT NO. 37. DISCARDED TIRES IN HIGHWAY CONSTRUCTION
This project will demonstrate the feasibility of using the rubber from discarded tires in various highway construction and maintenance operations. The project will include the following: a slide tape presentation explaining the general concept of the project; explanation of the project details and answering of pertinent questions; technical assistance for the construction of demonstration installations; and the negotiation of agreements for the construction of these installations with participating agencies. Laboratory and field tests have indicated that the performance of several asphaltic materials can be improved by incorporating proper amounts of recycled rubber. When these materials are applied at select locations, the overall improved performance should economically justify their use. The asphalt rubber materials which show the most promise include seal coats, joint and crack fillers and strain relieving interlayers. A rubberized seal coat can resist reflective cracking when placed over a fatigue cracked surface. The strain relieving interlayer is placed between an existing cracked surface and an overlay. It is primarily intended to reduce and delay the reflection of thermal cracking through thin bituminous concrete overlays.

Federal Highway Administration 2 pp

2A 128800
DEMONSTRATION PROJECT NO. 34. CATHODIC PROTECTION
In an effort to acquaint field personnel with the theory of cathodic protection and assist in the design, construction and operation of a cathodic protection system, a demonstration project is being offered which will include an introductory slide presentation, assistance in development of a work plan and work schedule, assistance in locating material sources, assistance in the electronic circuitry and system design, and assistance during construction and post construction evaluation periods. Cathodic protection involves the external application of a direct current to the surface of the top mat of steel reinforcing steel. This project will demonstrate the feasibility of using the rubber from discarded tires in various highway construction and maintenance operations. The project will include the following: a slide tape presentation explaining the general concept of the project; explanation of the project details and answering of pertinent questions; technical assistance for the construction of demonstration installations; and the negotiation of agreements for the construction of these installations with participating agencies. Laboratory and field tests have indicated that the performance of several asphaltic materials can be improved by incorporating proper amounts of recycled rubber. When these materials are applied at select locations, the overall improved performance should economically justify their use. The asphalt rubber materials which show the most promise include seal coats, joint and crack fillers and strain relieving interlayers. A rubberized seal coat can resist reflective cracking when placed over a fatigue cracked surface. The strain relieving interlayer is placed between an existing cracked surface and an overlay. It is primarily intended to reduce and delay the reflection of thermal cracking through thin bituminous concrete overlays.

Federal Highway Administration 2 pp

2A 129128
KARL TERZAGHI AND THE CHICAGO SUBWAY
Terzaghi's engagement on the Chicago Subway, 1939-1941, influenced his decision to take up permanent residence in the United States and had a strong impact on the development of applied soil mechanics. So-called squeeze tests, in which the settlements and subsurface movements were correlated with construction procedures, permitted improvements in construction methods and decreases in lost ground. Measurement of loads in footing of open cuts led to better understanding of behavior of soft clay in undrained shear. Full-scale test sections provided basis for more economical design of permanent tunnel lining. All these activities evolved under Terzaghi's stimulation and in turn helped formulate his conceptions of the ways in which soil mechanics should be applied in practice.


ACKNOWLEDGMENT: EI
PURCHASE FROM: ESL Repr. PC, Microfilm

2A 129341
HIGHWAY TRANSPORTATION'S RESPONSE TO ENERGY CONSERVATION
The following two aspects of energy conservation are considered: (1) petroleum conservation versus other energy conservation, and (2) short term versus long term responses. Suggested ways of accomplishing petroleum conservation are the 55 mph national speed limit, more energy efficient vehicles, carpools, and better traffic management. Savings of energy other than petroleum are to be accomplished through substitution of present lighting installations by more efficient lighting sources such as high pressure sodium vapor lamps, reduced energy consumption in offices, utilization of innovative materials and construction methods, and curtailing the use of highway vehicles. Most of the above suggestions are considered to be short term responses. Long term responses are foreseen in the development of new energy sources. Potential for this lies in the fields of solar, nuclear, geothermal, hydraulic and magnetic energy, which can provide not only abundant energy, but can insure that it will be free of contaminating side effects.

Federal Highway Administration Dec. 1975, 12 p
PURCHASE FROM: DOT Repr. PC

2A 129447
STANDARD SPECIFICATIONS FOR HIGHWAYS, BRIDGES, AND MUNICIPAL UTILITIES
This publication gives a complete set of standard specifications and drawings used for highways, bridges and Municipal Utilities. It outlines descriptions, materials, construction and measurement for typical individual projects.

Department of Public Works, Canada Standard 1969, Figs., Tabs.

ACKNOWLEDGMENT: Roads and Transportation Association of Canada
PURCHASE FROM: Roads and Transportation Association of Canada 1765 St Laurent Boulevard, Ottawa, Ontario K1G 3V4, Canada Repr. PC

2A 129453
ROAD CONSTRUCTION GUIDE [Guide de Construction Routiere]
This second edition of the Road Construction Guide offers the necessary requirements for road construction to enable it to adequately serve the road user during its design life. The fundamental principals and complete and well stated. This construction guide outlines the exact requisites in an understandable and usable fashion. It outlines the specification with respect to pavement, soils, materials and construction. /RTAC/

Tessier, GR Quebec Ministry of Transport, Canada Text Book 1973, 218 pp, 42 Fig., Tabs., 24 Phot.

ACKNOWLEDGMENT: Roads and Transportation Association of Canada
PURCHASE FROM: Roads and Transportation Association of Canada 1765 St Laurent Boulevard, Ottawa, Ontario K1G 3V4, Canada Repr. PC

2A 129473
SILT BARRIERS AS EROSION POLLUTION CONTROL IN A LARGE RECREATIONAL LAKE
Soil erosion from urban development and Interstate highway construction during the winter and spring of 1972 and 1973 resulted in extensive runoff pollution of Lake Jackson, a large recreational lake in northern Florida. Turbidity levels in mid-lake reached levels of 180 Jackson turbidity units, and portions of the lake reached turbidity levels exceeding 500 Jackson turbidity units. Floating silt barriers were deployed in 2 arms of the lake by the Florida Department of Transportation to abate the movement of turbid waters into the main body of the lake. Sediment core analyses were performed to determine the extent of sedimentation that had occurred, and water turbidity was monitored to determine the effectiveness of the silt barriers. Clay and silt fines were found to be the major factor in creating turbid conditions in the lake. Erosion controls were effective in controlling movement of sand-size sediments, but they were ineffective in controlling clays and silts. The silt barriers were up to 93 percent effective in preventing the movement of suspended silt and clay into the main body of the lake.

Rivers, EG Allen, CJ (Florida Department of Transportation) Transportation Research Record No. 551, 1975, pp 12-24, 12 Fig., 1 Tab., 15 Ref.

PURCHASE FROM: TRB Publications Off Orig. PC

143
CONSTRUCTION MATERIALS

2A 12969r
CONCRETE POLYMER MATERIALS DEVELOPMENT IN THE U.S.

Concrete-polymer materials are new to the construction scene having been developed in the last 10 years. The three basic types of materials are polymer-impregnated concrete, polymer-concrete, and polymer-cement concrete. Most of the research has been focused on polymer-impregnated concrete. All three types of materials have considerable potential, however. The process or method for producing each material is reviewed. The properties of each are summarized, and past and current research is briefly reviewed. Potential applications are presented. (a) The number of the covering abstract of the conference is IRRD abstract no. 213776. /TRRL/


Fowler, DW (Texas University, Austin); Depuy, GW (Bureau of Reclamation)
New South Wales University, Australia Conf Paper No Date, 16 pp, 1 Fig., 3 Tab., 8 Phot., 15 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 213782)

2A 129689
BEHAVIORS OF BRACED CUT

The results of field measurement and analysis of an open cut in a weak reclaimed deposit are reported. The field measurement is carried out during the construction of a tunnel by open-cutting and analysis is done by finite element method with many extreme assumptions. The results show good agreement between measurement and analysis in spite of insufficient exploratory boring and soil test and extreme assumptions.


ACKNOWLEDGMENT: Japanese National Railways

Purchased from: Ken-yussha 1-45-6, Hikari-cho, Kokubunji, Tokyo, Japan Repr. PC

2A 130560
INSTALLATION OF A SAND-TIRE INERTIAL BARRIER SYSTEM IN CONNECTICUT

The Connecticut Department of Transportation, in cooperation with the Federal Highway Administration, has installed a Tire-Sand Inertial Barrier System at the junction of Routes 2 and 17 in Glastonbury. This system utilizes scrap tires as containers for the sand mass and supports fabricated from 55-gallon (208.1 liter) paint drums. Design, fabrication and construction details are presented for the selected test site. /FHWA/

Lane, KR

ACKNOWLEDGMENT: Federal Highway Administration (S0408)

2A 130588
TECHNOLOGY FOR USE OF INCINERATOR RESIDUE AS HIGHWAY MATERIAL—IDENTIFICATION OF INCINERATOR PRACTICES AND RESIDUE SOURCES

A survey was made of present municipal incineration practices in the United States and other countries. Previous world-wide research and development work on the use of incinerator residues as highway material is summarized. The types, quantities, and locations of municipal incinerator residues produced in this country were determined. The predominant factors affecting residue quality are the nature of the burning action and the degree of burn-out. Six basic types of incinerator residues were identified according to a classification system based on incinerator design. At the present time there are 141 incinerator plants and one pyrolysis plant in operation in 22 states plus the District of Columbia. Most of these plants are located in the northeastern states. These plants produce approximately 5.5 million tons of residue per year. Well burned out residue types 1 and 2 comprise 25 percent of the residue total. The incinerator residues available in the United States could supply from 1 to 9 percent of the annual highway aggregate requirements of the states in which the incinerators are located. /FHWA/

Pindzola, D Collins, RJ
Valley Forge Laboratories, Incorporated, (FIRL-3951) Intrm Rpt. FHWA-RD-75-81, July 1975, 87 pp

Contract DOT-FH-11-840
ACKNOWLEDGMENT: Federal Highway Administration (M-0258)

Purchased from: NTIS Repr. PC, Microfiche

2A 130712
SUMMARY REPORT ON THE FEASIBILITY OF USING HIGHWAY LITTER IN HIGHWAY CONSTRUCTION AND MAINTENANCE

The technical and economic feasibility of using highway litter in highway construction and maintenance was investigated. A research team gathered information and made technical and economic assessments of sixteen potential uses of highway litter. A major finding was that if highway litter is considered by itself none of the potential uses investigated would be economically feasible at the present time. In order to be economically feasible, highway litter should be combined with other solid wastes in order to provide either sufficient quantities or lower the unit cost of processing required. Other major findings were that six potential uses were assessed to be both technically and economically feasible, providing the litter is combined with other solid wastes. These six uses are landfill operations, aggregate replacement for base and subbase, aggregate replacement for stabilized materials, induced trench, vehicle impact attenuators, and maintenance materials. (Modified author abstract)

Presented at the Annual Meeting of the American Association of State Highway Officials, December 5-10, 1971

Gallaway, BM Ledbetter, WB Epps, JA

Contract DOT-FH-11-7692
ACKNOWLEDGMENT: Federal Highway Administration

Purchased from: NTIS Repr. PC, Microfiche

PB-224685/8GA

2A 131069
RECYCLED ASPHALT PAVEMENTS, KOSSTH COUNTY

The history of past policies is briefly reviewed, and the procedures and operations are outlined of the Kossuth County paving program. The construction operations consisted of 7 phases. (1) Salvaging recyclable material was initiated by a Cat 14 motor grader with rear mounted ripper to scarify the pavement to a depth of 4.5 inches. The material was then broken up and hauled to the plant site for crushing. (2) One half of the roadway containing only gravel-clay base was scarified (to 4 inches), windowed, moved and stockpiled on top of the unscarified base. The remaining half was worked in the same manner. (3) Widening of the roadbed followed. (4) The subbase construction was a routine procedure using the salvaged windowed gravel base. (5) According to specifications, the salvaged asphalt was now crushed to a maximum size of 2 inches. The percentage of virgin asphalt to be added was determined. (6) Processing of the recycled asphalt consisted of the mixing operation and the lay down operation. (7) The final surfacing placed upon the recycled base was a standard 3-inch Type B Class I Asphaltic Concrete. The factors that must be considered in projects of this nature, relate to pavement performance, economics, environment, and conservation. It is observed that the recycled material is nearly as good as new, and any potential problems may be resolved. The costs involved in this project are discussed and the ways in which recycling could be an economical process are pointed out. Pollution is not is to be a problem while conservation of fuel is an advantage associated with this project.

Hewnely, RP
Iowa Department of Transportation, (HR-176) Nov. 1975, 29 pp, Tabs.

2A 130859
SLIPFORM PAVERS PROVE THEIR VERSATILITY

Slipform pavers were developed in Iowa to pave thin 6-in. (150-mm) concrete pavements just 10-ft (3-mm) wide for country farm-to-market roads. Since the first mile of road was built in 1949, slipform paving techniques and equipment have revolutionized concrete paving. In recent years, slipform pavers have placed pavements up to 50-ft (15.2-m) wide slab thicknesses up to 20-in. (510-mm), and total large production pavers and up to 16,000 cu yd (12,200 cu m) of concrete in one working day, or over 4 miles (6.5 km) of two-lane pavement. On a high-speed test track project, a slipform paver placed a 47-ft (14-m) wide slab with superelavation designed for 140 mph (225-krn/h) speeds on the semicircular end sections. Slipform pavers have
CONSTRUCTION MATERIALS

also been used to construct curb and gutter sections, concrete median barriers, bicycle paths, railroad slabs for supporting rails, and concrete guideways for personal rapid transit systems.

Presented at the October 21-25, 1974, ASCE Annual and National Environmental Engineering Convention, Kansas City, Missouri.

ASCE Journal of Transportation Engineering Proceedings, Vol. 101, No. TE4, ASCE #11725, Nov. 1975, pp 721-736, 20 Fig.

2A 200206
HIGHWAY PAVING: WHICH WILL IT BE-ASPHALT OR CONCRETE:
SOME OF THE VARIABLES INVOLVED IN THE NECESSARY DECISION-MAKING FOR ASPHALT OR CONCRETE HIGHWAY PAVEMENTS ARE DISCUSSED. IT IS POINTED OUT THAT EVEN WHEN COMPARATIVE FIGURES ARE AVAILABLE, THE CIRCUMSTANCES AND CONDITIONS UNDER WHICH A ROAD IS BUILT MAY BE SO SPECIALIZED THAT THE RESULTS CANNOT BE SAFELY GENERALIZED TO APPLY EVERYWHERE. COSTS VARY CONSTANTLY FROM AREA TO AREA AND ARE DEPENDENT ON THE LOGISTICS OF SUPPLY, THE PRICE OF AGGREGATE, STONE, LABOR AND OTHER ELEMENTS IN THE POTENTIAL BID PRICE. THE TYPE & VOLUME OF TRAFFIC TO BE CARRIED WILL AFFECT THE THICKNESS OF THE PAVEMENT REQUIRED TO SUPPORT IT EFFICIENTLY AND ECONOMICALLY. COST PER MILE FIGURES ARE AFFECTED BY THE DEGREE OF CONTRACTOR INTEREST IN A JOB, THE EXTENT OF HIS EXPERIENCE, CLIMATE, TYPE, CONDITIONS, AVAILABILITY AND PROXIMITY OF AGGREGATE SOURCES, AND EQUIPMENT AND ESTIMATED MAINTENANCE COSTS. IT IS CONCLUDED THAT THE INFRACTIONARY SPIRAL, SHORTAGE OF MATERIALS, NEW DEVELOPMENTS IN MACHINERY, METHODS AND DESIGN CALL FOR AN OPEN MIND AND AN ALMOST DAILY REAPPRAISAL OF THE FACTORS WHICH INFLUENCE DECISION MAKING.

World Construction Apr. 1968

2A 200924
PAVING BY CALGARY CITY FORCES COST 28% MORE THAN CONTRACTORS JOBS
THIS ARTICLE IS A REPORT ON A STUDY CARRIED OUT IN THE CITY OF CALGARY. IT COMPARES THE COSTS OF PAVING WORK DONE BY CITY FORCES AGAINST THAT DONE BY PRIVATE CONTRACTORS. IT IS CONCLUDED THAT CONTRACTORS CAN DO THE WORK 25% CHEAPER. EQUIPMENT AND PERSONNEL INFLEXIBILITY, AS WELL AS A POOR COST ACCOUNTING SYSTEM, WERE BLAMED FOR THE DISCREPANCY. /CGRA/

Heavy Construction News /Canada/ Apr. 1966

2A 201895
REPORT OF INVESTIGATION OF LOW COST IMPROVED ROADS
A CANVASS WAS MADE OF ROAD BUILDERS, STATE HIGHWAY COMMISSIONS, HIGHWAY ENGINEERS, AND TECHNICAL PUBLICATIONS TO DETERMINE CURRENT KNOWLEDGE, NEED, AND COST WITH RESPECT TO TREATED AND UNTREATED IMPROVED ROADS WITH AN ADT OF 300-1500 VEHICLES. CHAPTER 5 OF THE REPORT COMPRISSE NINE ARTICLES, APPENDED AS A SUPPLEMENT, THAT ARE ABSTRACTED SEPARATELY. THE CONTENTS ARE AS FOLLOWS: (1) SUMMARY STATEMENT OF CONCLUSIONS, STRONG INDICATIONS, AND SUGGESTED FUTURE RESEARCH. (2) PRACTICAL APPLICATION OF FINDINGS. (3) DIGEST OF FINDINGS: CONSTRUCTION AND MAINTENANCE MATERIALS, CONSTRUCTION METHODS AND CLASSIFICATION OF LOW COST ROAD SURFACES, SURFACES, MAINTENANCE METHODS, CONSTRUCTION AND MAINTENANCE COSTS, SELECTION OF TYPE AND TYPICAL CROSS SECTION, EFFECTS OF CLIMATE AND SOIL ON TYPE, SERVICE, TRAFFIC, AND CONSTRUCTION AND MAINTENANCE EQUIPMENT. (4) PRESENTATION OF FINDINGS: SAND-CLAY SURFACES, CHERT, SHALE, AND DISINTEGRATED GRANITE SURFACES, GRAVEL SURFACES, TRAFFIC BOUND SURFACES OF GRAVEL, SLAG, AND STONE, MACADAM, LIMEROCK, MARL, CALICHE, BASE AND SURFACE, MISCELLANEOUS UNTREATED SURFACES, NORTHERN BITUMINOUS DUST PREVENTIVES, SINGLE AND DOUBLE BITUMINOUS TREATMENTS AND PENETRATION METHODS, MIXED-IN-PLACE BITUMINOUS SURFACES (FINE AGGREGATE, TYPE I AND II COARSE AGGREGATES), COLD-LAID PREMIXED BITUMINOUS SURFACES, NATURAL ROCK ASPHALT SURFACE, COLD-LAID MODIFIED OR "PUDDLE" BITUMINOUS MACADAM, BITUMINOUS MACADAM (HOT PENETRATION METHOD), HOT-LAID PREMIXED BITUMINOUS SURFACE, AND MISCELLANEOUS SURFACES (PRINCIPALLY LIME TREATMENTS OF CLAY). (5) SUPPLEMENTARY DISCUSSIONS: THE LOW COST ROAD PROBLEM, TRAFFIC BOUND ROADS AS FOUNDATIONS FOR SUBSTANTIAL PAVEMENTS, SELECTION OF MATERIALS FOR BASE AND SURFACE TREATMENT, UNTREATED SURFACES OF SAND-CLAY, MARL, AND GRAVEL, LOW COST IMPROVED ROADS IN WISCONSIN, TREATMENT OF LOW COST ROADS, PUDDLE MACADAM USING SOFT SANDSTONE, CONSTITUENTS OF A LOW COST ROAD, AND MAINTENANCE METHODS AND EQUIPMENT FOR LOW COST IMPROVED ROADS.

Caner, CN Highway Research Board Proceedings 1928

2A 202557
UTILIZATION OF PHOTO INTERPRETATION IN THE HIGHWAY FIELD
PHOTO INTERPRETATION IS BEING USED IN THE HIGHWAY FIELD FOR THE LOCATION OF CONSTRUCTION MATERIALS, EVALUATION OF SOILS AND GEOLOGY AND PREPARATION OF ENGINEERING SOILS MAPS, EVALUATION OF GROUND CONDITIONS, DRAINAGE STUDIES AND MAPS LAND USE STUDIES, TRAFFIC SURVEYS AND ANALYSIS, PLANNING SURFACE EXPLORATION, AND HIGHWAY CONDITION AND DAMAGE STUDIES.

Rin, H Highway Research Record, Hwy Res Board 1966

2A 202699
THE ENGINEERING SIGNIFICANCE OF LANDFORMS

Belcher, DJ Highway Research Board Bulletin Nov. 1948

2A 202717
LOCATING AND MAPPING GRANULAR CONSTRUCTION MATERIALS FROM AERIAL PHOTOGRAPHS
DATA COVERING TEN YEARS OF MAPPING GRANULAR CONSTRUCTION MATERIALS FROM AERIAL PHOTOGRAPHS WERE SUMMARIZED. DURING THIS PERIOD 2,165 GRANULAR-MATERIAL PROSPECTS WERE MAPPED. INDIVIDUAL DEPOSITS.
GRAVEL PROSPECTING BY USE OF AERIAL PHOTOGRAPHY AND GEOPHYSICS ARE DESCRIBED AS A RESEARCH UNIT FOR THE GEOLOGY, AERIAL PHOTOGRAPHIC INTERPRETATION, AND THE FEATURES DESCRIBED. EXAMPLES ARE GIVEN TO DEMONSTRATE THE PROCEDURES USED BY THE ARMY CORPS OF ENGINEERS, TULSA DISTRICT, IN LOCATING GRANULAR FILL MATERIAL. THE INTERPRETATION IS CARRIED OUT BY EXPERIENCED PHOTOANALYSTS FAMILIAR WITH AERIAL PHOTOGRAPHIC PATTERNS OF GRANULAR DEPOSITS IN THE REGION BEING SEARCHED, AS A PROSPECTING TOOL. THE AIRPHOTO TECHNIQUE IS FAST AND ECONOMICAL. RESULTS FROM TEN YEARS AIRPHOTO MAPPING SHOW THAT THE AREAL EXTENT AND QUALITY OF DEPOSITS CAN BE RELIABLY PREDICTED IN A HIGH PROPORTION OF CASES. THE METHOD PARTICULARLY AIDS FOLLOW-UP SUBSURFACE INVESTIGATIONS BY PIN-POINTING WHERE TO EXPLORE IN THE FIELD, AT THE SAME TIME INDICATING WHAT TO EXPECT IN TERMS OF MATERIAL QUALITY AND QUANTITY. THE NEED TO DISCOVER GRANULAR CONSTRUCTION MATERIALS IS POINTED OUT. PERTINENT DATA FROM CONSTRUCTION PROJECTS ON WHICH GRANULAR AIRPHOTO SEARCHES WERE MADE IS PRESENTED. PROSPECTING PROBLEMS FACING THE GROUND-INVESTIGATOR ARE REVIEWED AND A BRIEF DISCUSSION IS MADE OF CUSTOMARY GRANULAR SEARCH METHODS USED IN LOCATING GRANULAR CONSTRUCTION MATERIALS. A SUMMARY OF THE MORE COMMON GRANULAR LAND FORMS FOUND IN THE PLAINS AREA OF WESTERN CANADA AND THEIR IDENTIFYING FEATURES IN AERIAL PHOTOGRAPHS ARE PRESENTED. IN EACH PROJECT AREA SURVEYED, THE LAND FORM CONTRIBUTING THE GREATEST QUANTITY OF HIGH-QUALITY AGGREGATE IS TABULATED. TABLES AND OTHER STATISTICAL DATA ILLUSTRATE THE FREQUENCY OF OCCURRENCE OF VARIOUS GRANULAR LAND FORMS IN PARTS OF WESTERN CANADA. INFORMATION IS PRESENTED TO INDICATE, FOR DIFFERENT GEOLOGIC ENVIRONMENTS, THE PERCENTAGE OF PHOTO-IDENTIFIED DEPOSITS THAT ARE COMMONLY SUITABLE AS SUBBASE, BASE COURSE, AND VEGETATION MATERIAL. THE OCCURRENCE OF AIRPHOTO INTERPRETATION PREDICTIONS IS ASSESSED IN TERMS OF THE TRAINING, EXPERIENCE, AND JUDGMENT OF THE PHOTO-INTERPRETER.

Mollard, JD Dishaw, HE Highway Research Board Bulletin 1958

2A 202738 USING AERIAL PHOTOS TO LOCATE GRANULAR FILL MATERIAL.

THE RELIABILITY OF USING AERIAL PHOTOGRAPHIC INTERPRETATION AS ONE OF THE FASTEST AND MOST ECONOMICAL METHODS OF LOCATING GRANULAR MATERIALS IS DESCRIBED AND DEMONSTRATED. THE INVESTIGATION COVERS THE IDENTIFICATION FEATURES OF GRANULAR DEPOSITS AND A LIST OF DIFFERENT TYPES OF GRANULAR LANDFORMS. AERIAL AND GROUND PHOTOGRAPHS SHOW THE FEATURES DESCRIBED. EXAMPLES ARE GIVEN TO DEMONSTRATE THE PROCEEDURES USED BY THE ARMY CORPS OF ENGINEERS, TULSA DISTRICT, IN LOCATING GRANULAR FILL MATERIAL FROM AERIAL PHOTOGRAPHS FOR SEVERAL CONSTRUCTION PROJECTS. SEVEN PILOT PROJECTS, WHICH CAN BE EXTRAPOLATED TO OTHER AREAS, WERE SELECTED FROM AERIAL PHOTOGRAPHS AS POTENTIAL SOURCES OF GRANULAR MATERIAL. A 2-DAY FIELD EXPLOSION SHOWED THAT SIX SITES CONTAINED GRAVEL SUITABLE FOR USE IN GRIILED ROLLED BASE COURSES.

Neely, D Abdel-hady, M Am Soc Civil Engr J Construction Div Oct. 1968

2A 202752 GRAVEL PROSPECTING BY USE OF AERIAL PHOTOGRAPHIC INTERPRETATION.

GEOLOGY, AERIAL PHOTOGRAPHIC INTERPRETATION, AND GEOPHYSICS ARE DESCRIBED AS A RESEARCH UNIT FOR THE RECONNAISSANCE AND EXPLORATION OF SAND AND GRAVEL DEPOSITS SITUATED IN AN ECONOMICALLY IMPORTANT LOCATION TO THE INTERSTATE HIGHWAY SYSTEM IN NORTH DAKOTA. THIS RESEARCH HAS BECOME NECESSARY DUE TO A RAPIDLY DIMINISHING AGGREGATE SUPPLY COMPARED WITH A GREATLY INCREASED HIGHWAY CONSTRUCTION PROGRAM. THE PROCEDURE IS PRESENTED FOR GRAVEL SEARCH IN A LIMITED CRITICAL AREA. AVAILABLE PUBLISHED GEOLOGIC LITERATURE IS STUDIED AND THEN A COMPLETE COVERAGE PROVIDED BY AERIAL PHOTOS. AFTER ARRIVING AT THE FIELD OF LOCATION DESIGNATED ON THE AERIAL PHOTOGRAPH, A SMALL MOBILE DRILLING UNIT IS POSITIONED AND A TEST BORING MADE. OTHER PROBES ARE MADE TO ESTABLISH THE LOCATION AND THE APPROXIMATE THICKNESS OF THE DEPOSIT OVER THE AREA. AT PRESENT, IT IS THE POLICY TO TEST AND DETERMINE THE QUALITY AND QUANTITY OF A SAND AND GRAVEL SOURCE USING A LARGE POWER DRIVEN HYDRAULIC AUGER, BUT FUTURE PLANS CALL FOR USE OF EARTH RESISTIVITY EQUIPMENT TO ASSIST IN THE FIELD EXPLORATION.

Kasper, RJ Highway Research Board Bulletin 1959

2A 202755 INTRODUCTION TO PHOTOGRAMMETRY AND AERIAL SURVEYS.

THE USE OF PHOTOGRAMMETRY AND AERIAL SURVEYS IN HIGHWAY ENGINEERING IS REVIEWED. SOME OF THE ADVANTAGES OF AERIAL SURVEYS IN HIGHWAY ENGINEERING ARE: (1) THEY PROVIDE AMPLE QUALITATIVE INFORMATION PERTAINING TO PHOTOGRAPHY, SOILS, DRAINAGE, AND LAND USE; (2) THEY PROVIDE THE INDENTIFICATION FEATURES OF GRANULAR DEPOSITS CAN BE RELIABLY PREDICTED IN A HIGH PROPORTION OF CASES.

Thaler, RF Highway Research Board Bulletin 1958

146

CONSTRUCTION MATERIALS

THEY PROVIDE A MEANS OF CORRELATING TO THE TYPE OF HIGHWAY, (3) THEY PROVIDE A MEANS OF CORRELATING TO THE TYPE AND INTENSITY OF LAND USE THE LAND-USE AND TRAFFIC-GENERATION FACTORS AS DEVELOPED FROM ORIGIN AND DESTINATION TRAVEL STUDIES. THEY SERVE AS A RELIABLE GUIDE FOR LOCATION OF HIGHWAY ENGINEERING IS REVIEWED. SOME OF THE ADVANTAGES OF AERIAL SURVEYS IN HIGHWAY ENGINEERING ARE: (1) THEY PROVIDE AMPLE QUALITATIVE INFORMATION PERTAINING TO PHOTOGRAPHY, SOILS, DRAINAGE, AND LAND USE; (2) THEY PROVIDE THE INDENTIFICATION FEATURES OF GRANULAR DEPOSITS CAN BE RELIABLY PREDICTED IN A HIGH PROPORTION OF CASES.

Thaler, RF Highway Research Board Bulletin 1958

THEY PROVIDE A MEANS OF CORRELATING TO THE TYPE AND INTENSITY OF LAND USE THE LAND-USE AND TRAFFIC-GENERATION FACTORS AS DEVELOPED FROM ORIGIN AND DESTINATION TRAVEL STUDIES. THEY SERVE AS A RELIABLE GUIDE FOR LOCATION OF HIGHWAY ENGINEERING IS REVIEWED. SOME OF THE ADVANTAGES OF AERIAL SURVEYS IN HIGHWAY ENGINEERING ARE: (1) THEY PROVIDE AMPLE QUALITATIVE INFORMATION PERTAINING TO PHOTOGRAPHY, SOILS, DRAINAGE, AND LAND USE; (2) THEY PROVIDE THE INDENTIFICATION FEATURES OF GRANULAR DEPOSITS CAN BE RELIABLY PREDICTED IN A HIGH PROPORTION OF CASES.

Thaler, RF Highway Research Board Bulletin 1958

THEY PROVIDE A MEANS OF CORRELATING TO THE TYPE AND INTENSITY OF LAND USE THE LAND-USE AND TRAFFIC-GENERATION FACTORS AS DEVELOPED FROM ORIGIN AND DESTINATION TRAVEL STUDIES. THEY SERVE AS A RELIABLE GUIDE FOR LOCATION OF HIGHWAY ENGINEERING IS REVIEWED. SOME OF THE ADVANTAGES OF AERIAL SURVEYS IN HIGHWAY ENGINEERING ARE: (1) THEY PROVIDE AMPLE QUALITATIVE INFORMATION PERTAINING TO PHOTOGRAPHY, SOILS, DRAINAGE, AND LAND USE; (2) THEY PROVIDE THE INDENTIFICATION FEATURES OF GRANULAR DEPOSITS CAN BE RELIABLY PREDICTED IN A HIGH PROPORTION OF CASES.

Thaler, RF Highway Research Board Bulletin 1958

THEY PROVIDE A MEANS OF CORRELATING TO THE TYPE AND INTENSITY OF LAND USE THE LAND-USE AND TRAFFIC-GENERATION FACTORS AS DEVELOPED FROM ORIGIN AND DESTINATION TRAVEL STUDIES. THEY SERVE AS A RELIABLE GUIDE FOR LOCATION OF HIGHWAY ENGINEERING IS REVIEWED. SOME OF THE ADVANTAGES OF AERIAL SURVEYS IN HIGHWAY ENGINEERING ARE: (1) THEY PROVIDE AMPLE QUALITATIVE INFORMATION PERTAINING TO PHOTOGRAPHY, SOILS, DRAINAGE, AND LAND USE; (2) THEY PROVIDE THE INDENTIFICATION FEATURES OF GRANULAR DEPOSITS CAN BE RELIABLY PREDICTED IN A HIGH PROPORTION OF CASES.
CONSTRUCTION MATERIALS

2A 202952

NEEDED RESEARCH ON ASPHALTIC ROAD MATERIALS

THE TERM “ASPHALTIC MATERIALS,” AS USED IN THIS DISCUSSION, COVERS THE RANGE OF LIQUID, SEMI-SOLID, AND SOLID ASPHALTIC PRODUCTS USED IN ROAD CONSTRUCTION. IN CHEMICAL COMPOSITION, ASPHALTIC MATERIALS ARE VARIED AND COMPLEX AND ALMOST NUMBERLESS VARIETIES MAY RESULT FROM DIFFERENT MATERIALS AND METHODS OF REFINING. SOME TESTS FOR ASPHALTIC MATERIALS ARE INTENDED TO MEASURE CERTAIN QUALITIES DIRECTLY, OTHERS ARE IDENTIFICATION TESTS. FURTHER RESEARCH IS NECESSARY TO DETERMINE IN WHICH CATEGORY SOME TESTS BELONG. INVESTIGATION IS ALSO NEEDED TO DETERMINE IF TESTS INTENDED TO MEASURE QUALITY ACTUALLY DO SO. THERE IS EVIDENCE TO SHOW THAT DUCTILITY TESTS AND TESTS DESIGNED TO CONTROL SUSCEPTIBILITY TO TEMPERATURE CHANGES ARE NOT DIRECTLY RELATED TO SERVICE BEHAVIOR. A HIGH DEGREE OF DURABILITY IS VERY IMPORTANT AND LITTLE CONCERNING THIS QUALITY CAN BE FORETOLD FROM PRESENT TEST METHODS. FURTHER RESEARCH IS NEEDED TO DETERMINE HOW THE CHARACTERISTICS OF THE CRUDE OILS INFLUENCE THE QUALITY OF THE FINISHED PRODUCTS. CLOSELY ALLIED WITH THESE QUESTIONS ARE THE PROBLEMS WHICH ARISE FROM DIFFERENT METHODS OF REFINING. HEATING, MIXING AND PLACING ASPHALTIC MATERIALS ALTER THEIR CHARACTERISTICS. IT IS NECESSARY TO DETERMINE TO WHAT EXTENT SUCH CHANGES MAY BE PERMITTED WITHOUT DAMAGE TO THE QUALITY OF THE FINISHED PRODUCT. IT IS ALSO NECESSARY TO STUDY THE INTER-RELATION BETWEEN ASPHALTIC MATERIALS AND THE AGGREGATES. THIS STUDY IS ALSO NEEDED ON NEW USES FOR RUTIMINOUS MATERIALS SUCH AS STABILIZATION OF SOILS. WHEN THE DETAILS OF NEEDED RESEARCH ARE CONSIDERED THE PROBLEM BECOMES ENORMOUSLY COMPLEX. THE COMBINED EFFORTS OF ALL INTERESTED IN THE PRODUCTION AND USE OF THESE MATERIALS ARE REQUIRED IF RESULTS ARE TO BE ACHIEVED IN A REASONABLE LENGTH OF TIME. /AUTHOR/

Kelley, EF Crum, RW DISCUSSER Lang, FC
DISCUSSER Cattell, RA DISCUSSER Campbell, LC
DISCUSSER Boyd, JE DISCUSSER Baskin, CM DISCUSSER Highway Research Board Proceedings 1935

2A 202962

AERIAL PHOTOGRAPHIC INTERPRETATION OF ROAD CONSTRUCTION MATERIALS IN SOUTHERN AFRICA WITH SPECIAL REFERENCE TO ITS POTENTIAL TO INFLUENCE ROUTE LOCATION IN UNDEVELOPED TERRITORIES

THE DEVELOPMENT OF THE USE OF AERIAL PHOTOGRAPHIC INTERPRETATION IN MATERIALS INVESTIGATIONS FOR RURAL ROAD PROJECTS IN THE VARIOUS TERRITORIES OF SOUTHERN AFRICA IS BRIEFLY REVIEWED. REFERENCE IS THEN MADE TO A TECHNIQUE FOR THE QUICK AND RELIABLE MATERIALS APPRAISAL OF LARGE TRACTS OF COUNTRY FOR ROAD LOCATION PURPOSES. A TECHNIQUE IN WHICH AERIAL PHOTOGRAPHIC INTERPRETATION IN DIRECT TERMS OF ENGINEERING SIGNIFICANCE PLAYS A MAJOR ROLE. THE METHOD IS ILLUSTRATED BY DETAILING TWO SPECIFIC PROJECTS FROM THE TERRITORY OF SOUTH WEST AFRICA, IN WHICH IT IS SHOWN THAT THE DISTRIBUTION OF HIGH-QUALITY ROAD BUILDING MATERIALS CAN BE A DEFINITE ROUTE LOCATION CRITERION IN UNDEVELOPED COUNTRIES, AND THAT WITH THE DEVELOPMENT OF A RAPID AND DEPENDABLE TECHNIQUE OF TERRAIN EVALUATION, IT IS NOW FEASIBLE TO TAKE THIS CRITERION INTO ACCOUNT. FINALLY, ATTENTION IS FOCUSED ON ONE OR TWO IMPORTANT ASPECTS OF AERIAL PHOTOGRAPHIC INTERPRETATION APPLICABLE TO THE MATERIALS PLANNING AND ROUTE LOCATION OF ROADS. /AUTHOR/

Caiger, JH
Photogrammetria /Neth/ Vol. 25 No. 5/6, Apr. 1970, pp 151-76, 4 Fig, 2 Tab, 11 Phot, 17 Ref
CONSTRUCTION MATERIALS

ASPHALTED ROADS AT PRESENT IS 5,927 KM. THIRTY-ONE NEW ROAD PROJECTS, TOTALLING 3,098 KM, ARE UNDER CONSTRUCTION AND 3,416 KM MORE ARE UNDER DESIGN OR READY TO BE ADVERTISED TO TENDER. MOST OF THE ASPHALT USED FOR CONSTRUCTION IS PRODUCED LOCALLY BY THE ARABIAN AMERICAN OIL COMPANY REFINERY AT RAS TANURA. THE GRADOES OF ASPHALT PRODUCTS USED WERE STANDARDIZED TO FOUR TYPES: PENETRATION ASPHALT 60-70 FOR HOT MIX WEARING COURSES, RC-2 CUTBACK FOR THE TACK COATS, RC-4 IN ASPHALTIC STABILIZED BASES AND MC-1 CUTBACK FOR THE PRIME COAT. A PLEA IS MADE FOR FOREIGN CONSTRUCTION COMPANIES TO COME TO SAUDI ARABIA AND PARTICIPATE IN THIS DEVELOPMENT WORK.

Communications Ministry /Saudi Arabia/ Oct. 1967

2A 203345
COORDINATION OF METHODS IN HIGHWAY LOCATION AND DESIGN

APPROXIMATE LOCATIONS OF EACH NEW HIGHWAY FACILITY ARE DETERMINED FROM RECONNAISSANCE SURVEYS. THE RECONNAISSANCE PLAN WITH A TOPOGRAPHIC SHEET IS PRESENTED TO THE GEOLOGIST WHO PREPARES A GEOLOGIC STRIP MAP ALONG THE LINES SHOWN. THIS GEOLOGIC MAP INFORMS THE ENGINEER REGARDING THE KINDS OF SOIL MATERIALS, THE LOCATION OF BEDROCK OUTCROPS, AND THE VARIOUS LAND FORMS TO BE TRAVERSED BY THE HIGHWAY. LOCATIONS WHERE SEISMIC EXPLORATIONS ARE NEEDED OR INDICATED, A GEOLOGIC SURVEY IS CONDUCTED TO INDICATE ALL AVAILABLE SOURCES OF HIGHWAY CONSTRUCTION MATERIALS: TRAP ROCK GRAVEL, SAND, ETC. SOME OF THE SPECIFIC APPLICATIONS OF GEOLOGICAL INTERPRETATIONS AND SEISMIC EXPLORATIONS TO THE LOCATION AND DESIGN OF HIGHWAYS IN MASSACHUSETTS ARE DESCRIBED.

Delano, GH Highway Research Board Bulletin Nov. 1948

2A 203420
THE WASHO ROAD TEST PART 1: DESIGN, CONSTRUCTION, AND TESTING PROCEDURES


Highway Research Board Special Reports 1954

2A 203440
EXAMINATION OF THE REPORT OF THE TECHNICAL COMMITTEE ON PAVEMENT DESIGN

THE SESSION ON GENERAL HIGHWAY MATTERS WAS OPENED BY M. ANDRE SACCASYN OF BELGIUM WHO PRESENTED A REPORT PROPOSING SUBJECTS AND QUESTIONS WHICH BENEFIT FROM INTERNATIONAL EXCHANGE OF INFORMATION. THESE INCLUDED: (1) PERFORMANCE OF EXPERIMENTAL ROADS UNDER CLIMATIC CONDITIONS OF DIFFERENT COUNTRIES, (2) APPLICATION OF PROBABILITY CONCEPTS TO MATERIAL CHARACTERISTICS AS WELL AS TO TRAFFIC CHARACTERISTICS FOR ROAD DESIGN, (3) STUDY OF VIBRATION EFFECTS DURING DYNAMIC LOADING, (4) COMPARATIVE STUDY OF PAVEMENT COMPOSITIONS, (5) INSTRUMENTATION FOR MEASUREMENT OF SURFACE TEXTURE, (6) INVESTIGATION OF SURFACE TEXTURE MEASUREMENTS AT VARIOUS SPEEDS, (7) PROBLEMS OF SURFACE WATER DISPOSAL AND FORMATION OF BLINDING MISTS, (8) IMPROVEMENT OF SUBSOIL DRAINAGE, AND (9) NOISE PROBLEMS. THE DISCUSSION PERIOD FOLLOWING INCLUDED TALKS ON: (1) MEASUREMENTS OF STRESSES AND STRAINS IN ASPHALT, GIVEN BY DR. DEMPWOLFF OF FEDERAL GERMANY, (2) APPLICATION OF NEW METHODS AND MATERIALS IN HIGHWAY CONSTRUCTION BY DESIGNERS IN GREAT BRITAIN, GIVEN BY MR. H. N. GINNS; (3) SKIDDING PROBLEMS AND THE SEARCH FOR SATISFACTORY RUGOSITY OF BITUMINOUS PAVEMENTS, GIVEN BY M. HOLOFFE OF BELGIUM; (4) DISTINCTION OF PAVEMENT DESIGN FACTORS BETWEEN ASPHALT AND CONCRETE PAVEMENTS, GIVEN BY MR. KOBAYASHI OF JAPAN; (5) PAVEMENT DESIGN PRACTICES IN USSR, GIVEN BY MR. KRIVISSKY; (6) PROBLEMS OF PAVEMENT STRENGTH AND IMPROVEMENT OF QUALITY OF MATERIALS, GIVEN BY M. PASQUET OF FRANCE; AND (7) THE DISTINCTION BETWEEN ROADWAY CHARACTERISTICS AND VEHICLE CHARACTERISTICS IN CONSIDERATION OF ROAD SURFACE DESIGN, GIVEN BY MR. W. N. CAREY OF USA. THE PRESENTATIONS WERE FOLLOWED BY CONSIDERATION OF THE REPORT OF THE TECHNICAL COMMITTEE ON PAVEMENT DESIGN. THE REPORT WAS COMPILED FROM QUESTIONNAIRE REPLIES FROM VARIOUS COUNTRIES AND INCLUDED INFORMATION ON THICKNESSES OF VARIOUS PAVEMENT COURSES, MECHANICAL CHARACTERISTICS OF PAVEMENTS IN TERMS OF THE NATURE OF THE TRAFFIC, GEOTECHNICAL CHARACTERISTICS OF THE SUBGRADE, DRAINING CONDITIONS, AND CLIMATIC CONDITIONS. COMMENTS WERE MADE ON TECHNICAL ASPECTS OF THE REPORT, THE NEED FOR CONTINUOUS REVIEW OF DESIGN METHODS, AND THE NEED FOR FULLER EXPLANATIONS OF NOMENCLATURE DUE TO LANGUAGE BARRIERS.

Perm Intl Assoc Road Congresses Proc 1967

2A 203480
FAILURE STUDY OF AN OVERLOADED 96 IN. CONCRETE PIPE

A THREE-YEAR OLD 96-INCH SEWER IN SAN DIEGO, DESIGNED FOR APPROXIMATELY 13 FEET OF COVER, WAS ABANDONED BECAUSE OF OVERLOAD FROM THE CONSTRUCTION OF A NEW 40-50-Ft HIGHWAY EMBANKMENT. THE PORTION OF THE PIPE AFFECTED BY THE SURCHARGE WAS STUDIED THROUGH FAILURE. THE PIPE FAILED AS EXPECTED AND BEHAVED THEREAFTER AS A FLEXIBLE CONDUIT. THERE WAS A MARKED VARIANCE IN THE RELATIVE DISTORTION OF THE PIPE AT DIFFERENT LOCATIONS, APPARENTLY BECAUSE OF DIFFERENCES IN THE BEDDING AND COMPRESSIBILITY OF THE LAYER OF SOIL SURROUNDING THE PIPe. IT WAS CONCLUDED THAT A PIPE LOCATED IN COMPRESSIBLE SOIL (EITHER NATURAL GROUND OR EMBANKMENT) AND SUBJECTED TO SURCHARGE, CAN BE OVERLOADED BECAUSE OF THE GENERATION OF PASSIVE EARTH PRESSURES. THE USE OF COMPENSATING COMPRESSIBLE BACKFILL IS SUGGESTED, AND A FORMULA IS PROPOSED FOR ESTIMATING THE STRENGTH OF PIPE REQUIRED IN SUCH CASES. IT WAS FOUND THAT THIS PARTICULAR PIPE, LOCATED IN A SATURATED SOIL, EXPERIENCED A SIGNIFICANT STRENGTH GAIN IN A 3-YEAR, 10-MONTH PERIOD.

Smith, T Shirley, E.C Smith, RE California Dept Transportation Feb. 1970
CONSTRUCTION MATERIALS

GRAMMETRY AND AERIAL SURVEYS ARE MUCH BETTER THAN THOSE OBTAINED BY GROUND SURVEYS ONLY.

Pryor, WT  Highway Research Board Bulletin  1957

2A 203857

NEEDED RESEARCH ON ASPHALTIC ROAD MATERIALS

THE TERM "ASPHALTIC MATERIALS," AS USED IN THIS DISCUSSION, COVERS THE RANGE OF LIQUID, SEMI-SOLID, AND SOLID ASPHALTIC PRODUCTS USED IN ROAD CONSTRUCTION. IN CHEMICAL COMPOSITION, ASPHALTIC MATERIALS ARE VARIED AND COMPLEX AND ALMOST NUMBERLESS VARIETIES MAY OCCUR. ALL DIFFERENT MATERIALS AND METHODS OF REFINING. SOME TESTS FOR ASPHALTIC MATERIALS ARE INTENDED TO MEASURE CERTAIN QUALITIES DIRECTLY, OTHERS ARE IDENTIFICATION TESTS. FURTHER RESEARCH IS NECESSARY TO DETERMINE IN WHICH CATEGORY SOME TESTS BELONG. INVESTIGATION IS ALSO NEEDED TO DETERMINE IF TESTS INTENDED TO MEASURE QUALITY ACTUALLY DO SO. THERE IS EVIDENCE TO SHOW THAT DUCTILITY TESTS AND TESTS DESIGNED TO CONTROL SUSCEPTIBILITY TO TEMPERATURE CHANGES ARE NOT DIRECTLY RELATED TO SERVICE BEHAVIOR. A HIGH DEGREE OF DURABILITY IS VERY IMPORTANT AND LITTLE CONCERNING THIS QUALITY CAN BE FORETOLD FROM PRESENT TEST METHODS. FURTHER RESEARCH IS NEEDED TO DETERMINE HOW THE CHARACTERISTICS OF THE CRUDE OILS INFLUENCE THE QUALITY OF THE FINISHED PRODUCT. THE CHARACTERISTICS OF THE MATERIALS WHICH ARISE FROM DIFFERENT METHODS OF REFINING, HEATING, MIXING AND PLACING ASPHALTIC MATERIALS ALTER THEIR CHARACTERISTICS. IT IS NECESSARY TO DETERMINE TO WHAT EXTENT SUCH CHANGES MAY BE PERMITTED WITHOUT DAMAGE TO THE QUALITY OF THE FINISHED PRODUCT.

Kelley, EF  Crump, RW DISCUSSER Lang, FC DISCUSSER Cattell, RA DISCUSSER Campbell, LC DISCUSSER Boyd, JE DISCUSSER Baskin, CM DISCUSSER Highway Research Board Proceedings  1935

2A 203322

CONSTRUCTION MATERIALS IN DELTA AREAS

PROCEDURES FOR IDENTIFYING LIKELY SOURCES OF MATERIALS FOR ENGINEERING CONSTRUCTION WITH MULTISPECTRAL REMOTE SENSORS ARE APPLIED TO A PART OF THE MISSISSIPPI DELTA. SENSORS INCLUDED PAN, CHROMATICCOLOR AND COLOR-INFRARED PHOTOGRAPHS, THERMAL-INFRARED IMAGERY, RADAR, NINE-CHANNEL MULTISPECTRAL SCAN IMAGERY, AND SMALL-SCALE PHOTO-INDEX MOSAICS. GROUND TRUTH WAS ACQUIRED CONCURRENTLY WITH THE REMOTE SENSOR OVERFLIGHTS INCLUDING SOIL MOISTURE, SOIL TEMPERATURE, WIND VELOCITY, GROUND PHOTOGRAPHS AND SOIL SAMPLES. A TWO-PHASE PROCEDURE INVOLVED A REGIONAL ANALYSIS FOLLOWED BY A DETAILED ANALYSIS. THE APQ-97 WAS THE MOST VERSATILE RADAR SYSTEM FOR REGIONAL ANALYSIS. COLOR-IN-FRADED PHOTOGRAPHS WERE PREFERRED IN MOST INSTANCES FOR DETAILED ANALYSIS IN THE DELTA ENVIRONMENT. THERMAL-INFRARED IMAGERY PROVIDED USEFUL INFORMATION WHERE IT WAS APPLIED IN CONJUNCTION WITH PHOTOGRAPHS. THE HIGHEST POTENTIAL SOURCES OF CONSTRUCTION MATERIALS IN THIS AREA WERE WITHIN THE CHENIERS, POINT BARS, RIVER BARS AND ACTIVE BEACHES.

Orr, DG  Quick, JR  Photogrammetric Engineering  Apr. 1971

2A 203962

AERIAL PHOTOGRAPHIC INTERPRETATION OF ROAD CONSTRUCTION MATERIALS IN SOUTHERN AFRICA WITH SPECIAL REFERENCE TO ITS POTENTIAL TO INFLUENCE ROUTE LOCATION IN UNDEVELOPED TERRITORIES

THE DEVELOPMENT OF THE USE OF AERIAL PHOTOGRAPHIC INTERPRETATION IN MATERIALS INVESTIGATIONS FOR ROAD PROJECTS IN THE VARIOUS TERRITORIES OF SOUTHERN AFRICA IS BRIEFLY REVIEWED. REFERENCE IS THEN MADE TO A TECHNIQUE FOR THE QUICK AND RELIABLE MATERIALS APPRAISAL OF LARGE TRACTS OF COUNTRY FOR ROAD LOCATION PURPOSES: A TECHNIQUE IN WHICH AERIAL PHOTOGRAPHIC INTERPRETATION IN DIRECT TERMS OF ENGINEERING SIGNIFICANCE PLAYS A MAJOR ROLE. MATERIALS IDENTIFICATION TESTS ILLUSTRATED BY DATA ON TWO SPECIFIC PROJECTS FROM THE TERRITORY OF SOUTH WEST AFRICA, IN WHICH IT IS SHOWN THAT THE DISTRIBUTION OF HIGH-QUALITY ROAD BUILDING MATERIALS CAN BE A DEFINITE ROUTE LOCATION CRITERION IN UNDEVELOPED COUNTRIES, AND THAT WITH THE DEVELOPMENT OF A RAPID AND DEPENDABLE TECHNIQUE OF TERRAIN EVALUATION, IT IS NOW FEASIBLE TO TAKE THIS CRITERION INTO ACCOUNT. FINALLY, ATTENTION IS FOCUSED ON ONE OR TWO IMPORTANT ASPECTS OF AERIAL PHOTOGRAPHIC INTERPRETATION APPLICABLE TO THE MATERIALS PLANNING AND ROUTE LOCATION OF ROADS.

Caiger, JH  Photogrammetria /Neth/ Vol. 25 No. 5/6, Apr. 1970, pp 151-76, 4 Fig, 2 Tab, II Phot, 17 Ref

2A 203120

MARYLAND ENGINEERING SOIL STUDY

THIS FINAL REPORT DESCRIBES RESEARCH IN ENGINEERING SOIL MAPPING OF MARYLAND, PERFORMED BY THE CIVIL ENGINEERING DEPARTMENT OF THE UNIVERSITY OF MARYLAND IN COOPERATION WITH MARYLAND STATE ROADS COMMISSION AND THE DEPARTMENT OF COMMERCE, BUREAU OF PUBLIC ROADS. TO SATISFY THE RESEARCH SPECIFICATION REQUIRING PRESENTATION, FOR THE HIGHWAY SOILS ENGINEER, OF DETAILED KNOWLEDGE OF SURFACE, SUBSURFACE, CLIMATIC AND MATERIALS CONDITIONS. SIX MAPS WERE PREPARED FOR EACH COUNTY, AS FOLLOWS: 1/ ENGINEERING SOIL MAP AND PROPERTY TABLES, 2/ ENGINEERING GEOLOGY MAP WITH SUPPORTING TABLES, 3/ SLOPE MAPPING, 4/ MATERIALS DIRECTOR SURVEY, 5/ AGGREGATES SOURCES MAP AND TABLES, AND 6/ DRAINAGE PATTERN MAP. IN PREPARATION OF THE COUNTY ENGINEERING SOIL MAPS, MARYLAND STATE ROADS COMMISSION SOIL SURVEY DATA WERE USED AND NO FIELD SAMPLING OR LABORATORY TESTS WERE MADE. ENGINEERING SOIL MAP UNIT BOUNDARIES WERE PLOTTED USING CORRELATION BETWEEN THE ENGINEERING SOIL SURVEY TEST RESULTS AND THE COUNTY AGRICULTURE SOIL MAP UNIT BOUNDARIES. OTHER MATERIAL CONFRONTING THIS CORRELATION WAS CONSULTED. PARTICULAR EMPHASIS WAS MADE TO ROCK IN CUTS AND TO MATERIAL TOO WET FOR USE. A COMPLETE MAPPING SYSTEM IS ALSO DESCRIBED WHICH PERMITS REPRODUCTION OF MAPS FOR FIELD USE. FREE PLANING AND DESIGN CENTER, A REVISION PROCEDURE FOR CONTINUITY OF THE SOILS KNOWLEDGE, A KEY FEATURE IN FILING, FOR READY REFERENCES, THOUSANDS OF MAPS ON MICROFILM IN APERTURE CARDS.

Piper, HW  Maryland University

ACKNOWLEDGMENT:

2A 203257

ROADS DEVELOPMENT IN SAUDI ARABIA

THE PROGRAM OF ROAD DEVELOPMENT STARTED IN 1963 IN SAUDI ARABIA. THE PRIMARY AND SECONDARY ROAD NETWORKS ARE DESCRIBED. THE TOTAL LENGTH OF MAIN
CONSTRUCTION MATERIALS

ASPHALTED ROADS AT PRESENT IS 5,927 KM. THIRTY-ONE NEW ROAD PROJECTS, TOTALLING 3,698 KM, ARE UNDER CONSTRUCTION AND 3,416 KM MORE ARE UNDER DESIGN OR READY TO BE ADVERTISED TO TENDER. MOST OF THE ASPHALT USED FOR CONSTRUCTION IS PRODUCED LOCALLY, BY THE ARABIAN AMERICAN OIL COMPANY REFINERY AT RAS TANURA. THE GRADES OF ASPHALT PRODUCTS USED WERE STANDARDIZED TO FOUR TYPES: PENETRATION ASPHALT 60-70 FOR HOT MIX WEARING COURSES, RC-2 CUTBACK FOR THE TACK COATS, RC-4 IN ASPHALTIC STABILIZED BASES AND MC-1 CUTBACK FOR THE PRIME COAT. A PLEA IS MADE FOR FOREIGN CONSTRUCTION COMPANIES TO COME TO SAUDI ARABIA AND PARTICIPATE IN THIS DEVELOPMENT WORK.

Communications Ministry /Saudi Arabia/ Oct. 1957

2A 203435
COORDINATION OF METHODS IN HIGHWAY LOCATION AND DESIGN
APPROXIMATE LOCATIONS OF EACH NEW HIGHWAY FACILITY ARE DETERMINED FROM RECONNAISSANCE SURVEYS. THE RECONNAISSANCE PLAN WITH A TOPOGRAPHIC SHEET IS PRESENTED TO THE GEOLOGIST WHO PREPARES A GEOLOGIC STRIP MAP ALONG THE LINES SHOWN. THIS GEOLOGIC MAP INFORMS THE ENGINEER REGARDING THE KINDS OF SOIL MATERIALS, THE LOCATION OF BEDROCK OUTCROPS, AND THE VARIOUS LAND FORMS TO BE TREATED BY THE HIGHWAY LOCATION. AN IMPROVEMENT OF EXISTING HIGHWAYS NEEDED ARE INDICATED. A GEOLOGIC SURVEY IS CONDUCTED TO INDICATE ALL AVAILABLE SOURCES OF HIGHWAY CONSTRUCTION MATERIALS: TRAP ROCK GRAVEL, SAND, ETC. SOME OF THE SPECIFIC APPLICATIONS OF GEOLOGICAL INTERPRETATIONS AND SEISMIC EXPLORATIONS TO THE LOCATION AND DESIGN OF HIGHWAYS IN MASSACHUSETTS ARE DESCRIBED.

Delano, GH Highway Research Board Bulletin Nov. 1948

2A 203420
THE WASHO ROAD TEST PART I: DESIGN, CONSTRUCTION, AND TESTING PROCEDURES

Highway Research Board Special Reports 1954

2A 203440
EXAMINATION OF THE REPORT OF THE TECHNICAL COMMITTEE ON PAVEMENT DESIGN
THE SESSION ON GENERAL HIGHWAY MATTERS WAS OPENED BY M. ANDRE SACCASYN OF BELGIUM WHO PRESENTED A REPORT COMPRISING SUBJECTS AND QUESTIONS WHICH BENEFIT FROM INTERNATIONAL EXCHANGE OF INFORMATION. THESE INCLUDED: (1) PERFORMANCE OF EXPERIMENTAL ROADS UNDER CLIMATIC CONDITIONS OF DIFFERENT COUNTRIES, (2) APPLICATION OF PROBABILITY CONCEPTS TO MATERIAL CHARACTERISTICS AS WELL AS TO TRAFFIC CHARACTERISTICS FOR ROAD DESIGN, (3) STUDY OF VIBRATION EFFECTS DURING DYNAMIC LOADING, (4) COMPARATIVE STUDY OF PAVEMENT COMPOSITIONS, (5) INSTRUMENTATION FOR MEASUREMENT OF SURFACE TEXTURE, (6) INVESTIGATION OF SURFACE TEXTURE MEASUREMENTS AT VARIOUS SPEEDS, (7) PROBLEMS OF SURFACE WATER DISPOSAL AND FORMATION OF BLINDING MISTS, (8) IMPROVEMENT OF SUBSOIL DRAINAGE, AND (9) NOISE PROBLEMS. THE DISCUSSION PERIOD FOLLOWING INCLUDED TALKS ON: (1) MEASUREMENTS OF STRESSES AND STRAINS IN ASPHALT, GIVEN BY DR. DEMPWOLFF OF FEDERAL GERMANY; (2) APPLICATION OF NEW METHODS AND MATERIALS IN HIGHWAY CONSTRUCTION BY DESIGNERS IN GREAT BRITAIN, GIVEN BY MR. H. N. GINNS; (3) SKIDDING PROBLEMS AND THE SEARCH FOR SATISFACTORY RUGOSITY OF BITUMINOUS PAVEMENTS, GIVEN BY M. HOLOFFE OF BELGIUM; (4) DISTINCTION OF PAVEMENT DESIGN FACTORS BETWEEN ASPHALT AND CONCRETE PAVEMENTS, GIVEN BY MR. KOYAYASHI OF JAPAN; (5) PAVEMENT DESIGN PRACTICES IN USSR, GIVEN BY MR. KRIVISSKY; (6) PROBLEMS OF PAVEMENT STRENGTH AND IMPROVEMENT OF QUALITY OF MATERIALS, GIVEN BY M. PASQUET OF FRANCE; AND (7) THE DISTINCTION BETWEEN ROADWAY CHARACTERISTICS AND VEHICLE CHARACTERISTICS IN CONSIDERATION OF ROAD SURFACE DESIGN, GIVEN BY W. N. CAREY OF USA. THE PRESENTATIONS WERE FOLLOWED BY CONSIDERATION OF THE REPORT OF THE TECHNICAL COMMITTEE ON PAVEMENT DESIGN. THE REPORT WAS COMPILED FROM QUESTIONNAIRE REPLIES FROM VARIOUS COUNTRIES AND INCLUDED INFORMATION ON THICKNESSES OF VARIOUS PAVEMENT COURSES, MECHANICAL CHARACTERISTICS OF PAVEMENTS IN TERMS OF THE NATURE OF THE TRAFFIC, GEOTECHNICAL CHARACTERISTICS OF THE SUBGRADE, DRaining CONDITIONS, AND CLIMATIC CONDITIONS. COMMENTS WERE MADE ON TECHNICAL ASPECTS OF THE REPORT, THE NEED FOR CONTINUOUS REVIEW OF DESIGN METHODS, AND THE NEED FOR FULLER EXPLANATIONS OF NOMENCLATURE DUE TO LANGUAGE BARRIERS.

Perm Intl Assoc Road Congresses Proc 1957

2A 203480
FAILURE STUDY OF AN OVERLOADED 96 IN. CONCRETE PIPE A THREE-YEAR OLD 96-INCH SEWER IN SAN DIEGO, DESIGNED FOR APPROXIMATELY 13 FEET OF COVER, WAS ABANDONED BECAUSE OF OVERLOAD FROM THE CONSTRUCTION OF A NEW 40-50-FT HIGHWAY EMBANKMENT. THE PORTION OF THE PIPE AFFECTED BY THE SURCHARGE WAS STUDIED THROUGH FAILURE. THE PIPE FAILED AS EXPECTED AND BEHAVED THEREAFTER AS A FLEXIBLE CONDUIT. THERE WAS A MARKED VARIANCE IN THE RELATIVE DISTORTION OF THE PIPE AT DIFFERENT LOCATIONS, APPARENTLY BECAUSE OF DIFFERENCES IN THE BEDDING AND COMPRESSION OF THE LAWS OF SURROUNDING THE PIPE. IT WAS CONCLUDED THAT A PIPE LOCATED IN COMPRESSIBLE SOIL (EITHER NATURAL GROUND OR EMBANKMENT) AND SUBJECTED TO SURCHARGE, CAN BE OVERLOADED BECAUSE OF THE GENERATION OF PASSIVE EARTH PRESSURES. THE USE OF COMPENSATING COMPRESSIBLE BACKFILL IS SUGGESTED, AND A FORMULA IS PROPOSED FOR ESTIMATING THE STRENGTH OF PIPE REQUIRED IN SUCH CASES. IT WAS FOUND THAT THIS PARTICULAR PIPE, LOCATED IN A SATURATED SOIL, EXPERIENCED A SIGNIFICANT STRENGTH GAIN IN A 3-YEAR, 10-MONTH PERIOD. /AUTHOR/

Smith, T Shirley EC Smith, RE California Dept Transportation Feb. 1970
CONSTRUCTION MATERIALS

2A 203502

THE APPLICABILITY OF A TERRAIN CLASSIFICATION AND EVALUATION SYSTEM TO ROAD AND MILITARY ENGINEERING PROBLEMS IN AUSTRALIA

FOLLOWING ATTEMPTS TO MODIFY EARLIER LAND CLASSIFICATIONS FOR ENGINEERING USE, THE PATTERN UNIT COMPONENT EVALUATION (PUCE) SYSTEM OF TERRAIN CLASSIFICATION HAS BEEN PROPOSED, BASED UPON EASILY RECONCILABLE AND DEFINABLE NATURAL FEATURES. THE SYSTEM RELATES ENGINEERING PROPERTIES TO THE TERRAIN AND ACTS AS A: (1) BASE FOR THE VALID EXTRAPOLATION OF TERRAIN PROPERTIES FORM ONE AREA TO ANOTHER, AND (2) FILE INTO WHICH ALL KNOWLEDGE OF ENGINEERING SIGNIFICANCE CAN BE COLLATED, STORED AND RETRIEVED FOR FUTURE USE. THE CLASSIFICATION SYSTEM HAS FOUR LEVELS OF GENERALIZATION, viz. PROVINCE, TERRAIN PATTERN, TERRAIN UNIT, TERRAIN COMPONENT, ALL OF WHICH ARE DEFINED. A BASIC PREMISE OF THE SYSTEM IS THAT ONCE THE PROPERTIES OF ONE EXAMPLE OF ANY MEMBER OF A CLASS HAVE BEEN ESTABLISHED, THEN THOSE PROPERTIES REMAIN SIMILAR OVER ALL OCCURRENCES OF THAT MEMBER HENCE, WHILE THE TERRAIN REMAINS CONSISTENT, PREDICTION OF PROPERTIES CAN BE MADE. BASIC UNDERLYING THIS PRINCIPLE MAY BE MANY AND VARIED PREDICTION IN TERMS OF APPROPRIATE LEVEL IN THE CLASSIFICATION COULD BE MADE: OF ROUTE LOCATION, GRADE LINE LOCATION EARTHMOVING QUANTITIES, EARTHMOVING EQUIPMENT, BRIDGING AND CULVERTING FREQUENCIES BEHAVIOR OF NATURAL MATERIALS AS SUBGRADE, LOCATION OF NATURAL MATERIALS AS PAVEMENT CONSTRUCTION MATERIALS, AND BEHAVIOR OF NATURAL MATERIALS AS PAVEMENT CONSTRUCTION MATERIALS. THE MILITARY ENGINEER MAY FACE SIMILAR PROBLEMS IN CONSTRUCTION OF THE MANY FACILITIES REQUIRED BY AN ARMY. IN ADDITION HE MUST MAKE AN ASSESSMENT OF THE TRAFFICIBILITY OF THE NATURAL SURFACE. THE PUCE PROGRAM OFFERS A BASIS FOR THE RECORDING AND EXTRAPOLATION OF EXPERIENCE OF GROUND MOBILITY ON LARGE AND SMALL AREAS OF TERRAIN. /AUTHOR /

Aitchison, GD Grant, K
Australian Road Research Board /Paper No 452, 1968/

2A 203569

RESEARCH STUDIES IN CONNECTION WITH DESIGN FEATURES OF THE FLORIDA TURNPIKE

THE 110-MILE 4-LANE LIMITED-ACCESS FLORIDA TURNPIKE WAS OPENED TO TRAFFIC ON 25 JANUARY 1957. THE DESIGN AND CONSTRUCTION OF THE FACILITY ENCOUNTERED A NUMBER OF MAJOR PROBLEMS. THESE PROBLEMS ARE OUTLINED, THEIR PECULIARITIES ARE RECORDED, AND THE STUDIES, EXPERIMENTATION, AND ANALYSIS ARE DESCRIBED ON WHICH RECOMMENDATIONS FOR POLICY DETERMINATION OF THE FLORIDA TURNPIKE AUTHORITY WERE BASED. THE PROBLEMS DISCUSSED ARE (1) A THICK LAYER OF SOILICIT LIMBEROCK IN THE LOWER HALF OF THE HIGHWAY, (2) SELECTION OF GRASS TYPES FOR EROSION CONTROL, (3) SEEPAGE OF FINE SAND THROUGH PRECAST-CONCRETE PIPE JOINTS, (4) DESIGN OF SIGN SUPPORTS TO WITHSTAND WINDS UP TO HURRICANE FORCE, (5) LOCATION OF MEDIAN SERVICE AREAS, AND (6) RIGHT-OF-WAY ACQUISITION.

Bergendoff, RN
Highway Research Board Proceedings /1958/

2A 203651

GEOTECHNICAL PROJECT AND QUALITY CONTROL OF HIGHWAY CONSTRUCTION IN AN ISLAND /IN PORTUGUESE/ 

THIS PROJECT CONCERNS THE BEHAVIOR OF PAVEMENTS CONSTRUCTED BY NON-STANDARD TECHNIQUES NECESSITATED BY DIFFICULTIES IN OBTAINING MATERIALS ON ITAPARICA ISLAND (BAHIA STATE). THE TWO METHODS EMPLOYED WERE THE USE OF FINE AGGREGATES AND CATI-ONIC EMULSIONS FOR COLD-MIX ASPHALT SURFACING AND THE APPLICATION OF TECHNIQUES TO AVOID THE INCONVENIENCES ASSOCIATED WITH THE USE OF 'MASSAPE' CLAYEY SOILS IN EARTHWORKS.

Tavares, NETO P
Road Research Institute /Brazil/ 1971

ACKNOWLEDGMENT: Road Research Institute /Brazil/

2A 203910

TUNNELLING ON THE NEW ROME METRO BETWEEN LARGO LOLLI ALBANI AND STAZIONE TERMINI


Berti, P Pamjnn, JM
Tunnels & Tunnelling /UK/ Vol. 4 No. 5 Sept 1972, pp 430-5, 5 Fig, 6 Tab

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

2A 204063

FROM HYDROLOGY INVESTIGATIONS FOR RIVER CROSSINGS

A COMPREHENSIVE FIELD INVESTIGATION IS A NECESSARY PREREQUISITE TO THE CONSTRUCTION OF A BRIDGE AT A RIVER SITE SUCH AS TERRAIN, SOIL TYPES, RIVER CHARACTERISTICS, DEGRADATION AND EROSION AND DEPOSITION MUST BE CONSIDERED. INFORMATION CAN BE GAINED BY EXAMINING EXISTING BRIDGES. THE FLOOD-WATER-LINE AS WELL AS ANY DAMAGE DUE TO ICE OR DEBRIS JAMS WILL BE EVIDENT. FURTHER INFORMATION MAY BE GATHERED FROM INTERVIEWS WITH LOCAL RESIDENTS WHO MAY BE AWARE OF A RIVERS PECULIARITIES WHICH ARE NOT EVIDENT FROM SOIL INVESTIGATIONS. AERIAL PHOTO-GRAMMETRY MAY ALSO BE AN ASSET IN DETERMINING A RIVERS FORMER BED OR CURRENT CHARACTERISTICS. /CGRA/RRL/

Harris, JD
Ontario Dept Hwys, Downsview /Canada/ 1965

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

2A 204094

DISTRIBUTION OF SOIL PRESSURES ON CONCRETE PIPE

THE SOIL PRESSURES ON A 24-IN. OD CONCRETE PIPE BURIED IN A 6-FT WIDE BY 7-FT LONG BY 7-FT DEEP STEEL SOIL CONTAINER WERE MEASURED WITH 16 PRESSURE CELLS MOUNTED IN THE PIPE. LOADS WERE APPLIED TO THE SOIL SURFACE WITH A LARGE UNIVERSAL TESTING MACHINE. GRAPHICAL REPRESENTATIONS OF THE SOIL PRESSURE DISTRIBUTIONS ARE GIVEN FOR SIX DIFFERENT SUPPORT CONDITIONS AND SEVERAL CONCLUSIONS ARE DRAWN REGARDING THE SUPPORT CONDITIONS THAT PRODUCE THE MOST DESIRABLE PRESSURE DISTRIBUTIONS. THE PRESSURE DISTRIBUTIONS FOR SIX SPECIFIC BEDDING CONDITIONS REPRESENT A RANGE OF CONDITIONS THAT WILL BE USEFUL TO DEVELOP AN ANALYTICAL PRESSURE DISTRIBUTIONS FOR FIELD BEDDING CONDITIONS IF THE SOIL TYPES AND RELATIVE COMPRESSIBILITIES OF THE BEDDING AND FOUNDATION MATERIALS ARE CONSIDERED. /AUTHOR /

Pettibone, HC Howard, AK
Am Soc Civil Engr J Pipeline Div July 1967
INVESTIGATION OF POROUS PAVEMENTS FOR URBAN RUNOFF CONTROL

LABORATORY STUDIES DEMONSTRATED THE TECHNOLOGICAL AND ECONOMIC FEASIBILITY OF OPEN-GRATED ASPHALT CONCRETE AS POROUS PAVEMENTS TO CONSERVE WATER, TO REDUCE LOADS ON COMBINED SEwers AND TREATMENT PLANTS, AND TO MITIGATE URBAN RUNOFF AS A DESTRUCTIVE ENVIRONMENTAL FACTOR. STUDIES OF CANDIDATE MATERIALS REVEALED A POROUS ASPHALTIC CONCRETE CONTAINING 5% ASPHALT BY WEIGHT AND AGGREGATE GRADED TO ALLOW A WATER FLOW OF 76" PER HOUR TO BE THE OPTIMAL POROUS ROAD MATERIAL. MATERIALS TESTING FOR STABILITY, DURABILITY, AND FREEZE-THAW SUSCEPTIBILITY PROVED THIS MATERIAL SUITABLE FOR USE IN ROAD CONSTRUCTION. MAJOR DESIGN PARAMETERS CONSIDERED WERE THE LOAD-BEARING CAPACITY AND PERMEABILITY OF THE SUBGRADE, EXPECTED MAXIMUM PRECIPITATION AND DEPTH OF FROST PENETRATION.

Thelen, E
Franklin Institute Mar. 1972, 142 pp

EROSION PREVENTION AND TURF ESTABLISHMENT MANUAL

THE MANUAL IS DIVIDED INTO THREE SECTIONS WHICH PERMIT EASY EXTRACTION OF MATERIAL PERTINENT TO EACH PHASE OF TURF ESTABLISHMENT. BACKGROUND INFORMATION IS PRESENTED IN THE SECTION ENTITLED "PHILOSOPHY OF EROSION PREVENTION." SPECIFIC INFORMATION FOR EACH AREA OF INTEREST ARE PROVIDED IN TWO SECTIONS DEALING WITH PRECONSTRUCTION AND CONSTRUCTION PROCEDURE. THE FORMER SECTION PROVIDES INFORMATION ON PRELIMINARY AND DETAIL DESIGN AND WILL BE OF INTEREST TO DISTRICT ENGINEERS AND MAINTENANCE PERSONNEL. THE IMPLEMENTATION AND USE OF EROSION PREVENTION AND TURF ESTABLISHMENT ITEMS ARE COVERED IN THE SECOND SECTION WHICH WOULD BE RELEVANT TO CONSTRUCTION AND MAINTENANCE PERSONNEL.

Foote, LE Kill, DL Bolland, AH
Minnesota Department of Highways 1970, 44 pp, 44 Fig, 7 Tab

STABLE SHOULDERS

THE FOLLOWING POINTS CONCERNING SHOULDERS SHOULD BE CONSIDERED WHENEVER A HIGHWAY DESIGN PLAN IS UNDER CONSIDERATION: (1) COST OF DIFFERENT TYPES OF SHOULDERS VARY OVER A CONSIDERABLE RANGE; (2) DEPENDENT UPON THE TYPE OF HIGHWAY, WHICH IS RELATED TO THE TRAFFIC LOADS, A GIVEN SHOULER WILL PROVIDE ADEQUATE STABILITY AND BEST VALUE FOR MONEY EXPENDED: (3) STABILIZED TURF SHOULDERS HAVE A DEFINITE PLACE ON MODERN HIGHWAYS; (4) STABILIZED TURF COVERINGS; (5) STABILIZED TURF SOULDERS ARE RELATIVELY ECONOMICAL TO CONSTRUCT AND TO MAINTAIN; (6) MORE INFORMATION IS NEEDED CONCERNING THE CAUSE OF BUILD-UP OF STABILIZED TURF SHOULDERS AND A SERIES OF TESTS, DESIGNED TO DETERMINE WHY BUILD-UP TAKES PLACE, IS OFFERED FOR CONSIDERATION. TYPICAL COST DATA ARE GIVEN FOR A NUMBER OF SHOULDER TYPES: ASPHALTIC CONCRETE, CEMENT-STABILIZED SOIL, BITUMINOUS DESTRUCTIVE ENVIRONMENTAL FACTOR, IMPROVED STONE, GRAVEL, OILED SURFACES, AND TRANSITION STRIP (MODIFIED PENETRATION MACADAM). /AUTHOR/

Nikola, HC
Highway Res Bd Roadside Dev Com Reports 1952

FACTORs INVOLVED IN THE USE OF HERBACEOUS PLANTS FOR EROSION CONTROL ON ROADWAYS

ROADWAY CONSTRUCTION ANNUALLY RESHAPES THOUSANDS OF ACRES OF LAND IN THE UNITED STATES. HIGH RATES OF SOIL LOSS AND RESULTING SEDIMENT YIELDS FROM CONSTRUCTION SITES HAVE CAUSED A SERIOUS EROSION PROBLEM. ALTHOUGH AN EXCELLENT JOB IS BEING DONE TO STABILIZE AND BEAUTIFY INTERSTATE AND PRIMARY HIGHWAYS, SECONDARY ROADS REMAIN A PROBLEM. NUMEROUS SOIL MATERIALS ARE BEING EXPOSED THAT COMMONLY HAVE PHYSICAL AND CHEMICAL PROPERTIES UNFAVORABLE TO PLANT GROWTH, THEREBY MAKING ROADWAY STABILIZATION DIFFICULT. THE BASIC PRINCIPLES FOR ESTABLISHING VEGETATION ARE PRESENTED ALONG WITH A RECOMMENDATION THAT, WHERE FEASIBLE, SLOPES STEEPER THAN 3:1 BE FLATTENED. VARIOUS PLANTING METHODS AND REQUIREMENTS FOR SELECTING PLANT SPECIES ARE DISCUSSED, EMPHASIZING THE NEECESSITY FOR MULCHING AND MAINTAINING ESTABLISHED VEGETATION.

/Turelle, JW Hipway Research Board Special Reports No. 135, 1973, pp 99-104, 1 Tab, 8 Ref

CONSTRUCTION MATERIALS


Armstrong, MD Csathy, TI Burn, KN Highway Research Record Hwy Res Board 1963

CONSTRUCTION TOLERANCES FOR CONCRETE IN HIGHWAY STRUCTURES

CONSTRUCTION TOLERANCES FOR CONCRETE NOW GENERALLY SPECIFIED OR RECOMMENDED IN VARIOUS DESIGN STANDARDS ARE DISCUSSED. THE NEED FOR NEW TOLERANCE CRITERIA, AND A BASIC APPROACH TO TOLERANCING AS A FUNCTION OF DESIGN, ARE PROPOSED, TAKING INTO ACCOUNT SERVICE REQUIREMENTS, STRUCTURAL INTEGRITY, AND APPEARANCE OF CONCRETE CONSTRUCTION.

Anderson, AR Highway Research Record, Hwy Res Board 1965

AIRPORT PAVING


Federal Aviation Administration /US/ June 1964

ACKNOWLEDGMENT: National Asphalt Pavement Association NAPA 4076, 3C5017014

Turelle, JW Hipway Research Board Special Reports No. 135, 1973, pp 99-104, 1 Tab, 8 Ref
TESTING MACHINE, ALONG WITH A CAREFULLY PLANNED TIME AND MONEY. A PROPERLY DESIGNED ROLLING LOAD TESTING PROGRAM, MIGHT REDUCE THE COST IN BOTH WELL-DISTRIBUTED SUPPLY OF SANDSTONE. THE BEST EV AL-

THIS PAPER DESCRIBES A HIGH-CAPACITY ROLLING LOAD TESTING MACHINE AND THE RESULTS OF TESTS PERFORMED WITH IT OVER THE LAST THREE YEARS AT WEST VIRGINIA UNIVERSITY. THE TESTING MACHINE IS BEING USED FOR THE EVALUATION OF BASECOURSE MATERIALS IN A SIMULATED HIGHWAY. CONSIDERABLE ECONOMY IN ROAD AND HIGHWAY CONSTRUCTION COULD BE REALIZED IN WEST VIRGINIA IF SOME CONSTRUCTION METHOD WERE DEVISED THAT WOULD UTILIZE THE STATE'S ABUNDANT AND WELL-DISTRIBUTED SUPPLY OF SANDSTONE. THE BEST EVALUATION WOULD COME FROM HIGHWAYS CONSTRUCTED OF SUCH MATERIALS, AN EVALUATION EXPENSIVE IN BOTH TIME AND MONEY. A PROPERLY DESIGNED ROLLING LOAD TESTING MACHINE, ALONG WITH A CAREFULLY PLANNED TESTING PROGRAM, MIGHT REDUCE THE COST IN BOTH ASPECTS OPINION AS TO THE USEFULNESS OF ROLLING LOAD MACHINES OR TEST TRACKS OVER THE PAST SEVERAL YEARS HAS BEEN DIVIDED. ONE MACHINE HAS BEEN ABANDONED WHILE ANOTHER VERY LARGE MACHINE HAS BEEN CONSTRUCTED RECENTLY AT WASHINGTON STATE UNIVERSITY. CIRCULAR TRACKS ARE IN USE AT THE UNIVERSITY OF ILLINOIS AND AT THE AMERICAN OIL COMPANY IN WHITING, INDIANA. (AUTHOR/

Haynes, RR Worrell, DT Highway Research Record, Hwy Res Board 1967


De, HENAU A Persoons, J Reichert, J Romain, J Verstraeten, J Perm Intl Assoc Road Congresses Proc 1967

2A 205522 STRUCTURAL DESIGN OF FLEXIBLE PAVEMENTS EXPERIMENTAL RESEARCH PROGRAM IN MEXICO AN EXPERIMENTAL RESEARCH PROGRAM IS CONDUCTED ON FLEXIBLE PAVEMENT THICKNESS DESIGN FOR LOW TRAFFIC HIGHWAYS IN MEXICO. RESEARCH IS CONDUCTED ON SPECIALLY CONSTRUCTED ROADS. THE THREE PROJECTS UNDER STUDY COMPRISE 20 DIFFERENT STRUCTURAL DESIGNS, AND A TOTAL OF 80 FIELD SECTIONS. THE MAIN VARIABLES ARE: (1) THICKNESS OF BASE COURSE, WITH 2 LEVELS (10 AND 20 CM) AND (2) THICKNESS OF SUBBASE COURSE, WITH 3 OR MORE LEVELS (0.10,20 AND 30 CM) DEPENDING ON THE PROBLEM. THE EXISTING PAVEMENTS IN THE HIGHWAY NETWORK ARE STUDIED. THE FACTORIAL EXPERIMENT CONSISTS OF 9 PRIMARY CONTROL COMBINATIONS, EACH WITH 16 EXPERIMENTS, GIVING A TOTAL OF 144 SECTIONS FOR THE PERFORMANCE SURVEY. THE MAIN VARIABLES ARE: (1) CLIMATE, WITH 3 LEVELS: OPTICAL, STEPPE, AND SUBTROPICAL. AND (2) SUBGRADE STRENGTH, WITH THREE LEVELS: LOW, MEDIUM, AND HIGH. RESEARCH IS CONDUCTED ON PAVEMENT BEHAVIOR OF FIELD SECTIONS IN THE HIGHWAY NETWORK AND STUDY OF FULL-SCALE MODELS IN THE LABORATORY. A CIRCULAR TEST TRACK IS PLANNED FOR THE LATTER TEST. EXPERIMENTATION IS CONDUCTED WITH NON-DESTRUCTIVE TEST METHODS TO ESTIMATE PERFORMANCE. THE CHLO PROFILOMETER HAS BEEN USED WITH SATISFACTORY RESULTS WHEN THE TEXAS FORMULA IS APPLIED TO DETERMINE PRESENT SERVICEABILITY INDEX. BENKELMAN BEAM REBOUND DEFLECTIONS ARE POOR IND-
CONSTRUCTION MATERIALS

2A

CITORS OF COMPOSITE STRENGTH IN THE STUDIED PAVEMENTS. REPEATED FIELD PLATE BEARING TESTS, USING A 30.5 CM DIAMETER RIGID PLATE ARE PROGRAMMED TO ESTIMATE THE BEHAVIOR OF PAVEMENTS AND TO OBTAIN QUALITATIVE INFORMATION BOTH ON COEFFICIENTS OF RELATIVE STRENGTH FOR PAVEMENT MATERIALS AND ON AXIAL LOAD EQUIVALENCY FACTORS FOR REGIONAL CONDITIONS. SOME OF THE MATHEMATICAL MODELS DEVELOPED BY THE AASHO ROAD TEST HAVE BEEN FOUND USEFUL FOR RESEARCH.

Cabantro, SC Menchaca, LM Perm Intl Assoc Road Congresses Proc 1967

2A 205526
CALCULATION AND DESIGN OF FLEXIBLE PAVEMENTS-Poland

Wojciechowski, H Perm Intl Assoc Road Congresses Proc 1967

2A 205527
GENERAL HIGHWAY MATTERS-italy
THE PRINCIPLES FOR THE DESIGN OF ROADS AND HIGHWAYS ARE IN AN EVOLUTIONARY STAGE IN ITALY. THE AASHO EXPERIMENTS HAVE PERMITTED HIGHWAY ADMINISTRATION TO DRAW CONCLUSIONS FOR DESIGN AND CONSTRUCTION OF THE ROAD. MOST SUPERSTRUCTURES OF ROADS AND HIGHWAYS ARE OF A FLEXIBLE TYPE, THE THICKNESS OF WHICH IS DETERMINED BY THE CBRR METHOD AND CORRESPONDING GRAPHS. EMPIRICAL AND THEOREtical METHODS SUCH AS THAT OF IVANOV AND MEASUREMENT BY DEFLECTOMETER ARE ALSO USED. RIGID HIGHWAYS, EXCEPT AT AIRPORTS AND MILITARY AIRPORTS ARE Seldom USED IN ITALY. NUMEROUS SERIES OF RUGOSITY MEASURE-

MENTS OF STATE ROADS WERE CONDUCTED TO AID RESEARCH INTO THE CAUSES OF THE DIVERSITY OF VALUES ON THE SAME TYPE OF HIGHWAYS AND THEIR VARIATIONS WITH TIME AND TEMPERATURE. A PROFILOMETER WAS BUILT FOR RECORDING THE TRANSVERSE PROFILE OF THE HIGHWAY. A DRAINAGE METHOD IS DESCRIBED IN SOIL CONSISTING OF PEAT AND OTHER ORGANIC SUBSTANCES WHERE THE CREATION OF HOLES 42 CM IN DIAMETER FILLED WITH SAND AND THEN COVERED WITH A LAYER OF SAND HAS BEEN USED. SUPERFLEXIBLE SUBGROUNDS ARE USED TO PROTECT THE PAVEMENT SURFACE BY CAPILLARITY WHERE IT IS THEN COLLECTED INTO DITCHES. ANOTHER DRAINAGE METHOD FOR THE CONSOLIDATION AND STABILIZATION OF SLIP MOVEMENTS BY INDIVIDUAL DRAINING SPURE IN THE FORM OF AN AN IS DESCRIBED. THE CONSTRUCTION OF THE ITALIAN MOTORWAY NETWORK HAS REQUIRED SPECIAL WINTER MAINTENANCE ON THE HIGHWAYS. RESEARCH IS CONDUCTED: (1) TO AVOID BY PREVENTATIVE MEANS, THE FORMATION OF ICE ON THE ROADS SURFACE, (2) TO MAINTAIN THE CARRIAGE-WAY FREE FROM SNOW, AND (3) TO OBTAIN BEHAVIOR APPROPRIATE TO THE METEOROLOGICAL SITUATION AT THE TIME FROM THE USERS. THESE FIRST DEMANDS WERE ACHIEVED WITH CHEMICAL SOLVENTS (SODIUM CHLORIDE AND CALCIUM CHLORIDE) BEFORE THE FORMATION OF FROST ICING. THE SECOND WAS ACCOMPLISHED BY THE CONTINUOUS CLEARING OF THE SNOW BY MECHANICAL MEANS, AND THE THIRD BY A SPECIAL SIGNAL SYSTEM AND THE DISTRIBUTION OF INFORMATIVE LEAFLETS AT THE POINTS OF ENTRY. TO AVOID BUMPS FOR MOTOR VEHICLES PASSING FROM THE LEVEL OF A BRIDGE TO THE LEVEL OF THE ORDINARY ROAD SURFACE, SPECIAL ALLOWANCES BY EXPERIMENTAL RESEARCH WERE CARRIED OUT AND A SPECIAL NEOPRENE JOINT WAS OBTAINED.

Colabich, GF Perm Intl Assoc Road Congresses Proc 1967

2A 205528
GENERAL HIGHWAY MATTERS-INdIA
IN INDIA, RIGID PAVEMENT DESIGN IS GENERALLY BASED ON WESTERGAARD AND THOMLINSON ANALYSES FOR LOAD AND TEMPERATURE STRESSES RESPECTIVELY, OR ON THE PICKETTS CORNER FORMULA. WHERE THE NECESSARY TESTING FACILITIES ARE NOT AVAILABLE, AD-HOC THICKNESSES AS TENTATIVELY RECOMMENDED BY THE INDIAN ROADS COMMISSION ARE USED. A METHOD OF DESIGN BASED ON THE MODULUS OF SUBGRADE ELASTICITY AND A MODIFIED LEAFLET AT THE POINTS OF ENTRY. TO AVOID SNOW BY MECHANICAL MEANS, AND THE THIRD BY A SPECIAL SIGNAL SYSTEM AND THE DISTRIBUTION OF INFORMATIVE LEAFLETS AT THE POINTS OF ENTRY. TO AVOID BUMPS FOR MOTOR VEHICLES PASSING FROM THE LEVEL OF A BRIDGE TO THE LEVEL OF THE ORDINARY ROAD SURFACE, SPECIAL ALLOWANCES BY EXPERIMENTAL RESEARCH WERE CARRIED OUT AND A SPECIAL NEOPRENE JOINT WAS OBTAINED.

Wojciechowski, H Perm Intl Assoc Road Congresses Proc 1967
CONSTRUCTION MATERIALS

NANCE PRACTICES ADOPTED IN INDIA ARE DESCRIBED. /AUTHOR/

Mehra, SR Perm Intl Assoc Road Congresses Proc 1967

2A 205597 THE INCORPORATION OF DECOMPOSED GRANITE IN THE DESIGN AND CONSTRUCTION OF PAVEMENTS IN HONG KONG

THE DESIGN AND CONSTRUCTION OF ROADS AND AIRFIELDS USING STABILIZED DECOMPOSED GRANITE ARE DESCRIBED. INCLUDED IS A TAXI-TRACK AT KAI TAK WHERE DECOMPOSED GRANITE WAS TREATED WITH 12% CEMENT. EXCELLENT COMPRESSIVE STRENGTHS OF LABORATORY AND FIELD SPECIMENS WERE OBTAINED.

Henry, JK Grace, H Soil Mechanics & Foundation Engineering June 1948

ACKNOWLEDGMENT: Highway Research Board Bibliography

2A 205627 CALCULATION OF ELASTIC DEFORMATIONS OF PAVEMENTS BUILT ON PEAT /IN RUSSIAN/

DATA ARE PRESENTED ON ELASTIC DEFORMATIONS OCCURRING IN ROADS BUILT ON PEAT. OBSERVATIONS WERE CARRIED OUT UNDER VARIOUS WEATHER AND CLIMATIC CONDITIONS. MAXIMA ELASTIC DEFORMATIONS OCCURRED IN THE AUTUMN. THE MAGNITUDE OF THE DEFORMATIONS DEPENDS ON THE THICKNESS OF THE SURFACING AND SUBGRADE AND ON THE PHYSICO-MECHANICAL PROPERTIES OF THE PEAT. MODULI OF ELASTICITY WERE DETERMINED FOR DIFFERENT KINDS OF PEAT; THE ELASTIC MODULUS VARIES VERY LITTLE WITH THE COMPOSITION AND NATURE OF THE PEAT, BUT IS DETERMINED BY ITS DENSITY AND MOISTURE CONTENT. IT WAS SHOWN THAT THE ELASTIC THEORY COULD BE APPLIED TO THE CALCULATION OF ELASTIC DEFORMATIONS OF ROAD STRUCTURES BUILT ON PEAT. /LCPC/RRL/

Segerkrants, VM Tallin Polytech Inst Proc /USSR/ 1967

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 205648 PAVEMENT DESIGN CONCEPT FOR TROPICAL COUNTRIES /IN FRENCH/

THE ARTICLE STRESSES THE DIFFERENCES BETWEEN TROPICAL AND TEMPERATE ENVIRONMENTAL FACTORS AND THEIR INFLUENCE ON ROAD CONSTRUCTION AND MAINTENANCE. THE THREE MAIN PHASES OF TROPICAL PAVEMENT DESIGN ARE REVIEWED: (1) FROM 1950 TO 1955, TWO MAIN TECHNIQUES WERE USED: MACADAM AND BITUMEN-STABILIZED SOIL. THE PERFORMANCE OF BOTH MATERIALS PROVED SATISFACTORY; (2) FROM 1955 TO 1964, LOCAL MATERIALS, ESPECIALLY LATERITIC GRAVEL, WERE UTILIZED; (3) THE PRESENT PHASE IS CHARACTERIZED BY AN INCREASE IN TRAFFIC AND THE USE OF MORE COSTLY TECHNIQUES: GRAVEL STABILIZED WITH CEMENT, CRUSHER MATERIAL, AND GRAVEL-BITUMEN. NEW TRENDS ARE DEFINED AND ATTENTION IS DRAWN TO THE NEED FOR FURTHER RESEARCH INTO THE DEVELOPMENT OF NEW TEST METHODS TO SIMULATE REAL TRAFFIC CONDITIONS, THE ADOPTION OF NEW QUALITY CRITERIA FOR SECONDARY ROADS, MORE DETAILED TRAFFIC STUDIES, AND SURVEILLANCE AND MAINTENANCE OF CARRIAGEWAYS. /TRL/

Liutaud, GA Ann Inst Tech Batiment Travaux Publ /Fr/ No 281, May 1971, pp 137-62, Figs, Photos

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

2A 205662 A METHOD FOR THE DESIGN OF MULTIPLE SURFACE TREATMENTS BASED ON THE RESULTS OF THREE ROAD SURFACING EXPERIMENTS

A SERIES OF ROAD EXPERIMENTS WERE CARRIED OUT IN DIFFERENT CLIMATIC AREAS ON ROADS CARRYING DIFFER-
ENT AMOUNTS OF TRAFFIC TO COMPARE THE DIFFERENT METHODS OF SURFACE TREATMENT COMMONLY IN USE UNDER PROPERLY CONTROLLED CONDITIONS. ONCE THE RELATIVE PERFORMANCE WAS ESTABLISHED THIS WOULD ENABLE THE MOST ECONOMICAL METHOD TO BE USED IN PRACTICE FOR A PARTICULAR SET OF CIRCUMSTANCES. THREE EXPERIMENTS ARE CONDUCTED ON ROADS CARRYING BETWEEN 250 AND 1000 VEHICLES/DAY. THE METHODS INVESTIGATED INCLUDED SINGLE, DOUBLE AND TRIPLE SURFACE TREATMENTS AND SEVERAL VARIATIONS OF THE WARM PROCEDURES. INDUSTRY EXPERIENCE WITH USE OF SLURRY SEAL. THE PERFORMANCE OF THE DIFFERENT METHODS TESTED IN THE THREE EXPERIMENTS AFTER PERIODS VARYING BETWEEN 4 1/2 AND 8 YEARS AFTER CONSTRUCTION. THE RESULTS INDICATED THAT THE PERFORMANCE CAN BE RELATED TO THE BINDER-AGGREGATE RATIO AND THE SPREAD OF DATA OBTAINED ENABLED DESIGN CURVES TO BE DRAWN FOR ROADS CARRYING BETWEEN 250 AND 1000 VEHICLES/DAY. IT SEEMS THAT A NUMBER OF THE DOUBLE AND TRIPLE SURFACE-TREATMENT SPECIFICATIONS USED IN THE PAST HAVE NOT INCORPORATED SUFFICIENT BINDER FOR OPTIMUM DURABILITY, AND OTHER SPECIFICATIONS ARE SUSCEPTIBLE TO FATIGUE UP. SOME RELATIVE COSTS OF CONSTRUCTION ARE GIVEN FOR THE DIFFERENT METHODS TESTED IN TWO OF THE EXPERIMENTS. THE MORE EXPENSIVE METHODS HAVE NOT NECESSARILY PERFORMED BETTER THAN CHEAPER METHODS. THIS INDICATES THE IMPORTANCE OF SELECTING THE BEST METHOD FOR GIVEN CONDITIONS IN PRACTICE AND ALSO THAT CAREFUL ATTENTION TO DESIGN IS NECESSARY.

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 205681
DESIGN AND CONSTRUCTION OF AIRCRAFT PAVEMENTS IN UNUSUAL CONDITIONS

THIS PAPER DEALS WITH THE CONSTRUCTION OF AIRFIELD PAVEMENTS OVER DEEP DEPOSITS OF SOFT, COMPRESSIBLE SOILS AND SOILS VARYING IN ENGINEERING PROPERTIES. THE PERMANENT DEFORMATION OF SOILS AND SOILS VARYING IN ENGINEERING PROPERTIES AND DISTRIBUTION. SOME OF THE PROBLEMS ENCOUNTERED IN THESE CIRCUMSTANCES ARE DESCRIBED AND ILLUSTRATIVE EXAMPLES OF SOLUTIONS ADOPTED IN THE PAST ARE QUOTED FOR SOME OF THE AIRFIELD PROJECTS WITH WHICH THE AUTHORS HAVE BEEN ASSOCIATED.

ACKNOWLEDGMENT: Transport & Road Research Laboratory /UK/

2A 205731
DESIGN OF PAVEMENTS USING DEFLECTION EQUATIONS FROM AASHO ROAD TEST RESULTS

THE STRUCTURAL PERFORMANCE WAS INVESTIGATED OF SOME SATELLITE PAVEMENTS IN THE PIEDMONT REGION OF VIRGINIA AND THICKNESS EQUIVALENCY VALUES WERE EVALUATED OF MATERIALS USED ON THE BASIS OF AASHO ROAD TEST RESULTS. MODEL EQUATIONS SUGGESTED BY THE AASHO COMMITTEE, (3) ASSUMING THICKNESS EQUIVALENCY VALUE OF ASPHALTIC CONCRETE AS EQUAL TO 1.0, (4) ENVIRONMENTAL CONDITIONS, (5) TYPE AND DURATION OF TRAFFIC, AND (6) AGE OF PAVEMENT. TWENTY PROJECTS WITH VARYING PAVEMENT STRUCTURES WERE CHOSEN FOR STUDY TO EVALUATE THE THICKNESS EQUIVALENCY VALUES OF THE DIFFERENT MATERIALS IN THE PAVEMENTS' SYSTEMS, AND TO CORRELATE THESE VALUES WITH THE PAVEMENT PERFORMANCE LONG WITH THE VARIABLES OF SOIL SUPPORT, TRAFFIC, AND AGE. CONCLUSIONS OF THE INVESTIGATION INDICATE THAT: (1) THE STRUCTURAL PERFORMANCE OF THE PAVEMENTS CAN BE EVALUATED OF MATERIALS USED ON THE BASIS OF AASHO ROAD TEST RESULTS. MODEL EQUATIONS SUGGESTED BY THE AASHO COMMITTEE, (3) ASSUMING THICKNESS EQUIVALENCY VALUE OF ASPHALTIC CONCRETE AS EQUAL TO 1.0, (4) THE TOLERABLE DEFLECTION OF A PAVEMENT IS A FUNCTION OF ITS RIGIDITY, AND (5) THE METHOD USED IN VIRGINIA IS SUITABLE FOR DESIGN BUT COULD BE MADE MORE FLEXIBLE USING A NOMOGRAPH FOR THICKNESS INDEX DETERMINATION AND A DESIGN BASED ON THICKNESS EQUIVALENCY VALUES.

ACKNOWLEDGMENT: Transport & Road Research Laboratory /UK/

Walker, RN
Conf Asphalt Pavements Proc /S Africa/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 205668
DESIGN CONSIDERATIONS FOR ASPHALT PAVEMENTS

PAVEMENT DESIGN WITHIN A SYSTEMS FRAMEWORK IS CONSIDERED THE OUTLINES FOR A NUMBER OF SUBSYSTEMS WHICH CAN BE DEVELOPED TO EXAMINE SPECIFIC DISTRESS MODES INCLUDE: FATIGUE IN THE ASPHALT BOUND LAYER (RUPTURE), PERMANENT DEFORMATION IN THE PAVEMENT STRUCTURE (DISTORTION), AND FRACTURE DUE TO STRESSES RESULTING FROM BRAKING AND ACCELERATION (RUPTURE) OR DUE TO THERMAL STRESSES (RUPTURE). THE RELATIONSHIP BETWEENthese distress modes is examined in some detail. THE INFLUENCE OF MIXTURE VARIABLES ON THESE LOADING SITUATIONS IS SUMMARIZED, WITH EMPHASIS PLACED ON MIXTURE STIFFNESS, FATIGUE RESISTANCE, FRACTURE CHARACTERISTICS, AND RESISTANCE TO PERMANENT DEFORMATION. ALTHOUGH OTHER MIX CHARACTERISTICS SUCH AS THERMAL PROPERTIES AND DURABILITY CHARACTERISTICS ARE BRIEFLY SUMMARIZED, SINCE THESE DATA ENTER INTO THE SOLUTION OF THE SYSTEMS WHICH HAVE BEEN FORMULATED, ASPHALT MIXTURE DESIGN MUST BE RELATED TO ITS ROLE IN THE OVERALL PAVEMENT STRUCTURE. THE OTHER COMPONENTS OF THE PAVEMENTS HAVE A SIGNIFICANT INFLUENCE ON THE RESPONSE OF THE MIXTURE TO THE INPUT VARIABLES SUCH AS LOADING AND ENVIRONMENT. THE EFFECTS OF CONSTRUCTION ARE CONSIDERED, AND IT IS EMPHASIZED THAT CAREFUL ATTENTION MUST BE GIVEN TO PLACEMENT OF THE ASPHALT MIXTURE TO ENSURE THAT IT WILL FULLFILL ITS ROLE IN CONTRIBUTING TO PROPER PAVEMENT PERFORMANCE. FINALLY, A BRIEF DESIGN EXAMPLE IS PRESENTED ILLUSTRATING THE USE OF A WORKING SUBSYSTEM TO CONSIDER THE FATIGUE MODE OF DISTRESS FOR A THICK ASPHALT CONCRETE PAVEMENT SECTION. AVAILABLE THEORY IS USED WHERE POSSIBLE TO ASSIST IN THE ANALYSIS OF MIXTURES AND PAVEMENT STRUCTURES TO BOTH THE EFFECTS OF TRAFFIC LOADING AND ENVIRONMENT.

ACKNOWLEDGMENT: Road Research Laboratory /UK/

Walker, RN
Conf Asphalt Pavements Proc /S Africa/

Acknowledgement: Road Research Laboratory /UK/

2A 205748
CONDITION SURVEYS USED IN OKLAHOMA TO EVALUATE FLEXIBLE PAVEMENT DESIGN

THE PROCEDURE IS OUTLINED FOR MAKING FLEXIBLE PAVEMENT DESIGN SURVEYS AND ITS USE IN EVALUATING THE FLEXIBLE PAVEMENT DESIGN OF THE OKLAHOMA HIGHWAY DEPARTMENT. THE FLEXIBLE PAVEMENT DESIGN WAS ADOPTED IN 1947. THE THICKNESS DESIGN USES CALIFORNIA BEARING RATIO CURVES. THE TESTING PROGRAM TO EVALUATE THE PERFORMANCE OF THE PAVEMENT COLLECTED DATA ON THE FOLLOWING CLASSES: (1) CONSTRUCTION SUCH AS TYPICAL PAVEMENT SECTION, TYPE OF CONSTRUCTION,

Ferguson, RP Highway Research Board Bulletin 1961

2A 205760
BASIC PRINCIPLES OF FLEXIBLE PAVEMENT DESIGN AND CONSTRUCTION IN THE USSR

CLIMATIC FACTORS IN THE USSR ARE DISCUSSED IN REGARD TO ECONOMIC DEVELOPMENT OF FLEXIBLE PAVEMENTS. THE METHOD USED FOR DETERMINING THE THICKNESS OF FLEXIBLE ROAD PAVEMENTS IS DESCRIBED. THE METHOD IS BASED ON THE FOLLOWING THESIS: (1) THE STRESS CONDITIONS IN THE ROAD PAVEMENT AND THE APPROPRIATE PAVEMENT THICKNESS WAS DETERMINED FROM STANDARD CBR CURVES FOR SUBGRADE INDEX NUMBERS AND THE REQUIREMENTS FOR THEIR IMPROVEMENT OR RESTRICTION OF TRAFFIC AS REGARDS NATURE AND INTENSITY IN THE RAINY PERIOD OF THE YEAR. METHODS FOR OBTAINING THE NUMERICAL VALUES OF DEFORMABILITY INDICES FOR PAVEMENTS AND SUBGRADES ARE PRESENTED. THE MODULUS OF DEFORMATION OF THE SUBGRADE IS RELATED TO THE DESIGNED SOIL CONDITION; THE STRUCTURAL METHODS USED TO LIMIT THE SURFACE AND GROUND WATER ARE PRESENTED. THE PRINCIPAL SOILS STABILIZED IN THE USSR ARE CLAYEY AND SILTY SOILS; CHEMICALLY STABILIZED SOILS ARE CONSIDERED AS HIGH QUALITY MATERIALS FOR ROAD FOUNDATIONS IN PLACES OF POOR RESOURCES. STABILIZATION METHODS ARE DESCRIBED.

Bezruk, VM Highway Research Board Special Reports 1960

2A 205767
PRESTRESSED CONCRETE PAVEMENTS

DESIGN INVESTIGATIONS AND LIMITED TESTING OF MODEL AND PROTOTYPE SLABS INDICATE THAT PRESTRESSED PAVEMENTS PERMIT A MORE EFFICIENT USE OF CONSTRUCTION MATERIALS IN TERMS OF REQUIRED PAVEMENT THICKNESS. PRESTRESSED PAVEMENTS CAN BE DESIGNED WITH FEWER JOINTS AND WITH LESS PROBABILTY OF CRACKING THAN CONVENTIONAL RIGID PAVEMENTS, THEREBY PROMISING EXTENDED PAVEMENT LIFE AND REDUCED MAINTENANCE REQUIREMENTS. INFORMATION RELATIVE TO THE DESIGN AND CONSTRUCTION OF PRESTRESSED CONCRETE PAVEMENTS IS PRESENTED. RECOMMENDATIONS ARE DEVELOPED ON PLANNING, DESIGN, AND AREAS OF ENGINEERING INVESTIGATION AND RESEARCH. MINIMUM TESTS ARE RECOMMENDED FOR EXPERIMENTAL HIGHWAY PAVEMENTS. DESIGN VARIABLES ARE DISCUSSED WITH FACTORS AFFECTING DESIGN.

Highway Research Board Special Reports 1963

2A 205772
OPTIMAL DESIGN OF FLEXIBLE PAVEMENT SECTIONS

A SYSTEMS ANALYSIS WAS CONDUCTED TO DEVELOP A RATIONAL METHOD FOR THE OPTIMAL DESIGN OF FLEXIBLE PAVEMENT SECTIONS. THE OPTIMAL COMBINATION OF FLEXIBLE PAVEMENT COMPONENTS MUST MINIMIZE THE TOTAL IN-PLACE COST OF THE PAVEMENT SYSTEM. A DESIGN MODEL WAS CONSTRUCTED CONSISTING OF AN OBJECTIVE FUNCTION AND VARIOUS CONSTRAINT EQUATIONS. THE TOTAL PAVEMENT SYSTEM IS DESIGNED BY THE METHOD OF INCREASING DESIGN CRITERIA WHICH REPRESENT TRAFFIC CONDITIONS, SOIL SUPPORT VALUES, PAVEMENT MATERIAL CHARACTERISTICS, ENVIRONMENTAL EFFECTS, AND PAVEMENT PERFORMANCE REQUIREMENTS. UNIT COSTS OF PAVEMENT COMPONENTS AND ALTERNATE CROSS-SECTION DESIGNS ARE CONSIDERED IN THE SELECTION OF THE OPTIMUM FLEXIBLE PAVEMENT SECTION. THE TOTAL COST OF THE PAVEMENT SYSTEM IS QUANTITATIVELY DESCRIBED BY THE OBJECTIVE FUNCTION, AND THE MINIMUM-COST SOLUTION IS OBTAINED FOR EACH COMBINATION OF MATERIAL COSTS AND DESIGN CONDITIONS. THE MATHEMATICAL DESIGN MODEL WAS SOLVED BY A MODIFIED LINEAR PROGRAMMING TECHNIQUE. THE DESIGN PROCEDURE SPECIFIES A MINIMUM PAVEMENT THICKNESS TO ACCOUNT FOR VARIOUS INFLUENCING ENVIRONMENTAL CONDITIONS IN ADDITION TO THE TRAFFIC LOADING, SOIL SUPPORT, PAVEMENT PERFORMANCE, AND ENVIRONMENT CONSTRAINTS. PRACTICAL LIMITATIONS ON LAYER THICKNESSES ARE SPECIFIED IN CONCURRENCE WITH PRESENT HIGHWAY CONSTRUCTION PRACTICES. THE UNIT COSTS OF THE PAVEMENT COMPONENTS ARE SPECIFIED TO PERMIT THE DESIGN OF AN ACCEPTABLE PAVEMENT STRUCTURE UNDER THE DESIGN CRITERIA. THE COST-EFFECTIVENESS APPROACH SEEMS TO PROVIDE BOTH AN OPTIMAL AND A PRACTICAL SOLUTION TO THE PROBLEM OF FLEXIBLE PAVEMENT DESIGN.

Hejal, SS Yoder, SR Oppenlander, JC Purdue & Ind State Hwy Comm 1969
CONSTRUCTION MATERIALS

2A 205782
FLEXIBLE PAVEMENTS
FROM THE REPORTS OF 25 COUNTRIES DEALING WITH FLEXIBLE PAVEMENTS, DR. E. BALAGUER OF SPAIN PREPARED A LIST OF CONCLUSIONS AND RECOMMENDATIONS AND PRESENTED THESE TO THE MEETING UNDER THE FOLLOWING SUBHEADINGS: (1) SUBBASES AND THEIR MATERIALS; (2) BASIS AND THEIR MATERIALS; (3) COMPACTION OF LAYERS AND COMPARISON OF METHODS; (4) CHEMICAL STABILIZATION; (5) SURFACING COURSES AND THE GRADING OF AGGREGATES FOR SURFACING; (5) PARAFFIN-BASED BITUMENS; (6) DEFORMATION OF THE SURFACING PROFILES UNDER TRAFFIC ACTION; (7) MANUFACTURE, SPREADING AND COMPACTING OF BITUMINOUS COATED MATERIALS (INCLUDING PROBLEMS OF DUST IN HOT-MIX MANUFACTURING PLANTS); (8) LIGHT COLORED WEARING COURSES; (9) THIN WEARING COURSES; (10) EFFECTS OF HEAVY DUTY EQUIPMENT USE ON DESIGN; (11) SURFACE DRESSINGS USING ALTERNATIVES TO BITUMINOUS BINDERS; AND (12) ACTION OF SALT ON SURFACES. THE LIST OF SPEAKERS INCLUDED: (1) M. ARQUIE OF FRANCE, WHO OUTLINED THE MAIN TRENDS IN FLEXIBLE PAVEMENT CONSTRUCTION IN HIS COUNTRY; (2) MR. GABOYLEV OF THE USSR WHO DISCUSSED CHEMICALLY STABILIZED BASE COURSES AND USE OF PARAFFIN OIL BITUMENS; (3) MR. MIKHAILOV OF THE USSR WHO DESCRIBED HIS COUNTRY'S RESEARCH PROGRAMS ON THE PROCESSING OF BITUMENS AND PRODUCTION OF BITUMEN STRUCTURES; (4) MR. TAKAHASHI OF JAPAN, WHO DISCUSSED RECENT DEVELOPMENTS IN ROAD TECHNOLOGY IN HIS COUNTRY; (5) MR. FERREIRA OF PORTUGAL, WHO DESCRIBED EXPERIMENTS WITH SOIL CEMENT BASES; (6) MR. FENLO OF SPAIN WHO EMPHASIZED THE NEED FOR STANDARDIZATION OF TERMINOLOGY FOR COATED MATERIALS USED FOR FLEXIBLE PAVEMENTS; (7) MR. BENINI OF ITALY WHO DISCUSSED RESULTS OF PAVEMENT INVESTIGATIONS SUBSEQUENT TO THE SUBMISSION OF HIS COUNTRY'S REPORT; (8) MR. NICHOLS OF GREAT BRITAIN WHO SPEAKED ON BINDER MATERIALS AND MAINTENANCE OF SURFACE TEXTURE OF WEARING COURSES, AND AUTO­MATION OF MIXING PLANTS. THE SPEAKERS' COMMENTS WERE SUMMARIZED BY DR. BALAGUER AT THE CLOSE OF THE SESSION.

Perm Int Assoc Road Congresses Proc 1967

2A 205807
SOME PRINCIPLES INVOLVED IN BITUMINOUS MACADAM CONSTRUCTION
FUNDAMENTAL PRECAUTIONS FOR SUCCESSFUL BITUMINOUS MACADAM PAVEMENT DESIGN AND CONSTRUCTION ARE DISCUSSED IN THE LIGHT OF FIELD OBSERVATIONS. OF PRIME IMPORTANCE IS THE PREPARATION OF THE SUBBASE UPON WHICH THE BASE COURSE OF CRUSHED STONE IS TO BE Laid. ANOTHER PRINCIPLE IS THE PLACING OF SUFFICIENT SHOULDER ALONG THE SIDE LINES TO HOLD THE CRUSHED STONE COURSES. THE PENETRATION COURSE OF STONE SHOULD BE UNIFORM IN DEPTH TO ENSURE THE BEST RESULTS. THE BASE COURSE OF CRUSHED STONE SHOULD BE FILLED WITH SAND OR CRUSHER DUST. STREAKS IN THE PENETRATION COURSE OF STONE SHOULD BE PENETRATED WITH A HAMMER AND NOT LEFT FOR THE SEAL COAT TO COVER UP. IN ADDITION TO SKILLFUL ROLLING REQUIRED IN THE CONSTRUCTION OF A GOOD BITUMINOUS MACADAM, IT IS ESSENTIAL THAT THE PAVEMENT SECURE SUFFICIENT ROLLING TO THROUGHLY COMPACT THE STONE. CONSTANT CARE SHOULD BE TAKEN DURING THE WHOLE CONSTRUCTION PROCESS AND FAULTS CORRECTED AS THEY OCCUR.

Henderson, GH Highway Research Board Proceedings 1927

2A 205836
A GENERALIZED INVESTIGATION OF SELECTED HIGHWAY DESIGN AND CONSTRUCTION FACTORS BY REGIONAL GEOGRAPHIC UNITS WITHIN THE UNITED STATES
AN INVESTIGATION WAS MADE OF THE OCCURRENCE AND DISTRIBUTION OF SELECTED HIGHWAY FACTORS WITHIN REGIONAL GEOGRAPHIC UNITS COMPRISING THE ADJACENT 48 STATES. THE REGIONAL CLASSIFICATION SYSTEM USED AS A BASIS OF EXAMINATION WAS THAT PROPOSED BY WOODS-LOVELL. THIS SYSTEM WAS SLIGHTLY MODIFIED TO PRODUCE 97 SECTIONS FOR INVESTIGATION. THE HIGHWAY FACTORS ANALYZED BY SECTION WERE: AVAILABILITY OF QUALITY AGGREGATE RESOURCES; SOIL ORIGIN AND TEXTURE;Reducer;; FROST SUSCEPTIBILITY; POTENTIAL SUBGRADE SUPPORT CONDITIONS (CLAYEY AND ORGANIC TYPE) AND FROST SUSCEPTIBLE SOILS; POTENTIAL AGGREGATE MAPS OF THE UNITED STATES WERE COMPARED AND USED ALONG WITH VARIOUS OTHER SOURCES OF INFORMATION, INCLUDING A STATE HIGHWAY AGGREGATE CLASSIFICATION TO OBTAIN A QUALITATIVE ESTIMATE OF THE POTENTIAL AGGREGATE AVAILABILITY RATING FOR EACH SECTION. THE RATING WERE BASED UPON SOIL Texture, A GENERALIZED SOILS MAP OF THE UNITED STATES WAS DEVELOPED. A SUMMARY TABLE OF THE SALT COMPOSITE HIGHWAY FACTORS INVESTIGATED WAS COMPILED FOR EACH SECTION, AND REPRESENTED A BRIEF AND CONCISE SUMMARY OF THE MAJOR FINDINGS BECAUSE OF THE COMPLEXITY OF FACTORS USED TO DEFINE AND STUDY PHYSIOGRAPHIC SECTIONS. IT IS NOT POSSIBLE TO MAKE A BLANKET CONCLUSION REGARDING THE VALIDITY OF UTILIZING THESE SECTIONS AS FILING SYSTEMS FOR HIGHWAY FACTORS. THE MAJORITY OF SECTIONS EXAMINED SHOWED A SIGNIFICANT PRESENCE OF SMALLER, VARIANT UNITS WITHIN THEM. BASED UPON THIS CONSIDERATION, PLUS THE OVERALL IMPORTANCE OF THE PARENT MATERIAL ORIGIN CHARACTERISTICS TO THE HIGHWAY ENGINEER, A SUGGESTED HIGHWAY ENGINEERING-PHYSIOGRAPHIC UNIT MAP OF THE CONTINENTAL UNITED STATES IS PRESENTED. /AUTHOR/

Witczak, MW Highway Research Board Nchrp Summary

2A 205851
WYOMING THICKNESS DESIGN FOR FLEXIBLE PAVEMENT REVIEWS TO THE WYOMING PAVEMENT DESIGN PROCEDURES AT BASED ON THE AASHO ROAD TEST AND RECOMMENDATIONS MADE ARE BASED ON THE AASHO INTERIM DESIGN GUIDE. THE METHODS DEVELOPED DEPEND ON SUCH VARIABLES AS THE SUB-GRADE, TRAFFIC CONSTRUCTION MATERIALS, AND REGIONAL FACTORS. ACCORDING TO THE AUTHOR, THESE METHODS INDICATE A RELATIONSHIP OF TRAFFIC (AXLE LOADS) TO THE PERFORMANCE OF THE PAVEMENT (SERVICEABILITY). IN WYOMING DESIGN CONSIDERATIONS ALSO IMPORTANCE OF THE PARENT MATERIAL ORIGIN CHARACTERISTICS TO THE HIGHWAY ENGINEER, A SUGGESTED HIGHWAY ENGINEERING-PHYSIOGRAPHIC UNIT MAP OF THE CONTINENTAL UNITED STATES IS PRESENTED. /AUTHOR/

Nolen, ER Wyoming State Highway Department Nov. 1970

2A 205866
A PROCEDURE FOR EVALUATING PAVEMENTS WITH NONUNIFORM PAYING MATERIALS
A PROCEDURE WAS DEVELOPED TO EVALUATE LAYERED SYSTEMS WITH NONUNIFORM MATERIAL PROPERTIES. THE PROCEDURE CONSISTS OF DEFINING THE LAYERED SYSTEM BY A PHYSICAL MODEL CONSISTING OF MASS POINTS TIED TOGETHER BY SPRINGS AND BARS. THE VARIABILITY OF THE MATERIAL IS SIMULATED BY ASSIGNING DIFFERENT CHARACTERISTICS OF THE MATERIAL PROPERTIES TO SPRINGS CONNECTING THE MASS POINTS. ASSIGNMENT OF VALUES...
CONSTRUCTION MATERIALS

2A 206092

SYMPOSIUM-TECHNOLOGY OF THICK LIFT CONSTRUCTION

THIS SYMPOSIUM ON THICK LIFT CONSTRUCTION IS DIVIDED INTO FOUR SECTIONS: THE FIRST SECTION—STRUCTURAL DESIGN CONSIDERATIONS—ILLUSTRATES EXISTING AND POTENTIAL PAVEMENT DESIGN (THICKNESS SELECTION) PROCEDURES FOR THICK LIFT ASPHALT CONCRETE SECTIONS RESTING DIRECTLY ON PREPARED SUBGRADES. IN ADDITION, A METHOD USING RECENT RESEARCH DEVELOPMENTS INTENDED TO BROADEN THE DESIGN FRAMEWORK FOR SUCH PAVE-MENTS AND BASED ON CONCEPTS EMBODIED IN THE SHELL PROCEDURE IS ALSO BRIEFLY ILLUSTRATED. THE SECOND SECTION—MIX DESIGN CONSIDERATIONS—POINTS OUT THAT CONVENTIONAL MIX DESIGN PROCEDURES ARE GENERALLY SUITABLE FOR DESIGNING ASPHALT PAYING MIXTURES FOR THICK LIFT CONSTRUCTION. IT ALSO IS POINTED OUT THAT INFORMATION IS AVAILABLE ON HOW VARIOUS MIX DESIGN VARIABLES AFFECT THE BASIC MATERIAL PROPERTIES OF ASPHALT PAYING MIXTURES SUCH AS ELASTIC, FATIGUE, AND FRACTURE STRENGTH PROPERTIES.

SECTION THREE—LABORATORY CONSIDERATIONS—DEALS PRIMARILY WITH THOSE METHODS UTILIZED TO OBTAIN THE MATERIAL PARAMETERS USED IN THE DESIGN PROCEDURES DISCUSSED IN THE FIRST SECTION. SECTION FOUR—CONSTRUCTION METHODS—PRESENTS A COMPREHENSIVE UNDERSTANDING OF THE BEHAVIOR OF THE SYSTEM. THE LAST SECTION INCLUDES A DISCUSSION OF THE STABILITY TOPICS NOT ADDRESSED IN THE OTHER SECTIONS.

2A 206093

EXPERIMENTAL FLEXIBLE OVERLAYS ON CEMENT CONCRETE ON NATIONAL HIGHWAY NO. 7 NEAR HYDERABAD

THE DETAILS OF CONSTRUCTION OF EXPERIMENTAL FLEXIBLE OVERLAYS ON A THIN CEMENT CONCRETE SLAB IN VARYING DEGREES OF DISTRESS, TOGETHER WITH THEIR PERFORMANCE OBSERVED OVER A SEVEN YEAR PERIOD, ARE DEALT WITH. OUT OF TEN DIFFERENT SPECIFICATIONS TRIED ON A TEST TRACK, IT WAS FOUND THAT A 2 1/2 IN. THICK ASPHALTIC CONCRETE OR A 1 3/4 IN. ASPHALTIC CONCRETE SURFACED WITH EITHER A 1 1/2 IN. ASPHALTIC CONCRETE OR A 6 IN. WATER BOUND MACADAM LAYER CAN PROVIDE AN EFFECTIVE PERFORMANCE. THE LATTER BEING MORE ECONOMICAL.

2A 206094

RELATIONSHIPS BETWEEN PHYSIOGRAPHIC UNITS AND HIGHWAY DESIGN FACTORS

THIS REPORT IDENTIFIES THE SEVERITY AND/OR FREQUENCY OF OCCURRENCE OF AGGREGATE AVAILABILITY, SUBGRADE SUPPORT, HIGH VOLUME CHANGE SOILS, AND FROST-SUSCEPTIBLE SOILS WITHIN 97 PHYSIOGRAPHIC SECTIONS OF THE CONTIGUOUS 48 STATES AND QUALITATIVELY ASSESS THE POTENTIAL FOR THE INFLUENCE OF THESE FACTORS ON HIGHWAY DESIGN AND CONSTRUCTION. THE FINDINGS ARE FOUND ON THE PREMISE THAT PHYSIOGRAPHIC UNITS CAN FORM A NONOVERLAPPING SYSTEM FOR ACCUMULATING ENGINEERING EXPERIENCE WHICH, IN THE HIGHWAY DESIGN FIELD, CONSTITUTES ENGINEERING JUDGMENT. A LARGE AMOUNT OF INFORMATION ON THE DISTRIBUTION OF AGGREGATES AND SOILS IN THE CONTIGUOUS U.S. HAS BEEN COMPILED AND PRESENTED ON A SERIES OF MAPS.

2A 206095


2A 206096

SOME RECENT FINDING IN FLEXIBLE PAVEMENT RESEARCH


Acknowledgment: Bureau of Public Roads /US/ (4621532 67)PB 176 060, 3C26021626, 4C26020883

Witczak, MW Highway Research Board Nchrp Reports No. 132, 1972, 161 pp, 23 Fig, 20 Tab, 393 Ref

Levey, JR Barenberg, EJ Highway Research Record, Hwy Res Board 1970

2A 206097

EXPERIMENTAL FLEXIBLE OVERLAYS ON CEMENT CONCRETE ON NATIONAL HIGHWAY NO. 7 NEAR HYDERABAD

THE DETAILS OF CONSTRUCTION OF EXPERIMENTAL FLEXIBLE OVERLAYS ON A THIN CEMENT CONCRETE SLAB IN VARYING DEGREES OF DISTRESS, TOGETHER WITH THEIR PERFORMANCE OBSERVED OVER A SEVEN YEAR PERIOD, ARE DEALT WITH. OUT OF TEN DIFFERENT SPECIFICATIONS TRIED ON A TEST TRACK, IT WAS FOUND THAT A 2 1/2 IN. THICK ASPHALTIC CONCRETE OR A 1 3/4 IN. ASPHALTIC CONCRETE SURFACED WITH EITHER A 1 1/2 IN. ASPHALTIC CONCRETE OR A 6 IN. WATER BOUND MACADAM LAYER CAN PROVIDE AN EFFECTIVE PERFORMANCE. THE LATTER BEING MORE ECONOMICAL.

2A 206098

SOME RECENT FINDING IN FLEXIBLE PAVEMENT RESEARCH


Acknowledgment: Bureau of Public Roads /US/ (4621532 67)PB 176 060, 3C26021626, 4C26020883

Witczak, MW Highway Research Board Nchrp Reports No. 132, 1972, 161 pp, 23 Fig, 20 Tab, 393 Ref

Levey, JR Barenberg, EJ Highway Research Record, Hwy Res Board 1970

2A 206097

EXPERIMENTAL FLEXIBLE OVERLAYS ON CEMENT CONCRETE ON NATIONAL HIGHWAY NO. 7 NEAR HYDERABAD

THE DETAILS OF CONSTRUCTION OF EXPERIMENTAL FLEXIBLE OVERLAYS ON A THIN CEMENT CONCRETE SLAB IN VARYING DEGREES OF DISTRESS, TOGETHER WITH THEIR PERFORMANCE OBSERVED OVER A SEVEN YEAR PERIOD, ARE DEALT WITH. OUT OF TEN DIFFERENT SPECIFICATIONS TRIED ON A TEST TRACK, IT WAS FOUND THAT A 2 1/2 IN. THICK ASPHALTIC CONCRETE OR A 1 3/4 IN. ASPHALTIC CONCRETE SURFACED WITH EITHER A 1 1/2 IN. ASPHALTIC CONCRETE OR A 6 IN. WATER BOUND MACADAM LAYER CAN PROVIDE AN EFFECTIVE PERFORMANCE. THE LATTER BEING MORE ECONOMICAL.
CONSTRUCTION MATERIALS

2A 206309
INFLUENCE OF DESIGN, CONSTRUCTION AND TRAFFIC ON COMPACTION OF HOT-MIX ASPHALTIC CONCRETE

THE REPORT INDICATES SOME RELATIONSHIPS BETWEEN THE COMPACTIOIN OF HOT-MIX ASPHALTIC CONCRETE AS INFLUENCED BY CONSTRUCTION AND TRAFFIC. THE EFFECTS OF MIX DESIGN ARE NOT COVERED. THE CONCLUSIONS PRESENTED ARE BASED FOR THE MOST PART ON 4 MONTHS OF DATA. THE SIGNIFICANT FINDINGS ARE: (1) PAVEMENT DENSITY WAS FOUND TO INCREASE WITH TIME WHEN THE TEST SECTION WAS UNDER TRAFFIC. (2) LITTLE CORRELATION EXISTS BETWEEN LABORATORY DETERMINED DENSITY AND THE IN-PLACE DENSITY IMMEDIATELY AFTER CONSTRUCTION, (3) MOST OF THE PAVEMENTS WERE NOT COMPACTED TO 95% OF LABORATORY DENSITY AT THE TIME OF CONSTRUCTION. AND (4) NO APPRECIABLE DEGRADATION OF AGGREGATE TAKES PLACE DUE TO COMPACTION OPERATIONS OR TRAFFIC. /BPR/

Harper, WJ Gallaway, BM
Texas Transportation Institute, Texas State Department of Highways & Public Transp, Bureau of Public Roads /US/ 1967

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4351072 67)2R31012960, IC26021037

2A 206341
A STUDY OF THE RELATIONSHIP BETWEEN AIR TEMPERATURES AND DEPTH OF FROST PENETRATION AS RELATED TO PAVEMENT PERFORMANCE OF WEST VIRGINIA'S HIGHWAYS


Vaswani, NK
Virginia Department Highways, Federal Highway Administration /US/ 1972

ACKNOWLEDGMENT: Federal Highway Administration (4830062 70)NTIS PB 194334, IC26022256

2A 206492
FLEXIBLE PAVEMENT DENSITY: THREE STUDIES
THE FIRST STUDY REPORTED A CHANGE IN THE DENSITY AND ITS VARIABILITY IN ALL PAVEMENT COURSES DURING SUCCESSIVE PHASES OF CONSTRUCTION AND AFTER A PERIOD UNDER TRAFFIC. THE SECOND STUDY DETERMINED THE INFLUENCE OF VARIOUS NUMBERS OF STEEL-WHEEL ROLLER PASSES ON PAVEMENT DENSITY. THE PAVEMENT WAS RESAMPLED AFTER 3 YEARS TO DETERMINE THE CHANGE IN DENSITY RESULTING FROM A LIMITED AMOUNT OF TRAFFIC. IN THE THIRD STUDY, INITIAL PAVEMENT PROPERTIES (PERCENT OF AIR VOIDS AND ASPHALT CONTENT) WERE INVESTIGATED TO DETERMINE THEIR EFFECTS ON PERFORMANCE. ONE PARTICULAR PAVEMENT, CONSTRUCTED IN LATE-SEASON COOL WEATHER, WAS STUDIED TO FIND THE CAUSE OF ITS PREMATURE FAILURE. /AUTHOR/

New York State Dept Transportation July 1972, 57 pp

ACKNOWLEDGMENT: New York State Dept Transportation, Federal Highway Administration

2A 206518
RECENT EXPERIMENTAL PCC PAVEMENTS IN CALIFORNIA
THE CONSTRUCTION OF EXPERIMENTAL PCC PAVEMENT SECTIONS IS DESCRIBED. THE PREDOMINANT EXPERIMENTAL
CONSTRUCTION MATERIALS

2A 206543

FIRST PROGRESS REPORT ON CONCRETE EXPERIMENTAL TEST SECTIONS IN BRAZOS COUNTY, TEXAS


Little, RJ Mckenzie, LJ Dierstein, PG
Illinois Dept of Transportation Interim July 1973, 84 pp

ACKNOWLEDGMENT: Illinois Dept of Transportation, Federal Highway Administration

2A 206552

RESULTS OF OKLAHOMA FLEXIBLE PAVING RESEARCH PROJECT

FROM 1953 TO 1963 THE OKLAHOMA HIGHWAY DEPARTMENT STUDIED PLATE-BEARING AND BENKELMAN BEAM TESTS ON EXISTING ROADS AND THE EFFECTS OF SOILS, CLIMATE, TRAFFIC AND OTHER FACTORS. A PAVEMENT DESIGN METHOD WAS DEVELOPED AND A SOILS MANUAL WAS PUBLISHED. RECENTLY CONSTRUCTED PROJECTS GIVING UNSATISFACTORY SERVICE WERE INVESTIGATED AND STUDIES WERE MADE TO DETERMINE THE CAUSES OF POOR PAVEMENT PERFORMANCE. THESE WERE UNDERDESIGN FOR THE LOAD, POOR MATERIALS, DEFECTIVE MATERIALS IN THE OVERDESIGN, POOR SUBBASE MATERIAL, SHRINKAGE OF SUBGRADE SOIL AND WATER ENTERING THROUGH THE SURFACE. /RRL/

Helmet., RA Highway Research Record, Hwy Res Board 1965

2A 206659

AN APPARATUS FOR MEASURING THE DYNAMIC STIFFNESS OF ROADS AND SOILS


Thrower, EN Journal Scientific Instruments /UK/ July 1967

2A 206692

PAVEMENT STRUCTURE-POLAND

THERE HAS BEEN INTEREST IN POLAND FOR QUITE A TIME ON THE CAUSE OF CRACKING OF BASE LAYERS STABILIZED WITH CEMENT. ON THE BASIS OF TESTS AND OBSERVATIONS IT HAS BEEN NOTED THAT: 1/ THE CRACKING OF LAYERS IS MOST OFTEN CAUSED BY THE LACK OF UNIFORMITY OF THE COMPACTION OF THE SOIL UNDER HIGHWAY TRAFFIC, IT IS A KNOWN FACT, THAT VEHICLES NORMALLY TRAVEL ON THE SAME PATHS, WHICH IS DOUBTFUL THE PRINCIPAL CAUSE OF THIS TYPE OF CRACKING. IT IS NOTED THAT THE IRREGULAR PATTERN OF CRACKS OFTEN APPEARS IN THE
CONSTRUCTION MATERIALS

PLACES WHICH ARE EXPOSED TO THE NUMEROUS JOURNEYS PERPENDICULAR TO THE AXIS OF THE HIGHWAY. /2/ TO ANTICIPATE FORMATION OF CRACKING IN BASE LAYERS IN SOIL CEMENT, IT IS THEREFORE ESSENTIAL TO PAY SPECIAL ATTENTION TO THE COMPACTION OF SOIL CEMENT DURING THE CONSTRUCTION OF THE HIGHWAY AND ALSO THE SUBGRADE SOIL ITSELF. IT IS ALSO NECESSARY, THAT THE MIXING WITH CEMENT IS IN SUFFICIENT DEPTH, AND /3/ CRACKING DOES NOT BRING ABOUT VERY SERIOUS DAMAGE. BUT IT REQUIRES SUPPLEMENTARY PRESERVATION WORKS SUCH AS THE CLOSING OF THESE CRACKS WITH SEALANT MATERIALS.

Skalrnonski, W  *Perm Int'l Assoc Road Congresses Proc* 1967

2A 206734
FIELD MEASUREMENT OF DYNAMIC ELASTIC MODULI OF MATERIALS IN FLEXIBLE PAVEMENT STRUCTURES
A SERIES OF WAVE PROPAGATION (VELOCITY) MEASUREMENTS WERE MADE ON TWO FIELD PROJECTS IN THE UNITED STATES USING THE SMALL, HIGH FREQUENCY VIBRATION EQUIPMENT. THE USE OF THE HIGH FREQUENCY VIBRATION EQUIPMENT FOR TESTING PAVEMENT SECTIONS (BOTH EXPERIMENTAL AND REGULAR) HAS DEMONSTRATED THE ABILITY TO OBTAIN SIGNIFICANT WAVE PROPAGATION DATA WHICH CAN BE RELATED TO MATERIAL PROPERTIES SUCH AS THE MODULUS OF ELASTICITY. DYNAMIC TESTS ON THE PERFORMANCE OF A SERIES OF ASPHALT-TREATED SAND ASPHALT BASES SHOWED THE ANALYSIS OF VELOCITY DATA FROM PAVEMENTS CONTAINING RELATIVELY THICK LAYERS OF ASPHALT-BOUND MATERIAL REQUIRED THE USE OF ANALYTICAL METHODS WHICH DIFFER SOMEWHAT FROM THOSE EMPLOYED IN THE PAST. TESTS ON A LARGE VARIETY OF PAVEMENT TYPES CONFIRM THAT THE INDIVIDUAL TYPE OF PAVEMENT INVOLVED GOVERNS THE PATTERN OF VELOCITY RESPONSE WHICH IS OBTAINED FROM THE TESTS AND THAT EACH INDIVIDUAL TYPE MUST BE JUDGED FROM A KNOWLEDGE OF THE PARTICULAR COMPONENTS REPRESENTED.

Metcalf, CT  *Int'l Conf/Struc Design Asphalt Pmts* Aug. 1967

2A 206770
A STUDY OF VIBRATION PHENOMENA IN ASPHALTIC ROAD CONSTRUCTION
IT IS HYPOTHESIZED THAT THE FLEXURAL STRESSES SET UP BY MOVING TRAFFIC ULTIMATELY EXCEED THE STRENGTH OF THE MATERIALS, LEADING TO CRACK FORMATION. FLEXURAL STRENGTH AFTER REPEATED LOADINGS AND FATIGUE PHENOMENA ARE INVESTIGATED. A VIBRATION GENERATOR IS DESIGNED WHICH PRODUCES A WIDE VARIATION OF BOTH FREQUENCY AND AMPLITUDE OF FORCE APPLIED TO THE PAVEMENT STRUCTURE. METHODS OF DETERMINING PAVEMENT DEFLECTION AS A FUNCTION OF THE FORCE ACTING ON THE PAVEMENT AND MEASURING STRAINS IN THE PAVEMENT AND THE RATE OF PROPAGATION OF WAVES PRODUCED BY THE VIBRATION GENERATOR ARE PRESENTED. EXPERIMENTAL RESULTS INCLUDE SHEAR MODULUS OF PAVEMENT COMPONENT LAYERS, PAVEMENT DEFLECTION WITH AND WITHOUT ASPHALT SURFACE, PAVEMENT STIFFNESS, EFFECT OF THICKNESS OF BITUMINOUS BOUND LAYER, STRAIN MEASUREMENT UNDER THE VIBRATION MACHINE AND UNDER MOVING TRAFFIC. IT IS CONCLUDED THAT CRACKING OF ASPHALTIC ROAD CARPETS IS MAINLY DUE TO BENDING STRESSES EXCEEDING THE STRENGTH OF THE MATERIAL. STIFFNESS OF COMPLETED CONSTRUCTION CAN BE DESCRIBED BY A SINGLE VALUE, THE DYNAMIC Load PER UNIT OF DEFLECTION. IT IS POSSIBLE TO MEASURE THE DYNAMIC SHEAR MODULUS OF SUB-SOIL AND SUB-BASE IN SITU. BITUMINOUS BOUND BASE HAS A VERY BENEFICIAL EFFECT ON THE STRAINS IN THE CARPET.

Nijboer, LW  *Van, DER POEL C  Assoc Asphalt Paving Technol Proc* 1953

2A 206771
PAVEMENT BLOWUPS CORRELATED WITH SOURCE OF COARSE AGGREGATE
RESULTS ARE GIVEN OF A STUDY OF THE PERFORMANCE OF 3300 MILES OF RIGID PAVEMENT CONSTRUCTED IN INDIANA FROM 1921-1943. THE DATA WERE OBTAINED FROM FIELD PERFORMANCE SURVEYS MADE OVER A PERIOD OF TWO YEARS. TOGETHER WITH RECORDS FROM THE CONSTRUCTION AND TESTING DEPARTMENTS OF THE STATE HIGHWAY COMMISSION, AND FROM BLOWUP REPORTS OBTAINED FROM THE MAINTENANCE DEPARTMENT. IN ANALYZING THE DATA, IT WAS FOUND THAT THERE WERE 2404 BLOWUPS IN THE 2623 MILES WITHOUT EXPANSION JOINTS AND THAT 851 MILES contained NO BLOWUPS, WHILE 1715 MILES (65%) CONSTRUCTED FROM 82 COARSE AGGREGATE SOURCES CONTAINED ONLY 203 BLOWUPS. IN CONTRAST, 1188 BLOWUPS WERE FOUND IN 284 MILES OF PAVEMENTS CONSTRUCTED WITH MATERIAL FROM ONLY FIVE DIFFERENT SOURCES. FURTHERMORE, 97.1 MILES OF PAVEMENT CONSTRUCTED WITH MATERIAL FROM ONE OF THESE SOURCES CONTAINED 707 BLOWUPS (29.6% OF THE TOTAL BLOWUPS IN THE STATE). THESE DATA WERE CONSIDERED IMPORTANT, SINCE IT WAS OBSERVED GENERALLY THAT MAP CRACKING, SERIOUS DISINTEGRATION, AND A RELATIVELY SHORT PAVEMENT LIFE ACCOMPANIED THE BLOWUP FAILURES. IT WAS CONCLUDED, ON THE BIAS OF A STATISTICAL ANALYSIS OF THESE BLOWUP DATA THAT: /1/ AN OUTSTANDING CORRELATION EXISTED BETWEEN CERTAIN COARSE AGGREGATES USED IN THE CONCRETE MIX AND THE BLOWUP PERFORMANCE OF THE PAVEMENTS. /2/ NO CORRELATION EXISTED BETWEEN THE CEMENT, FINE AGGREGATE, TRAFFIC, OR SUBGRADE SOILS USED AND BLOWUP PERFORMANCE. AND /3/ EXTENSIVE BLOWUP HISTORY WAS NECESSARY TO DETERMINE THE BASIC REASON FOR THE VARIATION IN PERFORMANCE BETWEEN AGGREGATE SOURCES AND TO DEVELOP NEW AND BETTER METHODS OF TESTS BY WHICH THOSE AGGREGATES WHICH PRODUCE CONCRETE OF AN UNSATISFACTORY QUALITY CAN BE IDENTIFIED BEFORE THEY ARE INCORPORATED IN THE CONCRETE PAVEMENT.

Woods, KB  *Sweet, HS Shelsonbrurne, TE Highway Research Board Proceedings* 1945

2A 206772
FINAL REPORT ON DURABILITY PROJECT, MICHIGAN TEST ROAD

Rhodes, CC  *Finney, EA Highway Research Board Proceedings* 1960

2A 206898
A COMBINED APPROACH TO THE OPTIMISATION OF TIRE AND PAVEMENT INTERACTION
THE DEVELOPMENT OF PAVEMENT SURFACING TECHNOLOGY WITH REGARD TO SKID RESISTANCE, AND ADVANCES IN
THE UNDERSTANDING OF THE INTERACTION BETWEEN TIRES AND PAVEMENTS IS CRUCIAL FOR THE DESIGN AND MAINTENANCE OF HIGHWAY SYSTEMS.

**CONSTRUCTION MATERIALS**

**2A 207031**

**THE WASHO ROAD TEST, PART 2: TEST DATA, ANALYSES, FINDINGS**

Contents:
- Primary Objective, Principal Test Considerations, and Synopsis of Findings
- Operation of Traffic Test Vehicle Data and Summary
- Performance of Test Pavements and Instrumentation
- Test Sections: Special Observations and Measurements
- Climate and Meteorological Data Field
- Special Deflection Studies
- Temperature Versus Deflection
- Deflection Load Versus Deflection
- Moisture Content Versus Deflection
- Subgrade Profiles
- Surface Conditions
- Special Test Sections
- Summary

**Acknowledgment:** Road Research Laboratory /UK/

Holmes, T. Lees, G. Williams, AR
Birmingham University /UK/

**1962**

**2A 207032**

**CALIFORNIA PAVEMENT FAULTING STUDY**

Details of an Investigation of Faulted Concrete Pavements Constructed on Cement Treated Bases Are Presented. Various Tests and Measurements Were Made on the Pavements and Construction Materials Including Strains, Deflections, Load Transfer, Efficacy, Temperature Changes, Slab Curl, Compressive Strength, Petrographic and Chemical Tests. At Some Sites, Movement of Water at the Slab Interface Was Determined by the Use of Colored Tracer Sands Placed Under the Slabs Several Weeks Prior to Slab Removal or Coring. Portions of Pavement Slabs Were
CONSTRUCTION MATERIALS

GIVEN AN INDEX VALUE VARYING FROM 126 INCHES/MILE TO 220 INCHES/MILE, THE STUDY INDICATES THAT BETTER RIDING QUALITY CAN BE ACHIEVED BY MECHANIZED METHODS OF ROAD CONSTRUCTION AND WITH A SUPERIOR TYPE OF SURFACE LIKE ASPHALTIC CONCRETE. /AUTHOR/

Highways Res Station, Madras /India/ No. 35, 1971, 41 pp, Tabs

2A 207592

PAVEMENT CHARACTERISTIC STUDIES OF N.H. 3 AND N.H. 4

THIS STUDY WAS TAKEN UP IN MAHARASHTRA STATE ON THE INVITATION OF THE CHIEF ENGINEER, BUILDINGS AND COMMUNICATIONS, DEPARTMENT OF THE GOVERNMENT OF MAHARASHTRA, IN CONNECTION WITH THE I.D.A. WORKS FOR IMPROVING THE ROADS OF NATIONAL HIGHWAYS TO INTERNATIONAL STANDARDS. RIDING QUALITY OF EXISTING PAVEMENT WAS ONE OF THE FACTORS FOR DECIDING THE STRETCH OF ROAD TO BE IMPROVED. ROAD TESTS WITH THE BUMP INTEGRATOR WERE CONDUCTED ON THE N.H. 4 KOLHAPUR-SANGUPUR (Km 2836/0) AND BOMBAY-AGRA ROAD (KM 265/0-543/0). THE MEAN VALUE OF THE ROUGHNESS INDEX FOR THE 403 KMS TESTED IS 303.8 INCHES/MILE AND THE STANDARD DEVIATION IS 30 INCHES/MILE. ALLOWING THE TOLERANCE LIMIT 50 INCHES/MILE, IT WAS CONSIDERED THAT 250 INCHES/MILE AND BELOW WAS GOOD SECTION. THE STANDARD ADOPTED IN DIFFERENT COUNTRIES VARY ACCORDING TO THE DIFFERENT METHODS OF ROAD CONSTRUCTION, VOLUME OF TRAFFIC, AND THE WAY OF MAINTENANCE TO THE VARYING CLIMATIC CONDITIONS. 160 INCHES/MILE AND BELOW IS CONSIDERED TO BE A GOOD SURFACE IN THE UNITED KINGDOM; IN THE UNITED STATES (1) IN THE STATE OF VIRGINIA 100 TO 150 INCHES/MILE, (2) IN THE STATE OF CALIFORNIA 100 TO 200 INCHES/MILE, AND (3) IN THE STATE OF MINNESOTA 75 INCHES/MILE AND BELOW. THE HIGHWAY RESEARCH BOARD COMMITTEE HAS RECOMMENDED 100 TO 150 INCHES/MILE AS GOOD SURFACE. THE CENTRAL ROAD RESEARCH INSTITUTE, NEW DELHI, HAS Evolved A STANDARD OF 160 INCHES/MILE AND BELOW AS GOOD SURFACE AS PER THE TESTS CONDUCTED IN SOME OF THE ROADS IN INDIA. IN TAMIL NADU, IT HAS BEEN ASSESSED THAT 230 INCHES/MILE AND BELOW, ROUGHNESS INDEX IS GOOD ROAD SECTION, AND IMPROVEMENTS ARE BEING MADE TO THE ROAD SECTIONS WHERE THE VALUES ARE HIGHER. AS PER THE TESTS CONDUCTED IN MAHARASHTRA STATE, RECOMMENDATIONS ARE GIVEN FOR IMPROVING THE ROAD SECTIONS WITH A HIGHER INDEX VALUE THAN 250 INCHES/MILE. 46 KMS IN N.H. 3 WITH 3-1/2 INCH BITUMINOUS MACADAM AND 1.25-INCH THICK ASPHALTIC CONCRETE PAVEMENT HAS

2A 207616

PENN STATE'S CONTINUING PAVEMENT TEST IS YIELDING VALUABLE RESEARCH RESULTS


2A 207682

CHECKING THE PAVEMENT DESIGN OF THE EXPERIMENTAL SECTION ON THE SS NO 4 SALARIA, FULL DEPTH PAVEMENT

THE FIRST EXPERIMENTAL FULL-DEPTH ASPHALT PAVEMENT IN ITALY WAS CONSTRUCTED IN 1970. AFTER NEARLY TWO YEARS OF SERVICE AND TWO PARTICULARLY HARD WINTERS THERE WAS NO SUBSIDENCE, LOOSENING OF AGGREGATES OR TRACKING, WHILE SIMILAR DEFECTS HAD TO BE REPAIRED ON ADJOINING SECTIONS OF CONVENTIONAL STRUCTURE. SYSTEMATIC DEFLECTION MEASUREMENTS AND CORE SAMPLING ARE BEING CARRIED OUT TO EVALUATE THE LONG TERM PERFORMANCE OF THE TEST SECTION, THE DESIGN AND CONSTRUCTION OF WHICH ARE DESCRIBED AND ILLUSTRATED. /TRRL/

Castagnotto, V //Autoviastrade /Italy// Vol. 14 No. 11, Nov. 1972, pp 4-11, 5 Fig 1 Tab 5 Phot, 61 Ref

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/ IRRD 205 417, 2C26305417

2A 207699

DIMENSIONAL TOLERANCES AND QUALITY CONTROL IN WELDED STEEL CONSTRUCTION

RECENTLY THE AMERICAN WELDING SOCIETY ISSUED TWO REGULATIONS FOR WELDED CONSTRUCTION ONE FOR BUILDINGS AND THE OTHER FOR BRIDGES. A BRIEF DISCUSSION IS GIVEN OF THE PERTINENT CLAUSES DEVISED TO PROVIDE AN ACCEPTABLE QUALITY OF WORKMANSHIP AND TO SPECIFY THE LIMITS OF DIMENSIONAL DEVIATION OBTAINED IN WELDED FABRICATION. /AUTHOR/

Amirkian, A //Highway Research Record, Hwy Res Board// 1965
THAT A THERE IS A DIFFERENCE AS MUCH AS 3 KSI /AUTHOR/ SPECIMENS TESTED EXHIBITED FATIGUE STRENGTHS EQUAL OF SEVEN OF THE BEAM TESTS. A STATISTICAL ANALYSIS OF CHANGES IN STEEL CONSTRUCTION TOLERANCES ARE ANA­CREASED BY REDUCING THE FACTORS OF SAFETY PRES­CUSSED. THE DESIRABILITY OF DEVELOPMENT OF SO­COMMERCIALLY GOOD AND ACCEPT ABLE SPECIMENS, AND TORS ACTUALLY OCCURRED IN ELEVEN OF THE BEAMS.


Milek, WA Highway Research Record, Hwy Res Board 1965

2A 207711

FATIGUE STRENGTH OF 1/2-INCH DIAMETER STUD SHEAR CONNECTORS COMPOSITE STEEL AND CONCRETE BEAMS WERE TESTED IN FATIGUE AT VARIOUS STRESS LEVELS. ALL TWELVE BEAMS TESTED HAD 1/2-IN. DIAMETER WELDED STUDS AS SHEAR CONNECTORS. THE BEAMS WERE DESIGNED SO THAT NORMAL WORKING STRESSES WOULD BE ACHIEVED AT PEAK LOADS DURING REPEATED LOADING WHILE THE SHEAR STRESS ON CONNECTORS WAS SUFFICIENTLY HIGH TO PRODUCE FATIGUE FAILURE. FATIGUE FAILURE OF CONNECTORS ACTUALLY OCCURRED IN ELEVEN OF THE BEAMS. ELECTRICAL RESISTANCE STRAIN GAGES WERE USED IN EIGHT OF THE TEST BEAMS TO DETECT WHEN FATIGUE CRACKS WERE INITIATED IN CONNECTORS. THE USE OF SUCH STRAIN GAGES ENABLED THE INVESTIGATORS TO DETER­MINE THE EXTENT OF FATIGUE FAILURE AT ANY TIME DURING THE TESTING. THIS INFORMATION WAS COMPARED WITH END SLIP AND DEFORMATION DATA TAKEN DURING THE TESTS. THE CRITERION OF FAILURE WAS TAKEN AS THE INITIAL CRACKING OF A PAIR OF SHEAR CONNECTORS. ON THIS BASIS AN-N CURVE WAS OBTAINED FROM THE RESULTS OF SEVEN OF THE BEAM TESTS. A STATISTICAL ANALYSIS OF THESE DATA WAS MADE AND THE 95 PERCENT CONFIDENCE LIMITS OF THE DATA WERE OBTAINED. THE DATA ON FA­TIGUE OF STUD CONNECTORS OBTAINED BY OTHER INVESTIGATORS FALL GENERALLY WITHIN THESE 95 PERCENT CONFIDENCE LIMITS. /AUTHOR/

King, DC Slutter, RG Driscoll, GC Highway Research Record, Hwy Res Board 1965

2A 207712


Toprac, AA Highway Research Record, Hwy Res Board 1965

2A 207731

A STUDY OF LOAD DISTRIBUTION CHARACTERISTICS OF SINGLE AND LAYERED TIMBER BRIDGE DECKS SUPPORTED BY MULTIPLE STRINGERS

A THEORETICAL METHOD WAS DEVELOPED TO ANALYZE THE LOAD DISTRIBUTION CHARACTERISTICS OF MULTI­STRINGER BRIDGES, INCORPORATING THE STIFFNESS MATRIX METHOD AND THE THEORY OF HARMONIC ANALYSIS. THE METHOD WAS QUITE ADAPTABLE TO ELECTRONIC COMPUTATION. TESTS WERE CONDUCTED ON MODELS OF THREE DIFFERENTLY CONSTRUCTED TIMBER BRIDGE DECKS TO OBTAIN THEIR LOAD DISTRIBUTION CHARACTERISTICS FOR COMPARISON WITH THOSE OBTAINED FROM THE THEORETI­CAL METHOD. THE EXPERIMENTAL VALUES OBTAINED FOR THE INTERIOR STRINGERS ARE EXPRESSED AS A PERCENT­AGE OF THE PREDICTED VALUES, AND WHEN LISTED IN ASCENDING ORDER OF TRANSVERSE FLEXURAL STIFFNESS OF THE MODEL DECKS, THE DIAGNOSTIC DISTRIBUTION FACTORS WERE APPROXIMATELY 85 PERCENT, 93 PERCENT, AND 95 PERCENT. THE AASHO DISTRIBUTION FACTORS APPEARED TO BE QUITE CONSERVATIVE BASED ON THE EXPERIMENTAL RESULTS REPORTED. THIS CONSERVATISM SUGGESTED THAT THE LAY­ERED DECK BEING USED BY THE NORTH CAROLINA STATE HIGHWAY COMMISSION COULD SAFELY CARRY AN OCCA­SIoNAL OVERLOAD OF ABOUT 50 PERCENT. THE SIMILARITY OF THE DISTRIBUTION FACTORS OBTAINED FOR THE THREE TYPES OF DECK TESTED INDICATED THAT THE SELECTION OF THE MOST DESIRABLE DECK SYSTEM WOULD PROBABLY BE CONTROLLED BY OTHER DESIGN CONSIDERATIONS, SUCH AS MAINTENANCE OR UNIT COST. /BPR/

Zia, F Wilson, WT Rowan, WH North Carolina State University June 1964

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4610002 651C27020393, 1C27020062)

2A 207781

AN INVESTIGATION OF LOAD DISTRIBUTION CHARACTERISTICS AND LOAD CAPACITY OF SMALL TIMBER BRIDGES

CONSTRUCTION MATERIALS


ACKNOWLEDGMENT: Highway Res Abstracts Hwy Res Board

SA VIGNS ARE ESTIMATED TO BE 4 PER CENT OF THE NA-GIRDER BRIDGES AND TRUSSES. THE PROPOSED DESIGN COMPLETELY DESIGNED USING EXISTING SPECIFICATIONS.

THAT THE PRESENT MINIMUM CAP A CITY IS 2.0 LIVE LOADS. /CGRA/

FORCED CONCRETE DECK SLAB. /CGRA/

THE EXTENT, CAUSE AND EFFECT OF DELAMINATION IN THE PROVINCES OF ONTARIO, MANITOBA, SASKATCHE-WAN, ALBERTA AND BRITISH COLUMBIA AND IN THE STATES OF WASHINGTON, OREGON, IDAHO, MONTANA AND MINNE-SOTA. THE INSPECTIONS INDICATED THAT VERY LITTLE DELAMINATION OCCURS IN PROPERLY TREATED GLULAM BRIDGE MEMBERS AND THAT, WITH ONE EXCEPTION, WHERE DELAMINATION DOES EXIST. IT IS NOT SERIOUS. THE PAPER ALSO CONCLUDES THAT THERE IS SOME EVIDENCE THAT THE MOST EFFECTIVE PRESERVATIVE FOR STRUCTURAL TIMBER IS 100 PERCENT CREOSOTE WITH A RETENTION OF 8 POUNDS PER CUBIC FOOT. /CGRA/

Huggins, MW Aplin, EN Engineering Journal /Canada/ JUN65

2A 208150

STUDY OF CHECKING AND DELAMINATION IN GLULAM BRIDGE MEMBERS

THE EXTENT, CAUSE AND EFFECT OF DELAMINATION IN GLUED LAMINATED TIMBER BRIDGE MEMBERS WAS STUDIED. THE PAPER PRESENTS THE RESULTS OF A FIELD SURVEY OF 57 BRIDGES WITH GLUED LAMINATED TIMBER LOCATED IN THE PROVINCES OF ONTARIO, MANITOBA, SASKATCHE-WAN, ALBERTA AND BRITISH COLUMBIA AND IN THE STATES OF WASHINGTON, OREGON, IDAHO, MONTANA AND MINNE-SOTA. THE INSPECTIONS INDICATED THAT VERY LITTLE DELAMINATION OCCURS IN PROPERLY TREATED GLULAM BRIDGE MEMBERS AND THAT, WITH ONE EXCEPTION, WHERE DELAMINATION DOES EXIST. IT IS NOT SERIOUS. THE PAPER ALSO CONCLUDES THAT THERE IS SOME EVIDENCE THAT THE MOST EFFECTIVE PRESERVATIVE FOR STRUCTURAL TIMBER IS 100 PERCENT CREOSOTE WITH A RETENTION OF 8 POUNDS PER CUBIC FOOT. /CGRA/

Fountain, RS

Canadian Inst Steel Constr. Toronto Feb. 1968

ACKNOWLEDGMENT: Canadian Good Roads Association

2A 208201

COMPOSITE STEEL-CONCRETE MULTI-BOX GIRDER BRIDGES

A DISCUSSION OF BACKGROUND STUDIES OUT OF WHICH EVOLVED THE "CRITERIA FOR DESIGN OF STEEL-CONCRETE COMPOSITE BOX GIRDER HIGHWAY BRIDGES" IS GIVEN. AS WELL AS THE RESULTS OF DESIGN STUDIES ON SEVERAL BRIDGES USING THE CRITERIA. THE TYPE OF BRIDGE UNDER CONSIDERATION IS OF MODERATE LENGTH (UP TO 350 FEET) AND CONSISTS OF RECTANGULAR OR TRAPEZOIDAL SECTION STEEL GIRDER MADE COMPOSITE WITH A REIN-FORCED CONCRETE DECK SLAB. /CGRA/

Beaton, J. L Jonas, P.G

Am Soc Civil Engr Transactions 1955

ACKNOWLEDGMENT: Highway Research Board

2A 208559

CRITERIA FOR PRESTRESSED CONCRETE BRIDGES

THIS IS THE NEAREST APPROACH TO AN OFFICIAL BUILDING CODE FOR PRESTRESSED CONCRETE CONSTRUCTION IN THE UNITED STATES.


2A 208698

EXPERIENCES FROM FATIGUE AND RUPTURE TESTS ON A PRESTRESSED CONCRETE BRIDGE

DETAILS ARE GIVEN OF EXTENSIVE FATIGUE TESTS AND A FINAL STATIC TEST, UP TO FAILURE, CARRIED OUT ON A 5 YEAR OLD MODERN HIGHWAY BRIDGE WHICH HAD TO BE DEMOLISHED TO MAKE WAY FOR A NEW EXPRESS HIGHWAY.

INVESTIGATIONS INTO THE PROPERTIES OF THE CONSTRUCTION MATERIALS ARE DESCRIBED. THE TESTS REPRESENT A PROOF OF THE SAFETY AND RELIABILITY OF PRESTRESSED CONCRETE UNDER REPEETITIVE LOADING. /RRL/

Rosli, A


ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 208781

REPORT OF ROYAL COMMISSION INTO THE FAILURE OF WEST GATE BRIDGE, VICTORIA, PRESENTED TO BOTH HOUSES OF PARLIAMENT PURSUANT TO SECTION 7 OF THE WEST GATE BRIDGE ROYAL COMMISSION ACT 1970, NO 79/80.


Barber, EH
Rixon, C.H., Govt Printer /Australia/ 1971, 143 pp. 15 Fig. 1 Tab. 13
Photo, 14 Ref

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

2A 208815
PROBABILISTIC STRUCTURAL ANALYSIS AND DESIGN
SOME OF THE IMPORTANT ADVANTAGES OF PROBABILISTIC DESIGN PROCEDURES ARE PRESENTED AND COMPARED WITH DETERMINISTIC TECHNIQUES. THE PROBLEM OF THE COMPOUNDING OF HAZARDS IS ILLUSTRATED BY COMPARING A SERIES TYPE STRUCTURE WITH A PARALLEL TYPE STRUCTURE. BOTH STRUCTURES HAVE THE SAME CHARACTERISTICS FROM A DETERMINISTIC VIEWPOINT. BUT THE PARALLEL TYPE CLEARLY IS SUPERIOR TO THE SERIES TYPE IF PROBABILISTIC CONCEPTS ARE EMPLOYED. THE SPECIFICATION OF MATERIAL PROPERTIES IN MANUFACTURE IS CLEARLY PROBABILISTIC. THESE SAME MATERIAL PROPERTIES ARE SPECIFIED AND TREATED DETERMINISTICALLY IN STRUCTURAL PRACTICE WITHOUT REGARD TO THE ACTUAL PROPERTIES OF THE MATERIALS. SIMILARLY, REAL LOADINGS, ALTHOUGH PROBABILISTIC IN NATURE ARE TREATED AS DETERMINISTIC. ANALYSIS AND DESIGN PROCEDURES EMPLOY MODELS OF LOADING AND RESPONSE THAT HAVE LITTLE RELATIONSHIP TO REALITY. THE DESIGN DECISION PROCESS FOR SEISMIC LOADING IS ILLUSTRATED USING STATISTICAL DECISION THEORY. THE FORMULATION OF OPTIMIZATION OF DECISIONS UNDER UNCERTAINTY IS CONSIDERED. /ASCE/

Benjamin, JR Am Soc Civil Engr J Structural Div July 1968

2A 209989
CANTILEVERED END SPAN STEEL PLATE GIRDER
THE GEOLOGIC CONDITIONS AT A GIVEN STRUCTURE SITE MAY EXERCISE GREAT CONTROL OVER THE STRUCTURAL DESIGN. THIS IS PARTICULARLY TRUE IN UTAH WHICH WAS ONCE INUNDATED BY PREHISTORIC LAKE BONNEVILLE, WHICH DEPOSITED UP TO SEVERAL HUNDRED FEET OF FINE SAND, SILT AND CLAY. STRUCTURE AND ROADWAY FILLS ARE BOTH SUBJECT TO SETTLEMENT. ROADWAY FILLS HAVE BEEN FAIRLY WELL CONTROLLED THROUGH USE OF SAND DRAINS EITHER WITH OR WITHOUT SURCHARGE ON THE FILLS. IT WAS RECOGNIZED IN UTAH THAT IF BRIDGES COULD BE DESIGNED AND CONSTRUCTED INDEPENDENTLY OF THE APPROACH FILLS AND THE ASSOCIATED SETTLEMENT, THE MAINTENANCE PROBLEM WOULD BE REDUCED TO PERIODIC PLACEMENT OF NEW SURFACING TO MATCH WITH THE BRIDGE DECKS. A NEW PROCEDURE HAS BEEN DEVELOPED TO UTILIZE STEEL SUPER STRUCTURES WITH CANTILEVERED END SPANS WHICH ELIMINATES DECK JOINTS AND ROADSIDE HAZARDS IN THE FORM OF BRIDGE PIERs ADJACENT TO THE TRAVELED-WAY. THE FIRST STRUCTURE CONSTRUCTED OF THIS TYPE WAS THE WHITE RIVER BRIDGE WHICH ACCOMMODATES A SINGLE LANE OF TRAFFIC AND CROSSES THE RIVER AT 90 DEGREES ON A FLAT GRADE. THE PIERS CONSIST OF A SINGLE LINE OF DRIVEN STEEL PILES ENCASED IN CONCRETE. THE GIRDERs ARE FIXED TO THE TOP OF THE PIERS AGAINST LONGITUDINAL MOVEMENTS BUT ARE FREE TO ROTATE. THE STRUCTURE WAS BUILT WITH A MAXIMUM IMPACT FACTOR OF 30%. BRIDGE STRUCTURES OF THIS TYPE OF DESIGN SINCE THE FIRST STRUCTURE HAVE UTILIZED A 100% LIVE LOAD IMPACT FACTOR IN THE CANTILEVERED SPANS. DETAILS OF DESIGN AND CONSTRUCTION ARE PRESENTED; THIRTEEN STRUCTURES OF THIS TYPE HAVE BEEN COMPLETED. A FOUR SPAN BRIDGE HAS NOT YET BEEN CONSTRUCTED WITH CANTILEVERED SPANS. HOWEVER, CALCULATION HAS BEEN MADE OF THE THEORETICAL IDEAL PIER LOCATIONS.


2A 209185
MEMOIRES, ABHANDLUNGEN, PUBLICATIONS
THIS VOLUME CONTAINS 15 PAPERS, 8 OF WHICH ARE IN ENGLISH, 5 IN FRENCH AND 2 IN GERMAN. DESPITE THEIR DIVERSITY THEY ALL TAKE UP THE MAJOR PROBLEMS WITH WHICH BRIDGE AND STRUCTURAL ENGINEERS ARE CONCERNED WHO WISH TO EXCEED THE NORMAL STANDARD OF ACCOMPLISHMENTS SUBJECTS LIKE THE FOLLOWING ARE DEALT WITH; SAFETY, CONSTRUCTION MATERIALS, CREEP, TALL BUILDINGS, SPECIAL PROBLEMS REGARDING BRIDGE DECKS, CALCULATION METHODS, RELATION BETWEEN STATICS AND MATHEMATICS, STABILITY, PROBLEMS REGARDING APPLIED DYNAMICS AND OPTIMIZATION. /TRRL/

Intl Assoc Bridge & Struct Eng /Switz/ 1969

2A 209240
CONCRETE MASONRY STRUCTURES--DESIGN AND CONSTRUCTION
RECOMMENDATIONS ARE PROVIDED FOR THE DESIGN AND CONSTRUCTION OF REINFORCED AND NONREINFORCED CONCRETE MASONRY STRUCTURES USING UNITS MANUFACTURED TO ASTM SPECIFICATIONS. THE MANUFACTURING PROCESS ITSELF IS NOT DISCUSSED, AND MORTARLESS MASONRY AND CONSTRUCTION USING RESIN-TYPE ADHESIVES BETWEEN THE UNITS ARE NOT COVERED. DESIGN RECOMMENDATIONS BASED ON THE WORKING STRESS METHOD GIVE ALLOWABLE STRESSES FOR BOTH REINFORCED AND NONREINFORCED MASONRY. CONSTRUCTION RECOMMENDATIONS INCLUDE CHAPTERS ON MATERIALS AND THE SPECIFICATIONS, MORTAR AND GROUT, PREFERRED CONSTRUCTION PRACTICES; DETERMINATION OF MASONRY STRENGTH; INSPECTION; CONNECTIONS TO EMBEDDED AND ADJOINING CONSTRUCTION; AND REINFORCING BAR DETAILS. DESIGN CHAPTERS DEAL SEPARATELY WITH REINFORCED WALLS AND COLUMNS AND NONREINFORCED WALLS AND COLUMNS. SHEAR, BOND, AND ANCHORAGE PROVISIONS ARE GIVEN FOR REINFORCED MASONRY. RECOMMENDATIONS BASED ON THE WORKING STRESS METHOD ARE MADE, AND CONSTRUCTION OF MASONRY VENEERS, SCREEN WALLS, AND FENCES IS DESCRIBED. NEARLY 200 TERMS RELATING TO MASONRY DESIGN AND CONSTRUCTION APPEAR IN THE APPENDIX. /AUTHOR/

Mackintosh, A Am Concrete Inst Journal & Proceedings May 1970

2A 209414
CONCRETE COLUMN DESIGN BY AASHO SPECIFICATIONS
THE AASHO SPECIFICATIONS OF CONCRETE COLUMN DESIGN FAIL TO ENSURE CONSISTENT AND UNIFORM RESULTS BECAUSE THE DESIGN METHOD FOR CRACKED AND UNCRACKED SECTIONS YIELD DISSIMILAR ANSWERS TO THEIR COMMON BOUNDARY, AND BECAUSE IT LEFT TO THE DESIGNER TO WORK WITH A MODULAR RATIO OF EITHER N = 10 OR N = 20. A METHOD IS PROPOSED BY WHICH THE DEMONSTRATED INCONSISTENCIES CAN BE ELIMINATED AND INTERACTION DIAGRAMS ARE PRESENTED WHICH PERMIT THE DIRECT DETERMINATION OF REINFORCEMENT REQUIREMENTS FOR THE MOST COMMON COLUMN CONFIGURATION INCLUDING THE CASE OF BENDING ABOUT TWO AXES. THE PROPOSED METHOD IS PURELY PRAGMATIC, APPLIES TO WORKING STRESS DESIGN ONLY, AND IS SOLELY INTENDED TO OFFER A CONVENIENT MEANS OF OBTAINING UNIFORM AND CONSISTENT RESULTS WITHIN THE FRAMEWORK OF THE CURRENT SPECIFICATIONS. /AUTHOR/

Fickel, HH Am Soc Civil Engr J Structural Div Apr. 1971
TIMBER HIGHWAY BRIDGES IN OREGON

A Timber-deck type bridge has been developed which uses 4 in. by 12 in. planks for the subdeck and 2 in. by 2 in. cedar or treated fir strips, laid longitudinally, for a wearing surface, which is laid in hot asphalt. A composite timber and concrete trestle was also developed.

Many timber bridges have been used at sites where spans longer than practical with truss construction have been required. Treated timber culverts are practical even under normal conditions. Selection of bridge types should be made on comparative total annual cost. /Author/

Mccullough, CB; Paxson, GS; Marilley, CG; DISCUSSER: Seiler, JF

Highway Research Board Proceedings 1943

DESIGN OF COLUMBIA RIVER PILE DIKES

Designers of timber river control works often need to consider the structural integrity of the pile structure in addition to its normal function to shape and navigate channels and naturals. But stress to which the piles are subjected, and a practical procedure for determining the required penetration depth and the stresses in piles and foundations are developed. Previous design work were performed by judgment and extensive observation of problem bars. /ASCE/

Dodge, RO

Am Soc Civil Engr J Waterways & Harbors May 1971

EXPERIMENTAL PRESTRESSED CONCRETE HIGHWAY PROJECT IN PITTSBURGH

This pavement, 5 in. thick by 12 ft wide by 30 ft long, was constructed in Pittsburgh, Pa., not only to provide technical date on the structural action of prestressed concrete highway pavements but also to provide reliable information on the feasibility of construction and the relative economics involved. Almost a year was occupied in working out the engineering problems. Construction was started in September 1956 and the final prestressing operation was completed in February 1957. Realizable experience was developed by the construction operation, which generally worked satisfactorily. Among some of the unanticipated problems was a failure resulting from prestressing before adequate concrete strengths were obtained. Other desirable changes in practice are a reduction in maximum size of aggregate and some refinement in the construction at the ends of the slab sections. A unique solution to the age-old expansion joint problem was developed. The joint, which consists of laminations of rubber and steel resting on a long flexible sill, has performed satisfactorily to date. An extensive test series was carried out which included both static testing and moving load tests, but the test data on the structural action of the load testing was included. Results were considered excellent and the structural aspects of a 5 in. thick highway pavement with longitudinal prestressing only appear to be entirely adequate for modern highway loads. /Author/

Morell, B; Murray, JI; Heinzerling, JE; Melville, PL

DISCUSSER: Highway Research Board Proceedings 1958

PRESTRESSED COMPOSITE STEEL BEAM DESIGN

Four deck-girder highway bridges, located in an area which has since been flooded as a part of a TVA reservoir, were tested to failure under static loading. A system of rock anchors was used to develop the necessary forces. The loads were applied to a bridge span at eight load points, simulating the rear wheels of two AASHO HS trucks, one truck in each traffic lane. All of the bridges but one failed. As expected, in a flexural mode, composite design was lost in the precasted concrete girder, and the two interior girders failed in shear. The failure load for each bridge, achieved at the expense of large deflections, was several times the design load for the bridge. /Author/

Anand, SC; Telestchi, A

Am Soc Civil Engr J Structural Div Vol. 99 No. st3, Mar. 1973, pp 301-19, 3 Fig, 5 Tab
INTERNATIONAL RECOMMENDATIONS FOR THE DESIGN AND CONSTRUCTION OF CONCRETE STRUCTURES

These recommendations cover the whole field of joint concrete and steel action, from reinforced to prestressed concrete, as regards both design and construction. Structural lightweight concretes are considered along with normal aggregate concretes. The information was collected over a period of 16 years and is presented here organized under the titles of principles, recommendations, supplements and appendices. The principles deal only with basic concepts for use by committees preparing national regulations. The recommendations provide examples of these principles. Direct application of these recommendations is discussed. Justifications and explanations, graphs, tables and examples intended to assist the understanding of the principles and recommendations are provided in the section entitled "supplements". Appendices which will be published as separate volumes, will refer to the recommendations for design and construction of certain types of structures. They will also cover certain special subjects such as concrete exposed to high temperatures, fire resistance of reinforced and prestressed concrete, durability, and terminology.

Palmbaum, H Am Concrete Inst Journal & Proceedings Vol. 70 No. 10, Oct. 1973, pp 707-8, 1 Fig. 1 Tab. 1 Ref

MERSEY KINGSWAY TUNNEL: PLANNING AND DESIGN

PAPER 7480

The historical background of Mersey crossings and the planning of this crossing for the benefit of Merseyside as a whole is summarized. Topography and geology are described in particular the characteristics of the Bunter sandstone in which the tunnel is driven. The alignment, levels and gradients of the tunnel and approaches were determined to utilize the disused seacombe railway and to pass under the river bed with sufficient cover. The tunnel lining for use in the rock is of precast reinforced concrete with a welded steel inner face and was designed for erection by a tunnelling machine which provided a smooth and accurate bore. Cast iron segmental lining was used where the tunnel rose out of the rock into boulder clay. The road deck in the tunnel is a composite reinforced concrete structure with prestressed beams and in situ filling and topping, which forms the running surface. Ventilation shafts and ducts connect to the tunnel under two ventilation stations. Portal chambers of reinforced concrete at each end incorporate drainage sumps and rumps. At the Liverpool end a cut-and-cover section at a depth of 50-60 ft has a reinforced concrete arch of about 10000 cu ft/min from each of two stations. Drainage and pumping are provided for at the portals and at midriver principally to deal with rain water on the approaches and washing down water. The principal features of the decorative finishes within the tunnel are the direct epoxy spray applied to the primary lining where the welded steel facings are used, and vitreous enamelled steel clad panels above each walkway. Lighting, operational services and controls are described. Costs are summarized (A).

Megaw, T.M. Brown, C.D Inst Civil Engineers Proc. London /UK/ Vol. 51 Mar. 1972, pp 479-502, 7 Fig, 1 Phot. 1 Ref

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/
2A 210265
CONSTRUCTING LONGITUDINAL JOINTS IN HOT-MIX ASPHALT PAVEMENTS

This paper presents results of density and tensile strength test of samples cut from longitudinal joints in hot-mix asphaltic pavement. An unexpected finding is that in semi-hot and cold joints there is a low-density zone at the joint in the lane paved first and a high-density zone at the joint in the lane paved last. There are at least two low-density zones are not present in hot joints made with pavers operating in echelon. These low- and high-density zones may well be the basic problem in constructing durable longitudinal joints in asphalt pavements. /Author/

Foster, CR. Hudson, SB. Nelson, RS. Highway Research Record, Hwy Res Board 1964

2A 210387
FINAL REPORT ON THE USE OF LIGHTWEIGHT SYNTHETIC AGGREGATE IN FLEXIBLE PAVEMENTS

A summary is presented of a study on the use of lightweight synthetic aggregate in flexible pavements. Laboratory and field tests were conducted to prove that, to good under-synthetic aggregate is quite suitable as a coverstone for seal coats and surface treatments. Lightweight aggregate was found to cause no flying stone problem and thus damage to windshields and headlamps was eliminated. Where this material was used, it was found that lightweight synthetic aggregate used as coverstone for seal costs produced a surface of high and prolonged skid resistance. Exploratory research in the laboratory and field with lightweight synthetic aggregate in hot-mix asphalt paving mixtures shows great promise for this new source of aggregate. Mixes designed to include as much as fifty percent (by volume) of lightweight aggregate appear entirely Suitable for high-quality asphalt surface courses. The mixtures are highly stable, are not water susceptible, and produce a non-skid surface. The coefficient of friction as measured wet at 40 MPH on a locked wheel trailer is above 0.5. In plant mixes, this new aggregate presents no construction difficulties for which easy adjustment cannot be made. /Author/


ACKNOWLEDGMENT. Bureau of Public Roads /US/ (4642164 63)1C310210785 PB 178, 120, 1C31021167

2A 210406
KENTUCKY ROCK ASPHALT HOT MIX SURFACES

Data are presented pertaining to the properties of materials in Kentucky rock asphalt mixtures, and of construction practices, costs, and short time performance observations of pavements using the mixtures. The rock asphalt contains about 3.8% by weight of high-quality asphalt-mixed with a 3-inch screen, 85-100 penetration grade asphalt is added so the hot-mix contains a total of between 9-10 percent asphalt. Some problems were encountered when heating the rock asphalt and care was needed to prevent a build-up of material in the plant. The performance of pavements using this mixture is rated from satisfactory to good under-light traffic, with good skid resistance, which is the principal advantage of this mixture. It is rated high-coefficients of 0.57 to 0.72. The report also traces the development of the special asphalt.
CONSTRUCTION MATERIALS

2A 210551
REPORT ON EXPERIENCE WITH THE USE OF INTERMEDIATE BLANKETING IN ROAD CONSTRUCTION IN BADEN-WURTTEMBERG

IN BADEN-WURTTEMBERG, INTERMEDIATE BLANKETING HAS EVOLVED FROM THE NECESSITY OF FINDING A SYSTEM OF CONSTRUCTION WHICH BY SIMPLE MEANS, WOULD REDUCE THE FROST SENSITIVITY OF ROAD STRUCTURES. THE GOOD RESULTS OBTAINED IN MANY COUNTRIES WITH THE USE OF HOT TARMAC FOR MAKING BITUMINOUS COATINGS SUGGESTED THE USE OF THIS MATERIAL. ALSO IN BADEN-WURTTEMBERG ON A LARGE SCALE, FOR IMPROVING FROST-RESISTANCE, COMPLETE FOR THE PURPOSE OF INTERME­
DIATE BLANKETING TO IMPROVE FROST RESISTANCE BY THE SIMPLE APPLICATION OF A 30-40 KG/SM BLANKET HAD BEEN FOUND INSUFFICIENT TO PREVENT THE PENETRATION OF SURFACE WATER INTO THE SURFACING AND SUBSTRUCTURE. SINCE 1965, AFTER RAISING THE ROAD VERGES AND ANY NECESSARY WIDENING, A BITUMINOUS COATING OF AT LEAST 7 CM THICKNESS OF HOT TARMAC WAS APPLIED AND REINFORCED WHERE NECESSARY TO 10-12 CM THICKNESS, THE SURFACING AND WEARING COAT WAS A 70 KG/SM HEAVY ASPHALT CONCRETE LAYER. SUCH REINFORCEMENT OF THE ROADWAY EDGES BY HIGH OR SHALLOW CURB STONES LAID IN CONCRETE HAS BEEN FOUND HIGHLY EFFECTIVE. THIS FORM OF INTERMEDIATE BLANKETING WAS FOUND TO BE GOOD, AFTER INITIAL TROUBLES, SO THAT THE SYSTEM IS NOW IN GENERAL USE IN BADEN-WURTTEMBERG. THE DECISIVE FACTOR WAS THE FACT THAT LENGTHS CON­STRUCTED IN THIS MANNER SHOWED NO FURTHER SIGNS OF DAMAGE, REMAINED CONTINUOUS IN STRUCTURE AND IN NO WAY DETERIORATED IN APPEARANCE. THE POSSIBILITY OF USING MATERIAL OF LOCAL ORIGIN FOR A LARGE PART OF THE ROAD STRUCTURE IS PARTICULARLY IMPORTANT FOR THIS REGION WHICH IS DEFICIENT IN STONE. /RRL/

Bitumen /Germany/ May 1965

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 210561
OIL TREATMENT FOR DUST CONTROL IN SASKATCHEWAN

THE HIGH PROPORTION OF UNPAVED ROADS IN SASKATCHE­
WAN DEMANDED AN ECONOMICAL, ADEQUATE SURFACE TREATMENT TO CONTROL DUST AND PROVIDE THE ROAD USER WITH IMPROVED RIDING QUALITY. OIL TREATMENT HAS BEEN USED FOR SEVERAL YEARS IN THIS RELATIVELY ARID AREA WHERE PRECIPITATION IS LESS THAN 20 INCHES OF RAINFOREST. TREATMENT IS DEFINED AS A VERY THIN ROAD-MIXED, BITUMINOUS APPLIED TO AN OIL-PRIMED GRAVEL SURFACED SUBGRADE. SLOW-CURING LIQ­UID ASPHALTS /SC-1 OR SC-2/ ARE GENERALLY USED IN CONSTRUCTING THIS ONE-INCH THICK SURFACE. THESE OIL-TREATMENT PAVEMENTS HAVE AN AVERAGE LIFE OF 3 TO 5 YEARS AND TRAFFIC VOLUMES OF 100 TO 400 VEHICLES PER DAY. THE TOTAL PAVEMENT CONSTRUCTION COST IS APPROXIMATELY 3000 DOLLARS PER MILE WITH ANNUAL MAINTENANCE COSTS RANGING FROM 100 TO 1500 DOLLARS PER MILE. SUCCESS OF THE OIL TREATMENT DEPENDED UPON THE METHOD OF CONSTRUCTION AND ON PROMPT MAINTENANCE. THE CONSTRUCTION AND MAINTENANCE PROCEDURES ARE DESCRIBED. /CGRA/

Memillan, JD Western Assoc Can Hwy Officials Proc Apr. 1965

2A 210566
FUNDAMENTAL VISCOSITY TESTING OF ASPHALT CEMENTS THERE ARE CRITICAL POINTS ON THE TEMPERATURE CONS­ISTENCY CURVE OF ASPHALT CEMENT. SOME OF THESE POINTS, FOR ASPHALT MIX PAVING, ARE: MIXING AND COMPACTING TEMPERATURES, MAXIMUM PAVEMENT TEMPERATURE /140 DEGREES F.,/ AND TESTING TEMPERATURE FOR VOIDS /77 DEGREES F./. GRADING AND TESTING PROCEDURES FOR ASPHALT CEMENTS ADOPTED BY THE BRITISH COLUMBIA DEPARTMENT OF HIGHWAYS ARE DISCUSSED AND THE MORE RIGID SPECIFICATIONS IN THEIR ROAD BUILDING PROCEDURES ARE OUTLINED. /CGRA/

Varady, B Western Assoc Can Hwy Officials Proc Apr. 1966

ACKNOWLEDGMENT: Canadian Good Roads Association

2A 210624
LABORATORY STUDIES OF ASPHALTIC CONCRETES CONTAINING ASBESTOS FIBERS, RUBBERIZED ASPHALT AND EPOXY-RESIN ASPHALT

A STUDY WAS MADE ON USES OF ADDITIVES FOR IMPROVING ASPHALTIC CONCRETE FOR HYDRAULIC CONSTRUCTION. THE ADDITION OF FINE ASBESTOS FIBERS /WASTE SCREENINGS/ CAN INCREASE COMpressive AND TENSILE STRENGTH, STABILITY AND EROSION RESISTANCE PROPERTIES. THE MATERIAL IS HIGHLY DURABLE AND CAPABLE OF WITHSTANDING THE MAJOR STRESSES THAT DEVELOP DURING SERVICE. ALSO, USE OF THE FIBERS PERMITS INCREASING THE ASPHALT CEMENT CONTENT BY 1/2 TO 1 PERCENT WITHOUT SACKIFICING DENSITY OR STABILITY, ALTHOUGH STRENGTH PROPERTIES WERE SOMEWHAT INCREASED AND FLEXIBILITY SIGNIFICANTLY IMPROVED WITH USE OF RUB­BERIZED ASPHALT CEMENTS, DURABILITY OF ASPHALTIC CONCRETE WITH THIS BINDER IS QUESTIONABLE FOR HY­DRAULIC CONSTRUCTION DUE TO REDUCED EROSION RESIS­TANCE. ALSO, INDICATIONS ARE THAT STABILITY IS ADVERSELY AFFECTED. OF THE TWO RUBBERIZED ASPHALTS TESTED, GRS AND NEOPRENE, IT WAS INDICATED THAT THE NEOPRENE ASPHALT PRODUCED THE BETTER ASPHALTIC CONCRETE, PARTICULARLY ON THE BASES OF STABILITY AND EROSION RESISTANCE. COMPARED TO THE CONTROL, ASBESTOS FIBERS AND RUBBERIZED ASPHALT MIXES, THE EPOXY-ASPHALT CONCRETE EXCELLED IN ALL PHYSICAL PROPERTIES DETERMINED UNDER THE CONDITION OF FLEXIBILITY, WHICH WAS LESS THAN THE RUBBERIZED ASPHALT MIXES. EROSION RESISTANCE WAS COMPARABLE TO THE ASPHALT FIBER MIXES. THE EPOXY- ASPHALT CONCRETE APPEARS TO BE A VERY STRONG AND TOUGH MATER­IAL FOR HYDRAULIC CONSTRUCTION APPLICATION. HOWEVER, MORE DATA ARE REQUIRED RELATIVE TO ITS LONG-TERM WEATHERABILITY. THE RELATIVELY HIGH COST OF EPOXY-ASPHALT /APPROXIMATELY FIVE TIMES THAT OF NORMAL HOT-MIX/ WOULD RESTRICT ITS USE TO SPECIAL APPLICATIONS.

Bureau of Reclamation /US/ July 1965

ACKNOWLEDGMENT: Hwy Res Bd Hwy Res Abstracts Vol36,404

2A 210629
THE COMPACTION OF ASPHALTIC CONCRETE IN THE ROAD, PART 2

IT WAS DETERMINED THAT THE MOST EFFECTIVE METHOD OF ROLLING SEQUENCE FOR THE COMPACTION OF BITUMINOUS CONCRETE WAS ONE THAT UTILIZED A STEEL ROLLER FOR BREAKDOWN ROLLING, A PNEUMATIC-TIRED ROLLER FOR INTERMEDIATE ROLLING, AND A STEEL ROLLER FOR FINISHING. THIS PARTICULAR ROLLING SEQUENCE WAS UTILIZED TO DETERMINE THE EFFECTS ON COMPACTION OF INTERME­DIATE ROLLER SIZE, AND TIRE SIZE AND PRESSURE. THE TIRE PRESSURE WAS VARIED AND THE EFFECTS ON THE PERCENT COMPACTION ACHIEVED WERE DETERMINED. ALL RESULTS WERE ANALYZED BY STATISTICAL TECHNIQUES. LIGHT ROLLERS EQUIPPED WITH 7.50 X 15 TIRES, LOADED TO 2,000 POUNDS PER WHEEL AND WORKING AT 55 PSI, TIRE PRESSURE, ACHIEVED 97 PERCENT COMPACTION ONLY ON EASY TO COMPACT BITUMINOUS MIXTURES. MEDIUM SIZE PNEU­MATIC-TIRED ROLLERS, EQUIPPED WITH 9.00 X 26 TIRES AND LOADED TO 4,000 POUNDS PER WHEEL ACHIEVED THE RE­QUIRED DEGREE OF COMPACTION ON ALL BUT THE MOST DIFFICULT TO COMPACT BITUMINOUS MIXTURES INVESTI­GATED. THE PERFORMANCE OF THESE ROLLERS WAS AFFECTED BY TIRE PRESSURE /100 PSI SEEMED TO BE THE BEST PRESSURE/ LARGE PNEUMATIC-TIRED ROLLERS EQUIPPED...
TOS FILLER MIXED WITH CONVENTIONAL LIMESTONE


Acknowledgment: Highway Res Abstracts Hwy Res Board

2A 210635
OKLAHOMA HIGHWAY EXPLORES CONTROLLED FAILURE
A TEST HIGHWAY 4800 FEET LONG WAS BUILT BY THE STATE OF OKLAHOMA ON A 5 MILE STRETCH OF STATE HIGHWAY SOUTH OF TECUMSEH TO TEST WHETHER MIXING ASBESTOS FIBERS WILL STRENGTHEN THE ROAD SURFACE BY REDUCING OXIDATION AND BE ECONOMICAL IN THE DESIGN AND CONSTRUCTION OF BINDER AND/OR SURFACE COURSES. SO AS NOT TO WAIT FOR A NORMAL TEST OF THE NEW MIXTURES, A CONTROLLED FAILURE PROGRAM WAS USED BY UNDER-DESIGNING THE BASE MATERIAL. ASBESTOS FIBERS CAN BE INTRODUCED INTO ASPHALTIC CONCRETE IN A MANNER SIMILAR TO THE INTRODUCTION OF A MINERAL FILLER. THE LAYING AND ROLLING OF THE ASBESTOS FIBER MIX IS VERY SIMILAR TO THAT OF THE STANDARD MIX.

Hartronft, BC Constructor Nov. 1966

2A 210727
STRENGTH OF GUSSASPHALT AS INFLUENCED BY MINERAL FILLERS
AS A PAVING MATERIAL, GUSSASPHALT IS KNOWN TO PROVIDE A TOUGH, DURABLE, AND WATERTIGHT SURFACE. BUT LITTLE IS KNOWN CONCERNING ITS SPECIFIC ENGINEERING PROPERTIES. SINCE THIS MATERIAL IS Poured INTO PLACE AND Requires NO COMPACTATION, IT MAY BE POSSIBLE TO DEVELOP THE MATERIAL FOR SPECIAL PAVING APPLICATIONS IF APPROPRIATE STRENGTH AND OTHER PARAMETERS CAN BE OBTAINED. A TESTING PROGRAM WAS DEvised TO STUDY THE INFLUENCE OF TEMPERATURE, RATE OF LOADING AND TYPE OF MINERAL FILLER ON THE ULTIMATE COMPRESSION PROPERTIES, UNDER-DESIGNING TEMPERATURES, AND VISCOELASTIC BEHAVIOR IN TENSION OF GUSSASPHALT. FILLER MATERIALS USED AS ADDITIONS TO THE NORMAL LIMESTONE TO IMPROVE SOME STRENGTH PARAMETERS OF A CONTROL MIX OF GUSSASPHALT INCLUDED ASBESTOS AND FIBER GLASS. TESTS WERE CONDUCTED AT TEMPERATURES FROM 32 TO 120 DEGREES F. AND AT LOADING RATES FROM 0.005 TO 0.5 INCHES PER MINUTE. COMPARISON OF TESTS ON GUSSASPHALT WITH RESULTS FOR CONVENTIONAL BITUMINOUS MIXTURES SHOW THAT AT HIGH TEMPERATURES THE GUSSASPHALT EXHIBITS GREATER TENSILE AND COMPRESSIVE STRENGTH, WHILE THE REVERSE IS TRUE AT LOW TEMPERATURES. THE INFLUENCE OF FIBER GLASS OR ASBESTOS FILLER MIXED WITH CONVENTIONAL LIMESTONE MASON WAS SIGNIFICANT ONLY AT LOW TEMPERATURES, WHERE THE FIBER STRENGTH ENHANCED THE MATERIAL. THESE CHARACTERISTICS WERE ENHANCED BY THE USE OF THESE MATERIALS. THIS BEHAVIOR IS EXPLAINED IN TERMS OF THE GRIFFITH FRACTURE THEORY FOR BRITTLE MATERIALS. FINALLY, GUSSASPHALT IS SHOWN TO BE A LINEAR VISCOELASTIC MATERIAL FOR ALL TYPES OF FILLER MATERIAL USED IN THIS STUDY. /AUTHOR/

Schultz, BG Jones, RC Assoc Asphalt Paving Technol Feb. 1967

2A 210753
SINGLE SURFACE TREATMENTS-MEXICO
THIS WORK PRESENTS THE CRITERION FOLLOWED IN MEXICO REGARDING THE METHODS TO SELECT THE ROADS THAT MUST BE PAVED WITH SINGLE SURFACE TREATMENTS, WHICH IN GENERAL, ARE THOSE WHERE THE EXPECTED DAILY TRAFFIC IS NOT GREATER THAN ONE THOUSAND

2A 210758
BASE STABILIZATION WITH CUT-BACK ASPHALT AND CHLORIDES, NOBLES COUNTY
THIS STUDY WAS UNDERTAKEN IN 1960 TO INVESTIGATE THE FEASIBILITY OF STABILIZING A LOCAL AGGREGATE BY THE USE OF CUTBACK ASPHALT, SODIUM CHLORIDE, AND CALCIUM CHLORIDE. FIVE TEST SECTIONS, EACH APPROXIMATELY ONE MILE IN LENGTH, WERE CONSTRUCTED IN WHICH THE BASE OR SUBBASE WAS TREATED WITH ONE OF THESE MATERIALS. AN UNTREATED SECTION WAS ALSO INCLUDED FOR CONTROL. THE PROJECT IS LOCATED IN SOUTHWESTERN MINNESOTA ON A COUNTY ROAD WITH A LOW TRAFFIC VOLUME. THE MERITS OF USING THE VARIOUS ADDITIVES WERE EVALUATED BY VISUAL OBSERVATIONS AND FIELD AND LABORATORY TESTS BOTH DURING CONSTRUCTION AND THE FIVE YEAR PERIOD WHICH FOLLOWED. AT THE END OF THIS PERIOD, MOST OF THE SALT HAD MIGRATED OUT OF THE ROADWAY STRUCTURE. NONE OF THE ADDITIVES INVESTIGATED PROVIDED ANY DEFINITE BENEFITS IN EXPEDIENT CONSTRUCTION OR IN IMPROVING THE PERFORMANCE OF THE VARIOUS SECTIONS. /AUTHOR/

Velasco, MB Medina, JE Perm Int Assoc Road Congresses Proc 1967

2A 210769
METHODS FOR CALCULATING TEMPERATURE PROFILES OF HOT-MIX ASPHALT CONCRETE AS RELATED TO THE CONSTRUCTION OF ASPHALT PAVEMENTS
METHODS OF PREDICTING THE TEMPERATURE OF HOT-MIX ASPHALT CONCRETE, AS A FUNCTION OF TIME AND PLACE, IN THE MIX FROM THE MOMENT IT LEAVES THE PAVER UNTIL COMPACTATION TO SPECIFIED DENSITY IS COMPLETED WERE INVESTIGATED TO PROVIDE A MEANS FOR ENVIRONMENTAL CONDITIONS THAT MAY BE MARGINAL WITH RESPECT TO OBTAINING ADEQUATE COMPACTION AND TO STIMULATE THE DEVELOPMENT OF PROCEDURES FOR OBTAINING ADEQUATE COMPACTION UNDER ADVERSE ENVIRONMENTAL CONDITIONS. A NUMERICAL OR FINITE DIFFERENCE SOLUTION WAS USED AS THE BASIS FOR A COMPUTER PROGRAM FOR CALCULATING TEMPERATURES AS A FUNCTION OF TIME, PLACE IN THE MIX, AND VARIOUS ENVIRONMENTAL CONDITIONS. FOR USE IN THE COMPUTER PROGRAM, DATA FOR WIND VELOCITIES WERE CONVERTED TO BIOT NUMBERS AND DATA FOR SOLAR ALTITUDE WERE CONVERTED TO SOLAR RADIANT FLUX. CONSTANT PHYSICAL PROPERTIES FOR THE MIX AND BASE WERE ASSUMED AND USED DIRECTLY FOR DATA INPUT TO THE COMPUTER PROGRAM. THE EFFECT OF WIND VELOCITY, SOLAR RADIANT AND ATMOSPHERIC TEMPERATURE IS GREATER ON MIX TEMPERATURES NEAR THE UPPER SURFACE OF THE MIX THAN ON MIX TEMPERATURES NEAR THE LOWER SURFACE OF THE MIX. INITIAL BASE TEMPERATURE DISTRIBUTION AFFECTS TEMPERATURES NEAR THE LOWER SURFACE OF THE MIX TO A MUCH GREATER EXTENT THAN IT AFFECTS TEMPERATURES NEAR THE UPPER SURFACE. STUDY RESULTS INDICATE THAT TEMPERATURES OF THE HOT-MIX ASPHALT CONCRETE NEAR
THE LOWER SURFACE DECREASE MORE RAPIDLY THAN TEMPERATURES NEAR THE UPPER SURFACE. SINCE COMPAC?
TION EFFORT IS LESS NEAR THE LOWER SURFACE, TEMPERA?
TURES NEAR THE LOWER SURFACE ARE OF PARTICULAR SIGNIFICANCE IN OBTAINING SPECIFIC DENSITIES. THE NU?
MERICAL METHOD OF DETERMINING THE TEMPERATURE DISTRIBUTION IN HOT-MIX ASPHALT CONCRETE LENDS IT?
SELF WELL TO COMPUTER PROGRAMMING AND PROVIDES A MEANS OF INVESTIGATING THE EFFECT OF AN ALMOST LIMITLESS NUMBER OF ENVIRONMENTAL CONDITIONS ON THE COOLING OF HOT-MIX ASPHALT CONCRETE DURING CONSTRUCTION.

Corlew, JS Dickson, PF Assoc Asphalt Paving Technol Proc Feb. 1968

2A 210778

DESIGN AND CONSTRUCTION OF ASPHALTIC BRIDGE PAVEMENTS IN GERMANY

THE STRESSES TO WHICH BRIDGE PAVING SYSTEMS ARE SUBJECTED TO ENDURE THE BRIDGE OSCILLATIONS AND THE STRESSES ORIGINATING FROM MORE RAPID TEMPERA?
TURE CHANGES ARE DISCUSSED. THE PAVINGS ARE REQUIRED TO HAVE HIGH STABILITY COMBINED WITH GREAT PLASTICITY AND HIGH DURABILITY UNDER VARIOUS STRESSES. A MULTI-LAYER SYSTEM IS ADVISABLE IN VIEW OF THE SAFETY OF THE BRIDGE AND THE REQUIREMENTS OF THE TRAFFIC. THE COURSES ARE INSULATED COURSE, INTERMEDIATE PROTECTIVE COURSE AND WEARING COURSE. THE METHODS USED MUST BE TAILORED TO THE SPECIFIC NEEDS OF BOTH THE BRIDGE AND THE TRAFFIC. USUAL METHODS FOR CONCRETE BRIDGES ARE THOSE WHICH INCORPORATE SEPARATOR, INSULATION, INTERMEDIATE COURSE AND SURFACE COURSE. THE SEPARATOR MOSTLY CONSISTS OF PERFORATED OR NON-PERFORATED GLASS FIBER MATERIAL, THE INSULATION OF MASTIC OR METAL FOILS, THE PROTECTIVE COURSE OF GUSSASPHALT AND THE WEARING COURSE OF EITHER GUSSASPHALT OR ASPHALTIC CONCRETE. THE INSULATION FOR STEEL BRIDGES MUST HAVE A FULL-PHASE TYPE BOND WITH THE STEEL DECKING. THE INSULATION MAY BE EITHER MASTIC, METAL FOILS, OR HOT-SPRAYED BONDING COMPOSITIONS. PROTECTIVE COURSE AND WEARING COURSE ARE THE SAME AS FOR CONCRETE BRIDGES. METHODS FOR ELIMINATING THE SEPARATOR ARE PRESENTLY BEING TRIED IN GERMANY. THESE PROVIDE THAT ALL LAYERS ARE BONDED TOGETHER AND, MOST IMPORTANT, THE INSULATION IS BONDED TO THE DECKING. THE DIFFICULTIES TO BE OVERCOME IN STEEL BRIDGES ARE TO OBTAIN THE REQUIRED FATIGUE STRENGTH AGAINST DEFLECTIONS AND TO OBTAIN THE NECESSARY SHEAR RESISTANCE. THOSE TO BE OVERCOME FOR CONCRETE DECKINGS ARE BOND FAILURE AND BLOSTERING. FOR CONCRETE BRIDGES, THE DEVELOPMENT TEND IS TO DESIGN THE INSULATION SO THAT IT TAKES UP AND ELIMINATES WATER VAPOR PRESSURES BUT STILL MAINTAINS FULL-FACE BOND WITH THE CONCRETE DECKING. ADDITIONAL ANCHOR BARS ARE USED IN STEEL BRIDGES TO REDUCE DECK-PLATE DEFORMATIONS, AND TO PREVENT SHOVELING OF THE PAVING. SPECIAL HOT-APPLIED BONDING COMPOSITIONS ARE USED TO PROVIDE 100 PERCENT SHEAR-RESISTING BOND. RUBBER, PLASTICS, AND ASBESTOS ARE BEING TRIED AS ADDITIVES TO IMPROVE THE CHARACTERISTICS OF THE PAVING MATERIALS.


2A 210780

COMPACTING DEEP LIFT BITUMINOUS STABILIZED BASE

A STREET CONSTRUCTION PROGRAM WAS CONDUCTED USING BITUMINOUS STABILIZED BASE WHICH IS A HOT-PLANT MIX OF BANK RUN GRAVEL AND ASPHALT CEMENT HAVING A PENETRATION OF 85 TO 100. PAVEMENT TEST CORES FROM A SINGLE FIVE INCH LIFT CONSTRUCTION PROVED TO BE 1 PERCENT BETTER COMPACTED THAN THE CORES FROM PAVEMENT CONSTRUCTED WITH TWO 2-1/2 INCH LIFTS. INDICATIONS WERE THAT TEMPERATURE COULD BE A FACTOR IN OBTAINING THESE DENSITIES. THE TEMPERATURES WERE OBTAINED WITH THERMOCOUPLES TO CONFIRM THAT TEMPERATURE ASSISTED THE COMPACTION EFFORT. IN SUBSEQUENT WORK, THE GRADATION OF THIS MIX WAS ADJUSTED TO OBTAIN THE DESIRE TO PRESENT VOIDS, RESULTS INDICATED THAT MIXED BASE IS IMPORTANT IN SINGLE LIFT CONSTRUCTION. LIFTS OF 12, 15, AND 18 INCHES WERE CONSTRUCTED. TEST RESULTS REVEALED THAT: (1) HOT PLANT MIX STABILIZED BASE CAN BE CONSTRUCTED IN A SINGLE LIFT TO ANY DESIGN DEPTH, (2) THICK LIFTS RETAIN HEAT FOR A LONGER PERIOD OF TIME AND THUS PROVIDE AMPLIFIED TIME FOR ROLLING, (3) HEAVY RUBBER TIRED ROLLERS ARE USEFUL FOR COMPACTION OF THICK LIFTS, AND (4) THE LAY-DOWN TEMPERATURE OF THE MIX IS IMPORTANT BECAUSE THERE IS A RELATIONSHIP BETWEEN LAY-DOWN TEMPERATURE, THE COMPACTION FORCE AND THE DEPTH OF LIFT. A TEMPERATURE-COMPACTION RELATIONSHIP WAS SUBSTANTIATED INDICATING CONSIDERATION OF: (1) VOLUME-THE DEPTH OF THE LIFT, (2) PRESSURE-THE COMPACTION FORCE AND (3) TEMPERATURE-THE LAY-DOWN TEMPERATURE.

Beagle, CW Assoc Asphalt Paving Technol Proc Feb. 1966

2A 210807

BITUMINOUS BRIDGE COVERING AND PACKING LAYERS ON CONCRETE

COMMON FAULTS IN BITUMINOUS CONSTRUCTIONS ARE DISCUSSED, WITH SPECIAL REFERENCE TO BUBBLE FORMATION DUE TO MINERAL OIL AND WATER VAPOR. THE CHARACTERISTICS AND PREPARATION OF THREE TYPES OF CONSTRUCTION ARE DESCRIBED, IN WHICH THE TOP PROTECTIVE LAYERS ARE OF CAST ASPHALT OR FINE ASPHALT CONCRETE, THE PACKING OF ASPHALT CEMENT OR CORRUGATED METAL, AND THE SEPARATING LAYER BETWEEN THE BITUMINOUS CONSTRUCTION AND THE BRIDGE DECK OF GLASS WOOL OR OTHER SUITABLE MATERIAL. IN ADDITION TO THE NORMAL CONSTRUCTION MATERIALS, THE USE OF RUBBER, ASBESTOS AND SYNTHETIC RESIN IS DISCUSSED. LABORATORY TESTS AND PRACTICAL OBSERVATIONS ON IMPERVIOUSNESS TO WATER ARE DESCRIBED. /AUTHOR/

Von, STOSCH HJ Bitumen, Teere, Asphalte, Peche /Gerl/ 1967

ACKNOWLEDGMENT: Journal Applied Chemistry /UK/

2A 210819

A STUDY OF VARIABILITY IN AN ASPHALT CONCRETE MIX BASIC STRUCTURAL PARAMETERS ASSOCIATED WITH THE SIGNIFICANT REQUIREMENTS AND CHARACTERISTICS SPECIFIED OR DESIGNED FOR HIGHWAY MATERIALS AND STRUCTURAL ELEMENTS WERE DETERMINED THROUGH STUDIES OF A BROAD SPECTRUM OF CURRENT GOOD HIGHWAY DESIGN AND CONSTRUCTION. DETERMINATIONS WERE MADE OF THE AVERAGES AND VARIATIONS IN TEMPERATURE, ASPHALT CONTENT AND AGGREGATE GRADATION IN AN ASPHALTIC CONCRETE WEARING COURSE MIXTURE PRODUCED AT THE PLANT. THE EVALUATION WAS MADE OF THE EFFECTS OF INHERENT PROCESS VARIABILITY, SAMPLING PROCEDURE, AND TEST METHOD (MEASUREMENT PROCESS) ON THE VARIATIONS OBTAINED. RESULTS SHOWED THAT INHERENT PROCESS VARIABILITY WAS THE MAJOR FACTOR CONTRIBUTING TO VARIATION IN MIXTURE COMPOSITION AS DETERMINED BY EXTRACTION AND GRADATION TESTS. WHEN VARIABILITY IS EXPRESSED AS VARIANTS, APPROXIMATELY 60 PERCENT OF THE VARIATION IN ASPHALT CONTENT AND 85-98 PERCENT OF THE VARIATIONS IN GRADATION WERE ATTRIBUTABLE TO THE PLANT PROCESS. VARIATIONS ATTRIBUTABLE TO THE SAMPLING AND TEST PROCEDURES ACCOUNTED FOR THE REMAINDER OF VARIATION IN COMPOSITION. THE SAMPLING AND TESTING PROCEDURES USED IN THIS STUDY WERE CRITICAL FACTORS IN THE VARIATIONS OBSERVED IN MIX
CONSTRUCTION MATERIALS

COMPOSITION, ACCOUNTING FOR SUBSTANTIALLY LESS THAN HALF OF THE VARIATIONS FOUND FOR EACH ITEM OF COMPOSITION. DEVIATIONS OF THE TEST AVERAGES FROM THE DESIGN VALUES WERE THE MAJOR CAUSE OF THE DEVIATION OF INDIVIDUAL TEST RESULTS FROM THE PERMISSIBLE LIMITS (TOLERANCES). THE FEASIBILITY OF CONDUCTING STUDIES OF THIS TYPE WAS INDICATED WITHOUT APPRECIABLE INTERFERENCE WITH THE NORMAL COURSE OF PLANT PRODUCTION. A STATISTICAL ANALYSIS WAS MADE TO SHOW THE EFFECT OF TEST METHOD, SAMPLING PROCEDURE AND MATERIAL (BATCH-TO-BATCH) VARIATION ON THE OVERALL VARIATIONS OBTAINED.

Oglio, ER Zenewitz, JA Assoc Asphalt Paving Technol Proc Feb. 1965

2A 210823
CONSTRUCTION AND PERFORMANCE OF PLANT MIXED SEAL COATS
THE TYPE OF PLANT MIX SEAL COAT DISCUSSED IS ONE IN WHICH AGGREGATE SIMILAR TO THAT IN A NORMAL CHIP SEAL IS USED (OPEN GRADING, WITH MAXIMUM SIZE ABOUT 3/8 IN.) AND THIS AGGREGATE IS MIXED IN A PLANT WITH A RELATIVELY HIGH CONCENTRATION OF ASPHALT CEMENT AND PLACED TO A COMPACTED DEPTH OF 5/8-3/4 INCH BY AN ASPHALT PAYER. A THICKER COAT RESULTS WITH A CHIP SEAL. THERE ARE OTHER SIGNIFICANT DIFFERENCES: (1) THE PROBLEM OF LOSS OF CHIPS AND DAMAGE TO VEHICLES IS LARGELY ELIMINATED, (2) THE SURFACE HAS EXCEPTIONAL SMOOTHNESS, (3) THE SURFACE HAS UNIFORMLY GOOD SKID RESISTANCE AND IS OF A NATURAL SLIP RESISTANCE, (4) THE SURFACE HAS A VERY PLEASING, UNIFORM APPEARANCE, (5) THE SURFACE HAS GOOD DURABILITY, (6) COSTS ARE REASONABLE, AND (7) BECAUSE OF HIGH MECHANICAL STABILITY AND GREATER THICKNESS, SOME STRUCTURAL VALUE CAN BE ALLOWED IN THE PAVEMENT THICKNESS DESIGN PLANT-MIXED SEAL COATS ARE MOST COMMONLY PLACED ON EXISTING BITUMINOUS SURFACES, BUT THEY CAN BE AND ARE PLACED WITH GOOD RESULTS ON RIGID PAVEMENTS. THE TYPICAL HOT PLANT MIXED SEAL OF THIS TYPE USES OPEN-GRADED AGGREGATE OF HIGH QUALITY, CLEAN, HARD, TOUGH, NON-POLISHING, WITH A HIGH PERCENTAGE OF CRUSHED FACES AND GOOD RESISTANCE TO THE STRIPPING EFFECTS OF WATER. ADDITIVES SUCH AS HYDRATED LIME MAY BE NEEDED WHERE A PREDOMINANTLY WIDE ADHESIVE RESISTANCE TO STRIPPING MIXING WAS DONE AT RELATIVELY LOW TEMPERATURE WITH A RELATIVELY THICK COAT OF AN ASPHALT CEMENT. THE MIX IS PLACED WITH A REGULAR BITUMINOUS PAYER TO A COMPACTED DEPTH OF 5/8-3/4 INCH. EXPERIENCE WITH PLANT MIX SEAL PROJECTS ARE DISCUSSED. COSTS DEPEND ON THE COST OF THE AGGREGATE AND IT IS AN EXPENSIVE AGGREGATE TO PRODUCE-AFTER THE SAME AS GOOD AGGREGATE IN A CHIP SEAL. COSTS AVERAGE AROUND $.25 A SQUARE YARD FOR COMPARISON, AN ORDINARY CHIP SEAL WOULD PROBABLY NOT COST MORE THAN $.11 PER SQ. YD. AND WOULD ALSO BE LESS THAN HALF AS THICK. MIXING TEMPERATURES ARE QUITE CRITICAL UNDER CONDITIONS OF VERY HEAVY TRAFFIC AND CONTINUED HIGH TEMPERATURES. ADDITIONAL CONSOLIDATION CAN TAKE PLACE WHICH MAY RESULT IN THE MIX BEING OVERFILLED WITH ASPHALT, WITH THE EXCESS ASPHALT THEN FLUSHING TO THE SURFACE AND ELIMINATING THE NON-SKID ADVANTAGES. THIS PROBLEM MAY BE PREVENTED BY SOME REVISION IN AGGREGATE GRADING OR USE OF A LOWER PENETRATION ASPHALT.

CONSTRUCTION PROCEDURES ARE DESCRIBED. THESE ARE COMPARED WITH THE PERFORMANCE OF CONTROL SECTIONS IN WHICH NORMAL SPECIFICATION ASPHALT CEMENTS WERE USED. THE RESULTS OF LABORATORY AND FIELD TESTS ARE ALSO REPORTED TO SUPPORT AND SUPPLEMENT THE VISUAL SURVEYS. /AUTHOR/


2A 210827
COAL-MODIFIED TAR BINDERS FOR BITUMINOUS CONCRETE PAVEMENTS
THE POSSIBILITY OF MAKING AN IMPROVED BINDER FOR BITUMINOUS PAVEMENTS OF THE HOT-MIX HOT-LAY TYPE BY DISPERSING COAL IN DISTILLED COAL TARS AND COAL TAR OILS IS STUDIED. SUITABLE LABORATORY IN-PLANT EQUIPMENT WAS ASSEMBLED AND OPTIMUM CONDITIONS FOR THE DISPERSION OF COAL IN TARS AND OILS WERE DETERMINED. VARIOUS COALS, TARS, AND OILS WERE COMPARED AS TO THEIR SUITABILITY FOR THE PURPOSE. EXPERIMENTAL QUANTITIES OF COAL-MODIFIED TAR BINDERS WERE PRODUCED AND ANALYZED AND THEN COMBINED WITH VARIOUS AGGREGATES IN HOT MIXES. THE LATTER WERE THEN COMPARED WITH TYPICAL ASPHALT CEMENTS AND COAL-TAR BINDERS. THE TESTS APPEARED TO INDICATE THAT IT WOULD BE POSSIBLE TO MAKE HOT MIXES WITH COAL-MODIFIED TAR CEMENTS EQUAL OR SUPERIOR TO THOSE MADE WITH USUAL ASPHALT OR COAL-TAR BINDERS. A PILOT PLANT WAS BUILT TO PRODUCE 150,000 GALLONS OF COAL-MODIFIED TAR BINDER FOR COMPARISON WITH ASPHALT CEMENTS NORMALLY USED IN KENTUCKY IN CLASS I AND CLASS I-MODIFIED BITUMINOUS PAVEMENTS. DURING A PERIOD OF THREE MONTHS IT PRODUCED 104 BATCHES OF BINDER, OF WHICH 100 BATCHES WERE OF THE THREE-COMPONENT TYPE (COAL, TAR, AND OIL), TWO OF THE TWO-COMPONENT TYPE (COAL AND TAR), AND TWO CONSISTED ONLY OF TAR (RT-12). THE BINDER WOULD BE PLACED IN TWO LAYERS ON EXISTING BITUMINOUS PAVEMENTS OF THE STATE. AT TWO THREE-COMPONENT BINDER WAS USED IN HOT MIX LAID 2 3/4 INCHES THICK ON A TAR-PRIMED SOIL BASE (CLASS I-MODIFIED). AT ALL OTHER SITES, THE BINDER WAS USED IN 1 1/2 INCH CLASS I OVERLAYS ON EXISTING BLACK-TOP PAVEMENTS WHICH FOR THE MOST PART HAD REQUIRED EXTENSIVE MAINTENANCE BECAUSE OF BASE FAILURES, EXCESSIVE CRACKING, OR THE DEVELOPMENT OF SLIPPERY SURFACES. COAL-MODIFIED TAR BINDERS APPEARED TO BE SOMEWHAT SUPERIOR TO USUAL ASPHALTIC HOT-MIXES WITH RESPECT TO SET-UP DURING ROLLING AND EARLY TRAFFIC, BUT INFERIOR WITH RESPECT TO FUMING, ESPECIALLY WHEN THE TEMPERATURES OF THE MIXES EXCEEDED 260 F. INSPECTION OF SOME OF THE TEST SECTIONS IN SPRING 1960, FOLLOWING UNUSUALLY SEVERE WINTER WEATHER, EMPHASIZED THE NEED FOR BETTER TEMPERATURE SUSCEPTIBILITIES TO PROVIDE GREATER FLEXIBILITY OF THE OVERLAYS AT LOW ATMOSPHERIC TEMPERATURES. COMPARISONS WERE MADE OF THE SUITABILITY OF APPROXIMATELY 40 DIFFERENT COALS FROM VARIOUS PARTS OF THE UNITED STATES AND FOREIGN COUNTRIES, THE USE OF LOW, MEDIUM, AND HIGH-TEMPERATURE TARS AS DISPERSING MEDIA FOR THE COALS, ATTEMPTS TO USE OILS OF PETROLEUM ORIGIN AS FLUXING AGENTS, AND THE ADDITION OF VARIOUS POLYMERS TO THE COAL-DISPERSIONS. ALSO, VARIOUS TYPES OF BINDERS WERE COMPARED AS TO THEIR VISCOSITIES AT SEVERAL TEMPERATURES AND NUMEROUS METHODS FOR COMPARING THE BRITTLENESS OF DIFFERENT HOT-MIX BINDERS AT LOW TEMPERATURES WERE TRIED. /AUTHOR/


2A 210833
SETTING RATE OF ASPHALT CONCRETE
MIXES THAT SHOVE EXCESSIVELY UNDER STEEL WHEEL ROLLERS, DO NOT DENSIFY, OR ARE TENDER TO ANY TYPE OF DISTORTION ARE DEFINED AS 'SLOW SETTING.' AT TIMES,
CONSTRUCTION MATERIALS

2A 210845
CORRELATION OF LOW TEMPERATURE TESTS WITH RESISTANCE TO CRACKING OF SHEET ASPHALT PAVEMENTS

Certain physical properties of sheet asphalt paving mixtures as determined by low temperature laboratory tests with resistance to cracking of sheet asphalt pavements were investigated. Samples of 2 sheet asphalt pavements were tested to determine physical characteristics of the mixtures, particularly at low temperatures. One of these pavements is in good condition, while the other pavement has cracked a great deal. Testicular modulus of rupture indicates that the one pavement has properties tending to resist cracking, but the other pavement has low resistance to cracking. The following conclusions are reached of physical properties of hot-mix sheet asphalt paving mixtures: (1) the modulus of rupture and the modulus of elasticity are measures of the resistance to cracking of sheet asphalt paving mixtures, (2) toughness of a paving mixture at low temperature is a measure of the resistance to impact and may be used as a control test to evaluate mixtures with respect to their ability to withstand the action of traffic at low temperatures, (3) an asphalt paving mixture should not be designed to have adequate resistance to displacement as measured by stability tests without consideration of the resistance to cracking of the mixture, particularly if the mixture is to be laid in localities which have cold winters, (4) it would appear that those mixtures containing the highest penetration asphalt consistent with the physical properties should provide most resistant to cracking at low temperatures, and (5) the importance of proper control of plant and street construction operations to insure properly proportioned and well compacted mixtures of uniform density and to prevent great alterations in characteristics of the asphalt cement should be emphasized.


2A 210859
MECHANICAL PROPERTIES OF ASPHALT MATERIALS AND STRUCTURAL DESIGN OF ASPHALT ROADS

Numerous proposed rational approaches to bituminous road design contributed by previous investigators are reviewed. The mechanical properties and the test methods for the properties of materials entering into construction of road carpet are discussed. The characteristics of asphalts and aggregates which affect both the elastic and plastic behavior of mixtures are described. The problem of analyzing the properties and functions of base courses, sub-bases, and sub-soil layers are discussed. Design methods for road constructions are presented. Designs for the entire layers system for static loads and the design for only the road carpet for static loads are discussed in detail. It is shown that for sand sheet, tensile strength decreases with increased duration of loading irrespective of temperature, bonding strength decreases with an increase in the number of load applications applied to the specimen. This indicates the effect of fatigue. It is concluded that to avoid cracked formation, the lowest f/b ratio compatible with other criteria should be employed.

Nijboer, LW Herner, RC DISCUSSER Highway Research Board Proceedings 1954

2A 210873
CONSTRUCTION OF OPTIMUM SEAL COATS

No data was given but important considerations were given to the factors that should be considered in seal coat construction. One of these was the resistance and another was desirable finished surface characteristics. The idea of an optimum aggregate size was introduced and requirements were discussed that would provide proper adhesion of the aggregate and the binder. A number of factors basic to seal coat design and construction were discussed. /AUTHOR/

Nevitt, GH Assoc Asphalt Paving Technol Proc

2A 210884
BASIC PRINCIPLES FOR THE DESIGN AND CONSTRUCTION OF SEAL COATS AND SURFACE TREATMENTS WITH CUTBACK ASPHALTS AND ASPHALT CEMENTS

Failures, construction, techniques and a thorough design procedure are covered as pertains to seal coats and surface treatments. The design is based upon Hansons work and some modification of this basic work as made by the county roads board of Victoria, Australia. The quantity of aggregate and binder are related to an average least dimension of the aggregate and the quantity of the binder is further related to the voids between the compacted aggregates. Charts are also given that allow the selection of an appropriate type and grade of asphalt for the size of aggregate used and the road surface temperature at the time of application of the binder. /AUTHOR/

McLeod, NW Assoc Asphalt Paving Technol Proc 1960

2A 210887
ASPHALT SURFACE TREATMENTS

This publication deals entirely with materials, design and construction of surface treatments.

Asphalt Institute Manual Series 1964

2A 210890
BITUMINOUS AGGREGATE BASES

References are listed on bituminous gravel concrete as supporting base for bituminous pavements,
TYPES OF PAVING MIXTURES, TESTS OF BITUMINOUS PAVING MIXTURES, USE OF BITUMINOUS MACADAM FOR CONSTRUCTION OF ROAD BASE, ASPHALTIC PAVEMENT ON THE NEW JERSEY TURNPIKE, AND LOAD CARRYING CAPACITY OF BITUMINOUS BASE COURSES OF HIGHWAYS.

Highway Research Information Service

2A 210926
THE PRESENT STATE OF THE ADHESION PROBLEM IN BITUMINOUS ROAD CONSTRUCTION
ADHESION MAY BE DEFINED AS THE RESISTANCE TO SEPARATION OF TWO ADJOINING MATERIALS. THIS ADHESION MAY BE DUE TO NON-SPECIFIC FACTORS SUCH AS MECHANICAL FACTORS, SPECIFIC SURFACE-PHYSICAL OR CHEMICAL PHENOMENA. A SURVEY OF THE SUBSTANCES WHICH ARE IMPORTANT EITHER AS COMPONENTS OR AS NATURAL ENEMIES OF MINERAL-BITUMEN SYSTEMS, MAKES IT EVIDENT THAT PURELY PHYSICAL ABSORPTION CAN PLAY ONLY A NEGLECTIBLE ROLE IN THE ADHESION PROBLEM AND THAT PRIMARY ATTENTION SHOULD BE PAID TO ORIENTATION AND REACTION PHENOMENA. REACTION PHENOMENA (POLAR ABSORPTION AND COMPOUND FORMATION) TAKE PLACE WITH CONSIDERABLE MORE ENERGY THAN PHYSICAL ADSORPTION. THE POSSIBILITIES AND TYPES OF POLAR ADHESION AND COMPOUND FORMATION MUST BE LOOKED FOR ON THE BASIS OF THE CHEMICAL COMPOSITIONS OF THE BINDER AND OF THE MINERAL SURFACE. HISTORICAL REVIEWS ARE PRESENTED ON STUDIES OF THE ADHESION PHENOMENA AND TESTS FOR DETERMINING ADHESIVENESS, WITH THE GRADUAL RECOGNITION OF THE FACTORS DETERMINING THE ADHESION OF BITUMINOUS FILMS TO MINERAL MATERIALS, ATTEMPTS FOR THE IMPROVEMENT OF THE BITUMINOUS BINDERS HAVE ADVANCED WITH THOSE FOR THE IMPROVEMENT OF THE SURFACE PROPERTIES OF THE AGGREGATES. THE SURVEY INDICATES THAT ENOUGH SCIENTIFIC AND PRACTICAL DATA HAVE BEEN ACCUMULATED TO ENABLE THE ENGINEER TO DESIGN GOOD PAVEMENTS WITH THE BITUMINOUS BINDERS.

Winterkorn, HF
Montana State Highway Commission  Sept. 1937

2A 211000
PROPERTIES OF ASPHALTIC BITUMEN IN RELATION TO ITS USE IN ROAD CONSTRUCTION
THE PRINCIPAL PROPERTIES OF BITUMEN OF INTEREST TO THE ROADMAKER ARE ITS RHEOLOGICAL CHARACTERISTICS, ADHESIVE PROPERTIES, AND DURABILITY. THE TWO PROPERTIES OF BITUMINOUS ROAD SURFACINGS THAT ARE AFFECTED BY THE RHEOLOGICAL PROPERTIES OF THE BITUMEN BINDER ARE THE TENDENCY TO DEFORMATION OR FLOW, PARTICULARLY UNDER HEAVY TRAFFIC AT HIGH ROAD TEMPERATURES, AND THE POSSIBILITY OF FRACTURE AT LOW TEMPERATURES. BITUMEN MACADAM IS NOT GENERALLY LIABLE TO DEFORMATION BECAUSE, WHEN WELL COMPACTED, THE INTERNAL FRICTION DUE TO STONE-TO-STONE CONTACT IS ADEQUATE FOR RESISTING MOST TRAFFIC DEFORMATION. WITH DENSE MIXTURES, HOWEVER, INTERNAL FRICTION IS REDUCED AND SO THE PREPARATION OF A DURABLE DENSE SURFACING MATERIAL GIVES RISE TO THE RISK OF DEFORMATION. DEFORMATION OF A DENSE ASPHALT DEPENDS TO A CONSIDERABLE DEGREE ON THE AMOUNT AND VISCOSITY OF BITUMEN IN THE MIXTURE. THE HIGH TEMPERATURE COEFFICIENT OF VISCOSITY OF BITUMINOUS BINDERS EXPLAINS WHY DEFORMATION CAN BE A SERIOUS PROBLEM AT HIGH ROAD TEMPERATURES. FRACTURE OF AN ASPHALT ALSO DEPENDS TO A MAJOR DEGREE ON THE VISCOSITY OF THE BITUMEN USED. WHEN A BITUMINOUS BINDER IS SUBJECTED TO A CONSTANT TENSILE STRESS, DEFORMATION TAKES PLACE, THE STRAIN INCREASING WITH TIME, BUT NOT NECESSARILY AT A UNIFORM RATE. THE STIFFNESS OF THE BINDER IS DEFINED BY VAN DER POEL AS THE RATIO BETWEEN THE TENSILE STRESS AND THE TOTAL AMOUNT OF STRAIN WHICH OCCURS THIS RATIO DEPENDS ON THE TIME FOR WHICH THE STRESS ACTS BECAUSE STIFFNESS IS A DECREASING FUNCTION OF TIME.

Goode, JF Owings, EP
Public Roads, Us Bureau Public Roads  DEC 61

ACKNOWLEDGMENT: Highway Research Board Bibliography

2A 211009
A LABORATORY-FIELD STUDY OF HOT ASPHALTIC CONCRETE WEARING COURSE MIXTURES
RESULTS OF A LABORATORY-FIELD STUDY OF PROPERTIES AND PERFORMANCE OF ASPHALTIC CONCRETE PAVEMENTS, RANGING IN AGE FROM 3 TO 12 YEARS, FROM SIX TEST SECTIONS OF MARYLAND ROAD CONSTRUCTION PROJECTS ARE DESCRIBED. THE LOS ANGELES ABRASION WEAR LOSS FOR THE COARSE AGGREGATES USED IN THE TEST SECTIONS RANGED FROM 17 TO 39 PERCENT. COMPACTION FROM CONSTRUCTION TO AVERAGE SERVICE PERFORMANCE WAS FOUND TO HAVE CAUSED MINOR DEGRADATION OF THE AGGREGATES. THE DEGREE OF DEGRADATION WAS INSIGNIFICANT IN MOST INSTANCES AND IN NO CASE WAS SUFFICIENT TO AFFECT SERVICE BEHAVIOR OF THE PAVEMENTS. AIR VOIDS IN PAVEMENT FOLLOWING CONSTRUCTION COMPACTATION RANGED FROM 3.6 TO 14.5 PERCENT. TRAFFIC COMPACTION PRODUCED APPRECIABLE REDUCTIONS IN PERCENTAGE OF AIR Voids IN PAVEMENT PERFORMANCE AND RATE OF ASPHALT HARDENING WERE RELATED TO THE AMOUNT OF AIR Voids. A HIGH PERCENTAGE OF AIR Voids RESULTED IN EARLY DETERIORATION OF THE PAVEMENT. THE RESULTS OF THE STUDY TEND TO CONFIRM THAT THE 6 PERCENT AIR VOID CRITERION OF THE BUREAU OF PUBLIC ROADS MIX DESIGN PROCEDURE IS SATISFACTORY.

Goode, JF Owings, EP
Public Roads, Us Bureau Public Roads  DEC 61

ACKNOWLEDGMENT: Highway Research Board Bibliography

2A 211016
DURABILITY OF BITUMINOUS MATERIALS
THESE REFERENCES ON THE DURABILITY OF BITUMINOUS MATERIALS, THEIR WEATHERING AND AGING, LABORATORY TESTS FOR DURABILITY, DURABILITY OF ROAD BINDERS, TAR SURFACINGS, AND ROAD ASPHALTS, ACCELERATED WEATHERING TEST, FACTORS AFFECTING THE WEATHER RESISTANCE OF ASPHALT COATINGS, RECOVERY AND EXAMINATION OF ASPHALT IN PAVING MIXTURES, STUDIES OF LIQUID ASPHALTIC MATERIALS, THE SLOW-CURING TYPE, RELATION OF LOW TEMPERATURE TESTS WITH RESISTANCE TO CRACKING OF SHEET ASPHALT PAVEMENTS, OXIDATION OF ASPHALT AND ITS Constituents, ROAD ASPHALT HARDENING, EFFECT OF ULTRA-VIOLET LIGHT ON VISCOSITY OF THIN FILMS OF ASPHALT CEMENTS, CURING RATE TEST FOR CUTBACK ASPHALTS, QUALITY OF ASPHALTIC ROAD MATERIALS, EFFECT OF FILLERS ON DURABILITY OF ASPHALT, FACTORS RELATING CHEMISTRY COMPOSITION AND RHEOLOGICAL PROPER-
CONSTRUCTION MATERIALS 2A

TIES OF PAYING ASPHALTS WITH DURABILITY, AND PROPERTIES OF ASPHALTIC BITUMEN IN RELATION TO ITS USE IN ROAD CONSTRUCTION.

Highway Research Information Service Sept. 1970

2A 211018
MODIFIED ASPHALTS
THREE REFERENCES ON MODIFIED ASPHALTS INCLUDE SELECTIONS ON THE EFFECT OF SYNTHETIC ELASTOMERS AND OF RUBBER ON THE PROPERTIES OF PETROLEUM ASPHALTS. STUDIES OF RUBBER-ASPHALT PAVING MIXTURES, HEAT RESISTANT PROPERTIES OF ADDITIVES FOR BITUMINOUS MATERIALS, MODIFICATION OF ASPHALT WITH NEOPRENE, ANTI-STRIPPING ADDITIVES FOR HOT BITUMINOUS MIXES, AND DESIGN AND CONSTRUCTION OF EPoxy ASPHALT CONCRETE PAVEMENTS.

Highway Research Information Service Sept. 1970

2A 211023
BASIC FACTS ON ROAD BINDERS AND VARIOUS TYPES OF BITUMINOUS MIXTURE, APPLICATION OF GEOTECHNICS TO ROAD CONSTRUCTION /IN FRENCH/
BASIC FACTS ON ROAD BINDERS AND BITUMINOUS MIXTURES AND THE APPLICATION OF GEOTECHNICS TO ROAD CONSTRUCTION ARE DISCUSSED. DETAILS ARE GIVEN ON THE DETERMINATION OF THE THICKNESS OF FLEXIBLE PAVEMENTS, MOISTURE CONTENT IN SOILS AND THE ROAD STRUCTURE, AND SOIL PERMEABILITY AND CAPILLARITY. VISCOSITY AND WATER VAPOR TENSION ARE DEFINED. THE BASIC CHARACTERISTICS OF WATER ARE RECALLED, AND SOIL STABILITY AND COHESION ARE DISCUSSED. /LCPC/RRL/AUTHOR/

Duriez, M Monit Trav Publics Bâtiment /France/ May 1967
ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 211061
WIDERA-CONCRETE FOR THE RECONSTRUCTION AND REPAIR OF ROAD SURFACES, PARTICULARLY IN BUILT-UP AREAS /IN GERMAN/
IN ORDER TO RECONSTRUCT OR REPAIR WORN BITUMINOUS ROAD SURFACES IN BUILT-UP AREAS, BUT STILL RETAIN THE SUBSTANCE PRESENT, TEERBAU G.M.B.H. DEVELOPED WIDERA CONCRETE WHICH, Owing to its mineral mixture being composed of a maximum grain size of 2.3 or 5 MM, AND TO A CAREFUL DETERMINATION OF THE EFFECT OF THE ADHESION PROPERTIES OF A SPECIAL BINDER ON THE ADHESIVENESS AND ROUGHNESS OF THE CHIPPINGS, RENDERS POSSIBLE THE CONSTRUCTION OF DURABLE THIN COATINGS WEIGHING ONLY 25-40 KG PER SQUARE METER THEREFORE THE HEIGHT OF THE EXISTING CURBS, GUTTERS AND DRAINS DOES NOT HAVE TO BE ALTERED, ONLY SHARP-EDGED, HARD STONES ARE USED, DURING THE CHOICE OF WHICH ATTENTION MUST BE PAID TO A GOOD ADHESION BETWEEN THE BINDER AND MINERAL, AS OTHERWISE THIS TYPE OF SHARP-EDGED STONE IS EASILY TORN OUT OF THE SURFACING. TO PROVE THE SUITABILITY OF THE NEW ROAD CONSTRUCTION MATERIAL DETAILED EXAMPLES ARE QUOTED IN THE ARTICLE FROM WHICH THE PRACTICABILITY OF THE WIDERA CONCRETE CAN BE SEEN. /FG/RRL/

Steffen, H Marscholz, Veroffent Strassenbau, Essen /Ger/ 1967
ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 211063
THE USE OF CATION-ACTIVE PRODUCTS IN ROAD CONSTRUCTION /IN GERMAN/
THE USE OF AMINES AS ANTI-STRIPPING AGENTS WAS INTRODUCED IN CUT-BACK BITUMEN, HOT BITUMEN FOR MIXTURES, BINDERS FOR OIL-GRAVEL ROADS (SCANDINAVIA) AND IN PRETREATMENT OF ROADS FOR SURFACE DRESSING. THE PROPERTIES, CONTROL AND USE OF CATIONIC BITUMEN EMULSIONS AND BITUMINOUS SLURRIES ARE DESCRIBED. THE PREPARATION AND THE PLACEMENT OF THE SLURRIES IS EXPLAINED IN DETAIL. AFTER 15 MINUTES THE SLURRY CAN BE SUBJECTED TO CAREFUL USE BY TRAFFIC, AND AFTER 30 MINUTES, AT THE MOST, IT CAN BE SUBJECTED TO UNLIMITED USE. /FG/RRL/

Von, SCHOTT T Road Research Society /Germany/, Asphalt Und Teerstrassen, Vortrag /Ger/ Nov. 1966
ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 211065
THE WEARING RESISTANCE OF ASPHALT SURFACINGS (IN GERMAN)
THE FACTORS RESPONSIBLE FOR THE EXCESSIVE WEAR OF BITUMINOUS SURFACINGS (I.E. CONSTRUCTION MATERIALS, MIX COMPOSITION, PLACEMENT AND COMPACT, AND STRESS BY WEATHERING AND TRAFFIC) ARE EXAMINED IN DETAILED SIMULATION METHODS ARE CRITICALLY CONSIDERED, AND IT IS ESTABLISHED THAT AS YET NO METHOD IS SUITABLE FOR NUMERICALLY DETERMINING THE WEARING STRENGTH OF MIXTURES USED IN PRACTICE. /TRRL/

Schmidt, H Bitumen /Germany/ 1968
ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

2A 211089
ON ROAD SURFACES ON AUXILIARY BRIDGES /IN GERMAN/
SINCE TEMPORARY BRIDGES FOR MAINTENANCE OF TRAFFIC WOULD ONLY BE USED FOR HEAVILY USED ROAD STRETCHES, THE SURFACES MUST BE SUITABLE FOR HEAVY TRAFFIC, BUT NEED ONLY HAVE A SERVICE LIFE OF ONE TO TWO YEARS. THEY SHOULD BE FAIRLY FLEXIBLE OWING TO THE MOVABILITY OF CONSTRUCTIONAL COMPONENTS FROM 1958 TO 1964, DETAILED OBSERVATIONS WERE MADE IN HAMBURG ON SURFACES ON AUXILIARY BRIDGES. THE ORIGINALLY USED THIN SURFACE WITH A MASTIC LAYER OF 1-CM THICKNESS PROVED UNSATISFACTORY, AS ALSO A SURFACE OF SEVERAL LAYERS OF ASPHALT MASTIC. SINCE A SURFACE OF HEATED BITUMINOUS SAND AND GRAVEL APPLIED IN TWO LAYERS TO A DEPTH OF 12-CM ALSO SHOWED SURFACE DEFECTS AFTER A SHORT TIME, IT WAS DECIDED IN 1964 TO CHANGE OVER TO SURFACES OF ASPHALTIC CONCRETE OF 5-CM THICKNESS WITH BINDING LAYERS FIRST IN FOUR AND THEN IN TWO-LAYER-CONSTRUCTION, FOR THE ROAD FORMATION OF AUXILIARY BRIDGES ERECTED FOR A VERY LARGE BUILDING SITE, AS FOLLOWS: 100 KG/M OF BITUMINOUS CARPETING 1/18, AND 30 KG/M ASPHALTIC CONCRETE 0/5. FINALLY THE RECOMMENDATION IS MADE TO USE WARM-WORKING MIX MATERIALS, SINCE HOT-WORKING MATERIALS ARE REGARDED AS TOO BRITTLE. /FG/RRL/

Ascher, G Bitumen /Germany/ 1967
ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 211116
THE WETTING OF MINERAL MATERIALS WITH BITUMEN /IN RUSSIAN/
TESTS DO NOT CONFIRM THE CLASSIFICATION OF ROAD CONSTRUCTION MATERIALS INTO HYDROPHOBIC AND HYDROPHILIC MATERIALS. OR THE GENERAL OPINION THAT HYDROPHOBIC MATERIALS ARE MORE SUIT TO WETTING BITUMEN THAN HYDROPHILIC MATERIALS. TESTS SHOW THAT A DIFFERENCE IN MINERALOGICAL COMPOSITION, VALUES OF SURFACE ENERGY AND HYDROPHILIC PROPERTIES OF ROCKS SUBJECTED TO TESTS, HAVE NO DECISIVE INFLUENCE ON THE RATE OF WETTING BY BITUMEN. /LCPC/RRL/

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CONSTRUCTION MATERIALS

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 211120
TECHNOLOGICAL PREPARATION OF HIGHWAY ASPHALTS FROM PETROLEUMS OF VARIOUS GROUPS /IN RUSSIAN/
ALL U.S.S.R. CRUDES HAVE A VERY LOW RATIO OF ASPHALTENES (A) TO RESINS (R). AN INCREASE IN THE CRUDE MIXTURE CONCENTRATED TO A HIGH DEGREE TO OBTAIN AN ASPHALT TO BE USED FOR ROAD BUILDING WITH THE REQUIRED SOFTENING POINT. AS A RESULT THE ASPHALT HAS A LOW FROST RESISTANCE. A/R RATIO CAN BE INCREASED BYOXIDATION OF ASPHALTS WITH AIR AT HIGHEST DENSITY. DURING OXIDATION THE OIL CONTENT (O) DROPS ABRUPTLY, WHILE THE RESIN CONTENT DOES NOT CHANGE GREATLY. TO PRODUCE OXIDIZED ASPHALT FROM CRUDES OF GROUP I, A STRAIGHT-RUN DISTRIBUTION TAR FRACTION WITH A HIGH OIL CONTENT CAN BE USED, SO THAT THE REDUCTION OF THE OIL CONTENT IN OXIDATION IS COMPENSATED. TYPICAL TAR FRACTIONS OF THIS TYPE, OBTAINED BY CONVERSION OF THE CRUDES TO 50-60%, HAD THE FOLLOWING CHARACTERISTICS: A = 4-7, R = 30-33%; A/R LESS THAN 0.2. (A/R) /O = 0.62. TO ASPHALTS OBTAINED BY OXIDATION OF THESE FRACTIONS, SURFACE-ACTIVE COMPOUNDS WERE ADDED TO INCREASE ADHESION TO INORGANIC MATERIALS USED IN ROAD BUILDING. THE COHESION WAS IMPROVED BY ADDING DISTRIBUTION RESIDUES FROM SYNTHETIC FATTY ACIDS PRODUCTION. THE FROST RESISTANCE OF THE RESULTING ASPHALTS (A/R = 0.5-0.8. (A/R) /O = 0.64-0.72) WAS GOOD, BECAUSE OF THE HIGH OIL CONTENT (O = 46-53%). ASPHALTS FROM CRUDES OF GROUP II ARE BEST PRODUCED BY COMBINED OXIDATION AND COMPOUNDING. A HEAVY PRODUCT WITH A HIGH RESIN CONTENT (E.G. R = 39%) IS OXIDIZED TO THE DESIRED VALUE OF A/R AND THEN DILUTED WITH A LIGHT PRODUCT HAVING A HIGH OIL CONTENT. /LCPC(A)/

Akmetova, RS Fryazinov, VV

Nauch-issled Inst Pererab Nefti 1968

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 211131
GUSSASPHALT AND ASPHALTIC CONCRETE IN URBAN ROAD CONSTRUCTION /IN GERMAN/
THE EXTENT IS COMPARED TO WHICH THE PROPERTIES OF GUSSASPHALT AND ASPHALTIC CONCRETE SURFACINGS MEET THE REQUIREMENTS OF PRESENT-DAY AND ESTIMATED FUTURE TRAFFIC IN TOWNS AND BUILT-UP AREAS. IT IS CONCLUDED THAT GUSSASPHALT, DESPITE ITS PRO-NUANCED PLASTIC BEHAVIOR UNDER PARKED VEHICLES AND THE DIFFICULTIES IN LIGHTENING ITS SURFACE, IS THE BETTER SURFACING MATERIAL BECAUSE OF ITS GREATER DURABILITY, ITS EASE OF APPLICATION IN ALL WEATHERS, ITS ABILITY TO BE REPAIRED PERFECTLY, AND ITS HIGH RESISTANCE TO THE EFFECT OF STEEL STUDDED TIRES. /FG/RRL/

Schmidt, HE
Bitumen, Toere, Asphalte, Peche /Ger/ Sept. 1968

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 211140
THE USE OF INFRA-RED SPECTRA IN THE ASSESSMENT OF BITUMEN DURABILITY
INFRA-RED ABSORPTION SPECTROSCOPY PROVIDES A VERY SIMPLE, RAPID, AND NONDESTRUCTIVE METHOD OF EXAMINING BITUMENS. THIS PAPER DISCUSSES EXPERIMENTAL TECHNIQUES AND PRESENTS SPECTRA FOR BITUMENS PRODUCED IN AUSTRALIA, INCLUDING THE SAME TYPES AS USED IN ROAD CONSTRUCTION BUT SOMEWHAT HARDER. CHEMICAL FUNCTIONAL GROUPS ATTRIBUTED TO ABSORPTION BANDS ARE CONSIDERED, AND AN INVESTIGATION OF THE APPLICATION OF THE TECHNIQUE TO THE STUDY OF BOTH DARK AND PHOTO-OXIDATION OF BITUMENS IS REPORTED. COMPARISONS BETWEEN SPECTROPHOTOMETER AND MICROVISCOMETER ASSESSMENTS OF OXIDATION RATES ARE ALSO INCLUDED. /RRL/A/

Martin, KG
Australia Road Research Board Proc 1966

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 211145
SEVENTH WORLD PETROLEUM CONGRESS VOLUME B-APPLICATIONS AND NEW USES, PART 2
THIS VOLUME CONTAINS PAPERS PRESENTED AT THE CONFERENCE UNDER THE FOLLOWING GENERAL HEADINGS: CONTRIBUTION OF ADDITIVES TO THE PERFORMANCE OF PETROLEUM PRODUCTS; PROBLEMS RELATED TO THE USE OF HYDROCARBONS AT LOW TEMPERATURES; PETROLEUM AND MICROBIOLOGY (SPECIAL REFERENCE TO THE EDIBLE MATERIALS), NEW CONTRIBUTIONS OF PETROLEUM TO AGRICULTURE, NEW USES OF PETROLEUM PRODUCTS IN CIVIL ENGINEERING AND BUILDING (CONSTRUCTION); PETROLEUM WAX-NEW DEVELOPMENTS AND APPLICATIONS; AND PROPERTIES, APPLICATIONS AND PERFORMANCE OF ASPHALT AND ASPHALT EMULSIONS. /RRL/

Elsevier Publishing Company 1967

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 211149
SPECIFICATIONS AND PERFORMANCE OF ASPHALTIC MATERIALS IN THE UNITED STATES
THE REQUIREMENTS OF TWO SPECIFICATIONS FOR THE USE OF ASPHALTIC MATERIALS IN ROAD CONSTRUCTION ARE COMPARED, AND DATA ON ASPHALTIC CEMENTS PRODUCED IN THE U.S. ARE SUMMARIZED. THE PROPERTIES MEASURED BY FUNDAMENTAL TESTS VARY APPRECIABLY IN THE LOW TEMPERATURE RANGE. CONTINUED RESEARCH IS RECOMMENDED TO DEVELOP KNOWLEDGE RELATING FUNDAMENTAL PROPERTIES OF ASPHALT TO THE FUNDAMENTAL PROPERTIES OF ASPHALT-AGGREGATE SYSTEMS, AND TO PAVEMENT PERFORMANCE. TESTS SELECTED FOR A RATIONAL SPECIFICATION FOR ASPHALT SHOULD BE RELIABLE, SIMPLE AND RAPID. REQUIREMENTS SHOULD RECOGNIZE VARIABILITY DUE TO MANUFACTURING, SAMPLING AND TESTING, BUT SHOULD CONTROL THE PROPERTIES THAT ARE CRITICAL TO OPTIMUM PAVEMENT PERFORMANCE. /RRL/

Waldorn, JY
World Petroleum Congress Proc 1967

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 211150
DEEP-TEXTURE CARPET IN ROAD CONSTRUCTION
PRESENTED FOR DISCUSSION AT A MEETING OF THE MIDLANDS BRANCH OF THE INSTITUTE OF QUARRYING IN NOVEMBER 1967. THE PAPER EXAMINES THE ROAD SURFACE REQUIREMENTS NECESSARY TO ACHIEVE ADEQUATE SKID RESISTANCE AND DESCRIBES THE VARIOUS MATERIALS WHICH CAN BE USED TO OBTAIN THE NECESSARY TEXTURE DEPTH. /RRL/

Morris, D
Quarry Managers Journal /UK/ Feb. 1968

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 211156
BITUMINOUS ROAD CONSTRUCTION: DEVELOPMENT AND RESEARCH IN GERMAN SPECIALIST LITERATURE 1925-1940 /IN GERMAN/
THE DOCUMENTATION IS ARRANGED ANNUALLY, AND INCLUDES LITERATURE ON MINERALS, BITUMINOUS BINDES, ASPHALT ROAD CONSTRUCTION, TAR ROAD CONSTRUCTION
AND THE CONSTRUCTION OF SUBGRADE AND SUBSOIL FOR BITUMINOUS ROADS. /FG/RRL/

Skopnik, A
Forschungsarbeiten Aus Strassen /Ger/ 1968

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 211168
USE OF ASBESTOS IN BITUMINOUS ROAD CONSTRUCTION /IN GERMAN/

DETAILS ARE GIVEN OF RESEARCH PROJECTS INTO THE INFLUENCE OF ASBESTOS ADMIXTURES ON BITUMINOUS ROAD CONSTRUCTION A COMPARATIVE STUDY IS BEING MADE OF GUSSASPHALT AND FINE ASPHALTIC CONCRETE SURFACINGS CONTAINING VARYING PROPORTIONS OF ASBESTOS, BUT OTHERWISE HAVING SIMILAR STRUCTURE. THESE SURFACINGS WERE Laid IN CONGESTED AREAS AND AT BUS STOPS. MEASUREMENTS ARE CURRENTLY BEING CARRIED OUT. /FG/RRL/

Klotz, E
Strassen Und Tiefbau /Germany/ 1969

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 211174
QUALITY CONTROL IN CONSTRUCTION METHODS INVOLVING USE OF BITUMEN /IN GERMAN/

THE CAUSES OF UNAVOIDABLE FLUCTUATIONS IN THE QUALITY OF BITUMINOUS MIXTURES AND THE PAVEMENTS CONSTRUCTED WITH THEM ARE OUTLINED. THE USE OF QUALITY CONTROL TO PINPOINT THE EXTENT OF FLUCTUATIONS AND TO ENABLE THE NECESSARY CORRECTIVE MEASURES TO BE CARRIED OUT IS ALSO DISCUSSED. /FG/RRL/

Wester, K
Strassen Und Tiefbau /Germany/ 1969

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 211221
THE CONSTRUCTION OF ROADS WITH ROUGH SURFACINGS AND MAINTENANCE TREATMENT FOR RESTORING THE ROUGH TEXTURE OF SURFACINGS /IN RUSSIAN/

DATA COLLECTED IN THE USSR, CZECHOSLOVAKIA AND POLAND ON ROUGH SURFACING CONSTRUCTION ARE PRESENTED. THREE CONSTRUCTION METHODS ARE DESCRIBED: (1) SPECIAL GRANULAR FORMULAS FOR ASPHALTIC CONCRETE, (2) SURFACE DRESSINGS, AND (3) SPRINKLING OF PRECOATED CHIPPINGS ON ASPHALTIC CONCRETE WITH A HIGH MORTAR CONTENT DURING COMPACTION. OTHER METHODS ARE BRIEFLY LISTED, AND THE SPECIFICATIONS FOR INGREDIENTS AND MIXTURES ARE GIVEN. ATTENTION IS DRAWN TO THE SPECIFIC TECHNOLOGICAL ASPECTS OF THE SPREADING AND COMPACTATION OF THE MIXTURES. /LCPC/RRL/

Gorelyshev, NV
Soyuzdorznii /USSR/ 1967

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

2A 211226
STUDY OF BITUMEN AND BITUMINOUS MIXTURES, RESEARCH CARRIED OUT BY THE SOYUZDORZNII, THE FEDERAL INSTITUTE FOR ROAD RESEARCH AND STUDIES IN THE USSR /IN RUSSIAN/


Trudy Soyuzdorznii /USSR/ 1967

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 211300
THE PRACTICAL SAMPLING OF BITUMINOUS MIXTURES


Eichhorn, W
Das Stationare Mischwerk /Germany/ No. 1, 1970, pp 12-6

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

2A 211371
FLOW BEHAVIOR OF ASPHALT CEMENTS

THE FUNDAMENTAL MECHANICAL PROPERTIES OF FLEXIBLE PAVEMENT MATERIALS WERE STUDIED BY CREEP TESTING OF 13 ASPHALT CEMENTS IN A ROTATING COAXIAL CYLINDER VISCOMETER. THESE ASPHALT CEMENTS WERE SELECTED TO REPRESENT A VARIETY OF CRUDE SOURCES, PENETRATION GRADES, AND MANUFACTURING PROCESSES. THE ROTATING COAXIAL CYLINDER VISCOMETER ENABLED THE DETERMINATION OF THE FLOW BEHAVIOR OF ASPHALT CEMENTS AT TEMPERATURES BELOW FREEZING POINT. RHEOLOGICAL PROPERTIES OF ASPHALTIC CONCRETE AT TEMPERATURES BELOW FREEZING POINT WERE FOUND TO BE SIMILAR TO THAT OF A BINGHAM PLASTIC. ALL OF THE ASPHALT CEMENTS EXHIBITED STEADY-STATE FLOW BEHAVIOR AT 77 AND 104 F. THE STEADY-STATE FLOW BEHAVIOR OF EACH OF THE ASPHALT CEMENTS IN THE LOW TEMPERATURE RANGE WAS FOUND TO BE SIMILAR TO THAT OF A BINGHAM PLASTIC. ALL OF THE ASPHALTS APPEARED TO BEHAVE LINEARLY UNDER THE CONDITIONS OF TESTS EMPLOYED. THE TIME-TEMPERATURE SUPERPOSITION PRINCIPLE APPEARS TO BE APPLICABLE TO THE BEHAVIOR OF NORMAL ASPHALT CEMENTS AT LEAST IN THE LOW-TEMPERATURE RANGE (0 F TO 104 F). A RELATIONSHIP EXISTS BETWEEN PLASTIC VISCOSITY EVALUATED WITH THE ROTATING COAXIAL CYLINDER VISCOMETER AND THE RESULTS OF STANDARD PENETRATION TESTS WHEN BOTH TYPES OF TESTS ARE CONDUCTED AT IDENTICAL TEMPERATURES. THE EFFECT OF PENETRATION GRADE WAS EVALUATED USING THE THREE ASPHALTS OBTAINED BY VACUUM AND STEAM DISTILLATION FROM VENEQUELAN CRUDE. THE MIXTURES OBTAINED BY THE EFFECT OF CRUDE SOURCE FOR MATERIALS OF THE SAME PENETRATION GRADE IS DIFFICULT TO EVALUATE. TEMPER-
ASPHALT VISCOSITY OF 75-100 SECONDS, SAYBOLT FUROL. A PROPER UNDERSTANDING OF VISCOSITY, KNOWLEDGE OF HOW IT VARIES WITH DIFFERENT ASPHALTS, AND APPROPRIATE USE OF THIS KNOWLEDGE WILL LEAD TO MORE UNIFORM AND HIGHER QUALITY ASPHALT CONSTRUCTION.

Griffith, JM Highway Research Board Special Reports 1960

2A 211445 QUALITY ASSURANCE IN HIGHWAY CONSTRUCTION: PART IV-VARIATIONS OF BITUMINOUS CONSTRUCTION PROGRESS IS REVIEWED IN THE BUREAU OF PUBLIC ROADS RESEARCH PROGRAM FOR THE STATISTICAL APPROACH TO QUALITY ASSURANCE IN HIGHWAY CONSTRUCTION, TO DETERMINE THE QUALITY CHARACTERISTICS OF CURRENT CONSTRUCTION. MANY STATES HAVE BEEN MEASURING VARIATIONS IN ACCEPTED BITUMINOUS PRODUCTION. IT HAS BEEN FOUND THAT THE PRODUCTION OF HIGHWAY QUALITY BITUMINOUS PAVEMENT REQUIRES THE DILIGENCE OF THE PRODUCER, THE CONTRACTOR AND THE CONTRACTING AGENCY. THE STATISTICALLY MEASURED VARIATIONS OF ACCEPTED CONSTRUCTION INDICATE THAT MUCH MORE VARIABILITY EXISTS THAN IS REVEALED BY THE USUAL ACCEPTANCE TESTS. VARIATIONS IN EXCESS OF THOSE NORMALLY EXPECTED FOR GOOD PRACTICE WERE PREVALENT ON ALMOST EVERY JOB STUDIED. LARGE SAMPLING AND TESTING ERRORS VIRTUALLY PREVENT A TRUE EVALUATION OF THE MATERIAL VARIATION ON A SPECIFIC JOB. IT IS DIFFICULT TO ASSESS THE DEGREE TO WHICH VARIATIONS AFFECT ACTUAL PAVEMENT PERFORMANCE. RESEARCH RESULTS INDICATE THAT MUCH IMPROVEMENT COULD BE OBTAINED AND TESTING LOAD REDUCED BY THE FOLLOWING CHANGES: (1) ADJUST TOLERANCE LIMITS ON GRADATION TO CONFORM TO THE PRINCIPLE OF MOST TOLERANCE ON LARGEST FRACTION RETAINED ON A SIEVE, (2) CONTROL THE UNIFORMITY OF GRADATION OF THE MIXTURE BY HOT BIN STABILITY TESTS, WHERE A PRINTED RECORD OF BATCH WEIGHTS IS AVAILABLE, (3) REDUCE TO A MINIMUM THE NUMBER OF SIEVES USED FOR CONTROL TESTING, (4) EXERCISE MORE DILIGENCE IN THE TRAINING AND SURVEILLANCE OF OPERATORS PERFORMING CONTROL AND ACCEPTANCE TESTS, (5) REQUIRE INSTALLATION OF AUTOMATIC FEATURES ON ASPHALT PLANTS AND FINISHERS TO REDUCE HUMAN ERROR, AND (6) USE RANDOM SAMPLING TO OBTAIN ALL TEST PORTIONS.

Gratley, EC Public Roads, Us Bureau Public Roads AUG69

2A 211446 NEW IDEAS IN ASPHALT ROAD CONSTRUCTION REGINA, CANADA, HAS A TREMENDOUS SURPLUS OF SAND AND SHORTAGE OF ROCK. BECAUSE OF THIS FACT, WAYS WERE INVESTIGATED OF UTILIZING SAND AND CONSERVING ROCK. IF SANDS ARE STABILIZED WITH PORTLAND CEMENT AS IN SOIL CEMENT OR WITH ASPHALT BITUMEN IN ASPHALTIC CONCRETE, THEY CAN PERFORM A VERY USEFUL FUNCTION. ADVANTAGES OF HOT MIX ASPHALT BASE WERE REVIEWED. FROM THE POINT OF CEMENT COSTS, IT IS OBSIous THAT PENETRATION GRADE ASPHALT CEMENT AS USED IN HOT MIX ASPHALT BASE IS CHEAP AND HAS A DISTINCT COST ADVANTAGE IN SASKATCHEWAN. HOT MIX ASPHALT BASE CAN BE LAID IN COLDER WEATHER AND NOT BE SUBJECT TO DAMAGE. SOIL CEMENT REQUIRES TWO DAYS FROST FREE CURING AND SEVEN DAYS CURING BEFORE LOADING. SOIL CEMENT Requires A SURFACE OF ASPHALT TO PROVIDE A WEARING SURFACE. THEREFORE, A SOIL CEMENT CONTRACT REQUIRES BOTH SOIL CEMENT EQUIPMENT AND ASPHALT EQUIPMENT, WHEREAS HOT MIX ASPHALT BASE AND SURFACE COURSE IS MADE IN THE SAME PLANT. BY PUTTING HOT MIX ASPHALT DIRECTLY ON PREPARED SUB GRADE, THE NUMBER OF OPERATIONS ARE CUT DOWN AND, THEREFORE, THE TIME EXPOSED TO ADVERSE WEATHER IS REDUCED. IT IS SUGGESTED THAT THE DESIGN OF BASE AND CURBS BE MODIFIED TO ALLOW THE FOLLOW-
CONSTRUCTION MATERIALS

ING SEQUENCE: (1) Excavation, (2) Sub grade preparation and compaction, (3) Laydown first lift of hot mix asphalt base on clay sub grade so that it extends under the area that the curb sits on, (4) Construct curb and gutter on top of first lift of asphalt base, and (5) Finish final lift of asphalt base course. By placing curbs on prepared asphalt base, either slip formed machines laid concrete curbs construction procedures could be used or precast curbs could be used. Saving time normally used in setting and moving forms and in finishing concrete it is suggested that by flooding the asphalt concrete mix with inert gases during production, the high rate of oxidation of the asphalt cement which occurs during production could be retarded.

Clapson, LL Paving Forum /Napa/ June 1969

2A 211450
AN INVESTIGATION OF THE STRENGTH PROPERTIES OF SAND-EMULSIFIED ASPHALT MIXTURES

Four different Ontario sands were examined under the following headings: (1) the grading characteristics of the sands, (2) strength characteristics of the untreated sands, (3) stability characteristics of the sands when mixed with varying amounts of emulsified asphalt, and (4) the strength characteristics of the sand-emulsion mixtures. Tentative relationships were established among the grading characteristics of the untreated sands, strength characteristics of friction, cohesion, and unconfined compression strength of the sand-emulsion mixtures, and the empirical test results. A method of predicting the suitability of sands, when mixed with emulsified asphalt, and for use as highway base or subbase material, using only the results of a complete sieve analysis in conjunction with these relationships is suggested. An abbreviated series of tests was performed on two additional sands in an attempt to provide confirmation of this method. The water control test indicated that water content at time of test has an effect on the strength of sand-emulsion mixes. /Author/

Davies, JR Stewart, JA
Ontario Dept Hwys, Downsview /Canada/ June 1969

2A 211457
ASPHALT PAVING TECHNOLOGY-SOME CURRENT DEVELOPMENTS AND TRENDS

A brief summary is presented of research and development trends in the design, construction and performance of asphalt pavements. Improvement efforts have included activities related to: (1) development of improved specifications for asphalt, (2) measurement of the response characteristics of asphalts and asphalt paving mixtures in more fundamental terms, (3) analysis of systems representative of asphalt pavement structures with some applications to design, (4) construction operations including thick-lift asphalt concrete construction, use of pneumatic-tired rollers, and increased mixture production capabilities, and (5) construction control including statistical specifications and improved control of the compaction operation through establishment of compaction effort by means of small test sections, permeability measurements, or nuclear measurements. An example is presented to describe the results of some of these studies that have been utilized to develop a pavement design for a city-county highway in California. Trends illustrated in the example are these of fixed sections of asphalt concrete, particularly

FOR HEAVY DUTY HIGHWAYS, THE USE OF THEORY TO ASSIST IN DESIGN, IMPROVED CHARACTERIZATION OF MATERIALS TO UTILIZE THEORY AND COMPAC TION PROCEDURES TO ACCOMPANY THICK-LIFT DESIGNS. ADDITIONAL TOOLS ARE PRESENTED AS SUPPLEMENTING EXISTING PROCEDURES TO EXTEND THE SCOPE OF ASPHALT PAVING TECHNOLOGY.

Monsmith, CL Civil Engineering ASCE Aug. 1969

2A 211480
ASPHALT EMULSION-VERSATILE CONSTRUCTION MATERIAL

The experience of Douglas County, Oregon, with open graded cold mix paving, has established it as an economical and satisfactory paving method. Construction methods and materials are described.


2A 211492
THE USE OF FLY ASH AS FILLER IN ASPHALTIC CONCRETE PRODUCTION IN NEW SOUTH WALES

In the production of asphaltic concrete for road construction, a filler material is usually required to provide a dense and stable mixture. Limestone dust was generally applied as filler in new south Wales until the department of main roads had experimented with and subsequently adopted the use of flyash, an industrial waste, as its substitute. This paper describes an investigation carried out at the department's central testing laboratory which establishes in principle that fly ash may be used as filler in asphaltic concrete to replace the more expensive limestone dust. However, the presence of clinkers and furnace debris in the fly ash from Pyrmont power station posed a difficult problem in handling of the material. After a series of experiments a device was designed which efficiently filtered off the undesirable clinkers and debris thereby enabling the practical utilization of fly ash in the departments Rosehill Hotmix Plant. As a result of the changeover in 1962, the savings to the department amount to approximately 75,000 P.A. /Author/

Fung, KY Dickinson, EJ DISCUSSER Brummelas, TT DISCUSSER Martin, KG DISCUSSER Australian Road Research Board Proc 1968

2A 211517
TEMPERATURE IN BITUMINOUS MIXTURES, INTRODUCTION

Temperature is an important factor in asphalt pavement construction. The effects of temperature must be viewed from several standpoints: (1) its effect on the mix constituents which changes the viscosity, the wetting energy, and perhaps some of the properties of the aggregate which affect both the spreading and absorption of the asphalt; (2) its effect on the mixing, laying and compaction operations as a result of these changes in the properties of the mix constituents, and (3) how the temperature affects the traffic densification. The discussion topics are presented: temperature of materials, effects of temperature on mixing, and on compaction.

Lehmann, HL Highway Research Board Special Reports 1960

2A 211527
DISCUSSION OF REPORT OF COMMITTEE ON CHARACTER AND USE OF ROAD MATERIALS. II. BITUMINOUS MATERIALS

The subject of laboratory investigations of asphalt paving mixtures emphasize pavement construction details, particularly as to obtaining the best prac-
2A CONSTRUCTION MATERIALS

TICABLE COMPRESSION OF THE MIXTURE AND UNIFORMITY OF CONTOUR. THE IMPORTANCE IS EMPHASIZED OF CONTROLLING CONSTRUCTION DETAILS. FIELD TESTS SHOULD BE UNDERTAKEN TO SECURE DEFINITE DATA ON CONSTRUCTION DETAILS, PARTICULARLY ON COMPACTION. THE EFFICIENCY OF OPERATION CAN BE DETERMINED BY DENSITY TESTS, BY TESTING THE PAVEMENT TAKEN DURING AND IMMEDIATELY AFTER COMPACTION BY DETERMINING: (1) RELATIVE EFFICIENCY OF A 10 TON 3-WHEEL ROLLER, A 10 TON TANDEM ROLLER, AND A 4 TOM TANDEM ROLLER OPERATING FOR A GIVEN PERIOD ON A GIVEN MIXTURE WITH A GIVEN INITIAL TEMPERATURE, (2) TIME EFFICIENCY OF A 10 TON 3-WHEEL AND A 10 TON TANDEM ROLLER OPERATED CONTINUOUSLY OVER A GIVEN MIXTURE WITH A GIVEN INITIAL TEMPERATURE. TESTS TO BE MADE AT REGULAR INTERVALS UNTIL THE MIXTURE HAS COOLED TO APPROXIMATELY ATMOSPHERIC TEMPERATURE, (3) EFFECTIVE TEMPERATURE OF MIX UPON EFFICIENCY OF ROLLING WITH A 10 TON 3-WHEEL ROLLER AND A 10 TON TANDEM ROLLER, ROLLING TO BE CONDUCTED FOR SPECIFIED INTERVALS DURING COOLING AND (4) EFFICIENCY OF TAMPER ROLLER AS COMPARED WITH THE USUAL 3-WHEEL AND TANDEM ROLLERS ON THE SAME MIXTURE WITH DIFFERENT INITIAL TEMPERATURES. GENERAL USE IS SUGGESTED OF A SIMPLE CONTOUR TESTING DEVICE SUCH AS THAT ADOPTED BY THE OHIO STATE HIGHWAY COMMISSION AND KNOWN AS THE BUMPOMETER. DETAILED INFORMATION SHOULD BE SECURED RELATIVE TO THE MIXING OPERATION FOR DIFFERENT TYPES OF FINE AGGREGATE MIXTURES AS AFFECTED BY TEMPERATURE OF THE MIX, TIME OF MIXING AND SIZE OF BATCH FOR THE USUAL MIX OF A GIVEN RATED CAPACITY. IT APPEARS THAT SOME FINE SANDS WHICH ARE UNSATISFACTORY FOR USE WITH THE ORDINARY FILLER MAY BE MADE TO PRODUCE SATISFACTORY MIXTURES IF COMBINED WITH A MUCH FINER FILLER THAN HAS BEEN CUSTOMARILY USED.

Hubbard, P DISCUSSER Highway Research Board Proceedings 1927

2A 211547 REPORT OF COMMITTEE ON CHARACTERISTICS OF ASPHALTS A QUESTIONNAIRE RELATING TO THE SERVICE OF ASPHALTIC ROAD MATERIALS WAS Addressed to various organizations and individuals having to do with the use of asphalt in highway construction. Ninety-one replies were received and these indicated that failures of asphaltic surfaces due to the quality of the asphalt are prevalent and merit serious attention. Failures were reported from all sections of the country and were associated with many types and grades of asphalt. On the basis of these replies a program of asphalt research is recommended. During 1937, ten laboratories cooperated in a study of film stripping in bituminous mixtures containing various types and grades of asphaltic road materials. Widely varying results with different aggregates indicate aggregate character to be of major importance in connection with film stripping. As for the bituminous materials, resistance to stripping increased with consistency and cracked materials were more resistant than uncracked. The curing of samples was found to have an important effect on test results. Modifications of the test procedure are suggested. /AUTHOR/ Kelley, EF Highway Research Board Proceedings 1937

2A 211550 DESIGN CONSTRUCTION, AND INITIAL EVALUATION OF EXPERIMENTAL TEST SECTIONS OF ASPHALT CONTAINING SYNTHETIC RUBBER THE 16 TEST SECTIONS OF ASPHALT CONTAINING RUBBER WERE CONSTRUCTED AS PART OF A PRIMARY HIGHWAY PROJECT IN SOUTHEASTERN UTAH. THE EXPERIMENT CONSISTS OF 5 FACTORS AT 2 LEVELS, EACH INCORPORATED IN A ONE-HALF REPLICATE OF A 2 TO THE FIFTH POWER FRACTIONAL FACTORIAL EXPERIMENT. THE DESIGN PROVIDES THE BASIS FOR DETERMINING THE EFFECT OF EACH OF 5 FACTORS AND EACH OF 10 TWO-WAY INTERACTIONS ON PAVEMENT CONSTRUCTION, PERFORMANCE, AND DESIGN. THE EFFECT OF EACH VARIABLE WAS DETERMINED FOR THE CONSTRUCTION PROCESS, AND AN INITIAL EVALUATION WAS MADE. A DESCRIPTION OF THE CONSTRUCTION PROCESSES, INCLUDING THE RUBBERIZING PROCESS, IS GIVEN. EVALUATION IS CONTINUING THROUGH MANY OBSERVATIONS AND PHYSICAL TESTS ON THE PAVEMENTS AND PAVING MATERIALS. FAILURE RATE OF PAVEMENTS WILL BE ASSESSED AT THE END OF THE PRODUCTION AND HALF THE DESIGN THICKNESS. THE DESIGN PROVIDES A SOUND METHOD OF ANALYSIS AND OFFERS A DEFINITE BASIS TO DETERMINE WHICH FACTORS AND INTERACTIONS ARE SIGNIFICANTLY AFFECTING PAVEMENT PERFORMANCE AND DESIGN. /AUTHOR/

Darter, MI Peterson, DE Jones, GM Vokac, R Highway Research Record, Hwy Res Board 1970

2A 211601 BITUMINOUS CONSTRUCTION THE HIGHWAY INDUSTRY IS RELUCTANT TO ABANDON TRADITIONAL METHODS AND SPECIFICATIONS AND ADOPT STATISTICALLY DERIVED TOLERANCES, EVEN THOUGH THE NEW LARGER TOLERANCES ARE DEMONSTRABLY SOUND. FOUR STEPS ARE NECESSARY TO IMPLEMENT STATISTICAL SPECIFICATIONS: (1) ESTABLISHMENT OF A REALISTIC VARIABILITY; (2) USE OF THE VARIABILITY TO ESTABLISH REALISTIC TOLERANCES; (3) SIMULATION OF THE NEW SPECIFICATION; AND (4) USE OF THE NEW SPECIFICATION AS THE BASIS OF ACCEPTANCE IN A CONTRACT. ONLY FOUR STATES HAVE REACHED THIS STAGE. INITIAL TENTATIVE STATISTICAL SPECIFICATIONS ARE: LOT SIZE, SAMPLE, NUMBER, ACCEPTANCE OF CENTRAL TENDENCY, ACCEPTANCE OF VARIABILITY. OTHER ACCEPTANCE CRITERIA (PERCENT DEFECTIVE PRODUCT QUALITY INDEX, SEQUENTIAL ANALYSIS LIMITS), ADJUSTMENT OF BID PRICE, CONTROL CHARTS, AND RETESTING AND REFEREE PROCEDURES, BECAUSE OF THEIR CLARITY AND DEFENSIBILITY, STATISTICAL SPECIFICATIONS SOLVE MANY OF THE PROBLEMS CAUSED BY INDEFINITE AND ARBITRARY SPECIFICATIONS. HOWEVER, THERE IS A LACK OF STATISTICAL TRAINING AMONG ENGINEERS, WHICH MUST BE REMEDIED BEFORE STATISTICAL SPECIFICATIONS CAN BE IMPLEMENTED.

Hughes, CS Highway Research Board Special Reports 1971

2A 211641 USE OF EXPANDED CLAY AGGREGATE IN BITUMINOUS CONSTRUCTION THIS PAPER SUMMARIZES THE PRELIMINARY LABORATORY INVESTIGATION MADE BY THE LOUISIANA DEPARTMENT OF HIGHWAYS AND DISCUSSES THE USE OF EXPANDED CLAY AGGREGATE IN SURFACE TREATMENT AND HOT-MIX HOT-LAID ASPHALTIC CONCRETE WORK IN REGARD TO DESIGN, CONSTRUCTION QUANTITIES, AND PERFORMANCE DURING 3-1/2 YEARS. THE RESULTS ARE VERY FAVORABLE AND COMPARABLE AND BETTER ROADS CAN BE BUILT WITH THIS MATERIAL IN LOCALITIES WHERE OTHER MATERIALS ARE IN SHORT SUPPLY. /AUTHOR/

Lehman, HL Adam, V Highway Research Board Proceedings 1959

2A 211712 INTRODUCTION TO THE SYMPOSIUM ON ASPHALT PAVING MIXTURES THESE PAPERS WERE PREPARED TO MAKE INVESTIGATIONAL DATA, OBTAINED TO DATE, AVAILABLE IN CONDENSED FORM TO HIGHWAY DESIGN AND CONSTRUCTION ENGINEERS. IN PAPER NO. 2, THE PRELIMINARY ANALYSIS
CONSTRUCTION MATERIALS

MADE TO SELECT TEST APPARATUS IS SUMMARIZED AND IN PAPER NO. 3, THE RESULTS OF THE FIRST LABORATORY STUDY ARE REVIEWED. IN PAPER NO. 4, THE CONSTRUCTION AND TESTING OF A FIELD TEST SECTION, TOGETHER WITH THE SOLUTIONS TO THE FOLLOWING PROBLEMS ARE DISCUSSED: (1) ARE AGGREGATE MATERIALS WHICH ARE LOCALLY AVAILABLE SUITABLE FOR USE IN ASPHALT PAVEMENTS; (2) ARE TWO OR MORE AGGREGATES TO BE BLENDED, WHAT ARE THE DESIRABLE PROPORTIONS FOR EACH; (3) WHAT PERCENT ASPHALT IN THE PAVING MIXTURE SHOULD BE USED AS A BASIS OF ESTIMATE FOR TOTAL QUANTITIES REQUIRED; AND (4) IS THE ASPHALT MIXTURE AS PRODUCED AND LAID AS A PAVEMENT OF SATISFACTORY QUALITY, CONTAINING THE PROPER AMOUNT OF ASPHALT FOR THE MAXIMUM INTENDED SERVICE: ITEMS 1, 2, AND 3 INVOLVE PRELIMINARY WORK AND SHOULD BE COMPLETED WELL IN ADVANCE OF ACTUAL CONSTRUCTION. ITEM 4 INCLUDES A FINAL DESIGN BASED ON MATERIALS ACTUALLY TAKEN FROM PLANT BINS AND INCLUDES CONSTANT SAMPLING, TESTING, AND ANALYSIS OF THE ASPHALT MIXTURE AS IT IS BEING PRODUCED.

PROJECT SERVED TO DEMONSTRATE THE EFFICACY OF THE METHOD AND ITS INHERENT ECONOMY. THE CAMBER FULL-DEPTH DESIGN COMPRISSES 16 INCHES OF ASPHALT MIXTURES PLACED DIRECTLY ON IMPROVED SUBGRADE. GUSSASPHALT WAS APPLIED TO THE PAVEMENT AS A DURABLE, SKID-RESISTANT FINISH. PERFORMANCE EVALUATIONS ON THE PROJECT ARE CONTINUING. BENKELMAN BEAM DEFLECTION MEASUREMENTS, TEMPERATURE AND SOIL MOISTURE CONTENTS, SMOOTHNESS AND SKID RESISTANCE READINGS WILL BE MADE.

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

2A 211864
GUSSASPHALT: MACHINE-MADE MASTIC ASPHALT IN ROAD CONSTRUCTION
THE DEVELOPMENTS IN MANUFACTURING PROCESSES FOR AND THE PROPERTIES OF MASTIC ASPHALT, OR GUSSASPHALT, ARE DISCUSSED UNDER THE FOLLOWING HEADINGS: PRINCIPLES OF THE COMPOSITION OF GUSSASPHALT; SPECIFICATION OF GUSSASPHALT; LAYING GUSSASPHALT; AND ASSOCIATED BINDER COURSE. AN EXTRACT FROM GERMAN SPECIFICATION TV BIT 6/60 AND DETAILS OF INDENTATION TEST (DIN 1956 SHEET 13) ARE APPENDED. /TRRL/

Schoenian, E
Shell International Petroleum Co /UK/ R&d Rept 1971, 16 pp, 2 Fig, 4 Tab, 19 Phot

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

2A 211866
BITUMINOUS MATERIALS FUTURE RESEARCH AT THE TRANSPORT AND ROAD RESEARCH LABORATORY
THIS PAPER OUTLINES THE MAIN OPERATIONAL AND ENGINEERING REQUIREMENTS FOR BITUMINOUS ROAD-MAKING MATERIALS, SUMMARISES THE PRESENT STATE OF KNOWLEDGE, AND INDICATES THE MAIN LINES OF RESEARCH NEEDED IN THE NEXT FEW YEARS. IT WAS WRITTEN TO PROVIDE A BASIS FOR A REVIEW BY THE RRRL COMMITTEE ON BITUMINOUS MATERIALS OF THE RESEARCH PROGRAMME IN THIS FIELD. IT IS NOW BEING PUBLISHED AS MANY ROAD ENGINEERS AND RESEARCH WORKERS MAY BE INTERESTED IN THE BACKGROUND TO, AND PLANS FOR, RESEARCH ON BITUMINOUS MATERIALS AT RRL.

/Author/

Burt, ME Nicholas, JH Roads & Road Construction, London /UK/ Vol. 50 No. 589, Jan. 1972, pp 4-6, 3 Fig

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/IRR 201 684, 3C31232325

2A 211876
REPLACEMENT OF CUTBACKS WITH EMULSIFIED ASPHALT EMULSIFIED ASPHALTS HAVE REPLACED, IN LARGE MEASURE, THE USE OF CUTBACKS IN MAINTENANCE SURFACE TREATMENTS. MOST CUTBACK CONSTRUCTION CAN BE DONE WITH EMULSIFIED ASPHALTS. THE RECOMMENDED USE OF THIS MATERIAL AS SUBSTITUTE FOR CUTBACK ARE TABULATED. ALL SURFACE TREATMENT AND PENETRATION MACADAM CONSTRUCTION CAN BE DONE WITH EMULSIFIED ASPHALTS. TACK COATS CAN BE DONE WITH CRS-1 AND RS-1. SLURRY SEALS CAN BE DONE ONLY WITH EMULSIFIED ASPHALTS. HOWEVER, EMULSIFIED ASPHALTS CANNOT REPLACE ALL CUTBACK APPLICATIONS. THEY CANNOT PREREATE DENSE, TIGHT SURFACES AND SO MANY NOT BE USED FOR PRIME COATS WHICH REQUIRE A BINDER THAT PENETRATES SOIL AND UNTREATED AGGREGATE. EMULSIFIED ASPHALTS CAN BE USED TO MAKE STOCKPILE PATCHING MIXES. COLD MIX BASE COURSE AND SURFACE CONSTRUCTION CAN BE DONE WITH EMULSIFIED ASPHALT. MIXED-IN-PLACE CONSTRUCTION, WHERE ASPHALT IS SPRAYED ON THE AGGREGATE FOLLOWED BY BLADE MIXING, IS MORE

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DIFFICULT WITH EMULSIFIED ASPHALTS. COLD MIX EMMULSIFIED ASPHALT SURFACE COURSE DESIGN REQUIRES AN AGGREGATE MODIFICATION. THE USE OF OPEN-GRADED EMULSION MIXES ARE OUTLINED. IN THE TREATMENT OF DUST WITH EMULSIFIED ASPHALT, SOME MIXING IS NECESSARY BEFORE APPLICATION. CURRENT AASHO EMULSIFIED ASPHALT GRADES HANDLE MOST WORK, EITHER AS DIRECT SUBSTITUTES OR WITH CHANGES IN CONSTRUCTION PROCEDURES. EMULSIFIED PRIMES, STOCKPILE MATERIALS AND DUST PALLIATIVES HAVE BEEN DEVELOPED AND ARE SPECIFIED BY SOME USER AGENCIES. INFORMATION ON PRODUCT AND ON INSTRUCTION TECHNOLOGY MUST BE DISSEMINATED THROUGH FHWA RESEARCH IMPLEMENTATION PROGRAMS, DEMONSTRATIONS AND STATE-OF-THE-ART REPORTS.

Kari, WJ *Highway Research News, Hwy Res Board* No. 53, Dec. 1973, pp 21-4, 2 Fig, 1 Tab

**2A 211915**

**REVIEW PAPER 11. THE APPLICATION AND PERFORMANCE OF ASPHALTS**

THE AUTHOR OUTLINES RECENT DEVELOPMENTS IN THE USE OF ASPHALT IN ROAD BUILDING AND HYDRAULIC ENGINEERING AND IDENTIFIES SOME SPECIFIC REQUIREMENTS. FACTORS CONSIDERED UNDER ROAD CONSTRUCTION INCLUDE THE WEARING COURSE, SKID RESISTANCE, EFFECT OF SNOW CHAINS AND STUDDED TYRES, PAVEMENT COLOUR, INFLUENCE OF SOIL MOISTURE, MIX BOUNDARY, FACE TREATMENT, BINDER COURSES, ASPHALT BASES MIXING PLANTS, PAVERS, ROLLERS, AND QUALITY CONTROL. COMMENTS ARE PRESENTED ON THE INCREASING USE OF ASPHALT FOR AIRPORT RUNWAYS, DAMS, SEA BED PROTECTION, CANAL LININGS AND UNDER RAILWAY TRACKS.

Klopp, AJ

*World Petroleum Cong Proc* 22 pp, 8 Fig, 83 Ref

**ACKNOWLEDGMENT:** Transport & Road Research Lab /UK/.

**2A 211954**

**STUDIES OF EARLY HYDRATION REACTIONS OF PORTLAND CEMENT BY X-RAY DIFFRACTION**

MONITORING BY X-RAY DIFFRACTION OF HYDRATION OF TRICALCIUM ALUMINATE IN PASTES CONTAINING CALCIUM HYDROXIDE AND GYPSUM HAS DEMONSTRATED SUCCESSIVE FORMATION OF THE HIGH-SULFATE FORM OF CALCIUM SULFALUMINATE HYDRATE /ETTRINGITE/, THE LOW-SULFATED HYDRATE AND TETRACALCIUM ALUMINATE HYDRATE. THESE REACTIONS ARE AFFECTED BY A NUMBER OF FACTORS ON THE RATE AND TO A DEGREE TO THE EARLY HYDRATION BEHAVIOR OF C3A IN PORTLAND CEMENT. DIFFRACTION STUDIES OF HYDRATING SINTERED TRICALCIUM ALUMINATE SLABS HAVE DEMONSTRATED THE RETARDING EFFECT OF THE INITIALLY FORMED ETTRINGITE FILM. X-RAY AND DILATOMETER STUDIES HAVE SHOWN THAT THE HYDRATING C3A PASTES UNDERGO A LARGE INCREASE IN VOLUME BECAUSE OF A TENDENCY TO IMBIBE LARGE QUANTITIES OF WATER. THE INDIVIDUAL EFFECTS OF OTHER PORTLAND CEMENT CONSTITUENTS ON THESE HYDRATION REACTIONS HAVE BEEN INVESTIGATED. A STUDY OF HYDRATION OF COMBINATIONS OF THE VARIOUS CONSTITUENTS HAS LED TO A FAIRLY COMPLETE PICTURE OF THE EARLY HYDRATION REACTIONS OF PORTLAND CEMENT. A FEW WELL-KNOWN ACCELERATING AND RETARDING MATERIALS HAS SHOWN THEM TO AFFECT PRIMARILY THE HYDRATION RATE OF C3S. THEY MAY AFFECT THE RATES BUT NOT THE NATURE OF THE EARLY C3A REACTIONS. RETARDERS CAN PRODUCE A LARGE INITIAL ACCELERATION OF C3A HYDRATION WHEN CONSIDERED IN RELATION TO THE STATE OF THE CALCIUM SULFATE IN THE PASTE. THIS PREVIOUSLY UNRECOGNIZED EFFECT CAN ACCOUNT FOR MANY INSTITUTIONS TO PRODUCE EXCESSIVE EXPANSION AND LOWERED STRENGTH. THIS WATER IMBIBITION IS A MAJOR FACTOR IN THE BEHAVIOR OF SHRINKAGE- COMPENSATING AND EXPANSIVE CEMENTS. /AUTHOR/

Selzmann, P Greening, NR *Highway Research Record, Hwy Res Board* 1964

**2A 211961**

**EFFECTS OF SEAWATER ON CONCRETE**

CONCRETE EXPOSED TO SEAWATER IS WETTED BY A SOLUTION OF SALT, ESPECIALLY SODIUM CHLORIDE AND MAGNESIUM SULFATE. DAMAGE TO CONCRETE, IF IT OCCURS, USUALLY RESULTS FROM FAILURE TO USE GOOD PRACTICES IN CONCRETE CONSTRUCTION, AND OFTEN IS THE RESULT OF FREEZING AND THAWING OR WETTING AND DRYING, AS MUCH AS OR MORE THAN THE EFFECTS OF SEAWATER AS SUCH. MAGNESIUM SULFATE MAY ATTACK MOST, IF NOT ALL, OF THE CONSTITUENTS OF HARDENED PORTLAND CEMENT PASTE, ESPECIALLY THE ALUMINATE CONSTITUENT. CHLORIDES MAY PROMOTE CORROSION OF STEEL. ALKALIES MAY PARTICIPATE IN ALKALI-AGGREGATE REACTION. THIS, CONCRETE EXPOSED TO SEAWATER SHOULD BE MADE WITH CEMENT OF CONTROLLED ALUMINATE CONTENT AND WITH NONREACTIVE AGGREGATE. EMBEDDED STEEL SHOULD BE WELL COVERED BY CONCRETE OF LOW PERMEABILITY, AND GOOD CONSTRUCTION PRACTICES SHOULD BE FOLLOWED. /AUTHOR/

Mather, B *Highway Research Record, Hwy Res Board* 1966

**2A 212089**

**PERFORMANCE OF ULTRASONIC EQUIPMENT FOR PAVEMENT THICKNESS MEASUREMENT AND OTHER HIGHWAY APPLICATIONS**

THE EQUIPMENT USED WAS A SONOSCOPE AND AN ASSOCIATED FREQUENCY GENERATOR AND COUNTER FOR DETERMINING REASONABLE FREQUENCY THROUGH THE DEPTH OF THE PAVEMENT SLAB. IT WAS CONCLUDED THAT THE EQUIPMENT IS NOT SATISFACTORY FOR MEASURING PAVEMENT THICKNESS IN CONSIDERATION OTHER APPLICATIONS IT WAS FOUND TO BE USEFUL IN DETERMINING THE CONTINUITY OF CONCRETE IN A STRUCTURE SUCH AS A SURVEY OF A BRIDGE DECK TO DETERMINE AREAS WITH DETERIORATED CONCRETE OR INCIPIENT SPALLING. USE OF PULSE VELOCITY FOR EVALUATING QUALITY OF FRESH CONCRETE WAS INVESTIGATED AND WAS NOT FOUND PROMISING FOR PRACTICAL CONTROL OF CONCRETE IN CONSTRUCTION. A LABORATORY INVESTIGATION OF THE EFFECT REINFORCING STEEL HAS ON PULSE VELOCITY MEASUREMENTS WAS CONDUCTED WITH STEEL VARYING FROM 0 TO 6 PERCENT OF THE VOLUME. IT WAS CONCLUDED THAT REINFORCING STEEL DOES NOT INFLUENCE PULSE VELOCITY WHEN THE PULSE MEASURING PATH CROSSES THE STEEL AS WOULD USUALLY BE THE CASE IN REINFORCED CONCRETE COLUMNS, SLABS AND BEAMS. /AUTHOR/

Scholer, CF

*Purdue & Ind State Hwy Comm Jbrp, Indiana State Highway Commission, Federal Highway Administration /US/*

**ACKNOWLEDGMENT:** Federal Highway Administration (460142470) REPORT PENDING, 1/32022302

**2A 212243**

**COMPLEX METHODS OF NON-DESTRUCTIVE TESTS OF CONCRETE IN CONSTRUCTION AND STRUCTURAL WORKS**

AN ANALYSIS OF NON-DESTRUCTIVE METHODS OF TESTING CONCRETE IS MADE WHERE THE COMPRRESSIVE STRENGTH IS RELATED, FOR EXAMPLE, TO IMPULSE PROPAGATION VELOCITY, FREQUENCY OF FREE VIBRATIONS, DENSITY OF CONCRETE, HARDNESS, TENSILE STRENGTH ETC., DEPENDING ON THE METHOD USED, AND THERE ARE FOUND TO BE CONSIDERABLE INHERENT ERRORS. THE ARTICLE SUGGESTS METHODS FOR THE SELECTION OF COMPLEX TESTS, AND THEIR
CONSTRUCTION MATERIALS

CLASSIFICATION, AND FORMULAS FOR CALCULATING THE STRENGTH OF CONCRETE OBTAINED BY SEVERAL METHODS. /RRL/


ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 212262

THE PERFORMANCE OF CONCRETE-RESISTANCE OF CONCRETE TO SULPHATE AND OTHER ENVIRONMENTAL CONDITIONS CONSTRUCTION IS Normally THE LARGEST OF A NATION'S INDUSTRIES AND THE USE OF CONCRETE EXCEEDS BY FAR THE USE OF ALL OTHER CONSTRUCTION MATERIALS COMBINED. THIS BOOK ON CONCRETE IS A COMPILATION OF SCIENTIFIC AND TECHNICAL PAPERS PRESENTED AT A SYMPOSIUM HELD IN HONOUR OF A CANADIAN SCIENTIST OF INTERNATIONAL STATURE, THE LATE THORBERGUR THO- WALDSON. IT IS INTENDED AS A MEMORIAL IN RECONCILIATION OF HIS GREAT CONTRIBUTION TO THE DEVELOPMENT OF SULPHATE RESISTANT CEMENT AND CONCRETE. THE ESTABLISHMENT OF SPECIFICATIONS AND RECOMMENDED PRACTICES REQUIRES KNOWLEDGE OF FIELD PERFORMANCE AS WELL AS CONCLUSIONS DRAWN FROM LABORATORY TESTING AND RESEARCH. THIS SYMPOSIUM PRESENTED AN UNUSUAL OPPORTUNITY TO GATHER THIS NEEDED ORIENTATION TO FIELD PERFORMANCE OF CONCRETE. ALTHOUGH MOST OF THE PAPERS DEAL WITH RESISTANCE OF CONCRETE TO SULPHATE ATTACK, SOME ARE CONCERNED WITH OTHER ASPECTS OF CONCRETE DURABILITY WHICH ARE PARTICULARLY PERTINENT TO CANADA. /CGRA/

Nrc Div Bldg Research /Can/

ACKNOWLEDGMENT: Canadian Good Roads Association

2A 212280

SAFE COMBINATIONS OF MIX PROPORTIONS, TEMPERATURE AND PROTECTION TIME IN WATER CONCRETING

THE PROBLEM FOR WINTER CONCRETING PRACTICE IS TO CONVERT THE NECESSARY PREHEATING TIME INTO ACTUAL TIME UNITS FOR STRUCTURAL CONCRETE MEMBERS. A CONCRETE STRUCTURE SHOULD BE PROTECTED AGAINST FREEZING DURING A PERIOD CORRESPONDING TO THE NECESSARY PREHEATING TIME. THE PROTECTION CAN BE PROVIDED BY COVERINGS AND INSULATION. THE PREHEATING TIME CAN BE DETERMINED FROM THE TEMPERATURE HISTORY WHICH IS DEPENDENT ON MANY VARIABLES. THESE VARIABLES ARE DISCUSSED: WATER-CEMENT RATIO, MAJORITY FACTOR, CONCRETE COMPOSITION, AND CEMENT CONTENT. AN EXAMPLE IS GIVEN COMPUTING HARDENING TIME FROM THE TEMPERATURE HISTORY VARIABLES GIVEN IN A TABLE OF RULES.

Jessing, J Highway Research Board Special Reports 1966

2A 212332

POZZOLANIC CLAYS OF INDIA: THEIR INDUSTRIAL EXPLOITATION AND USE IN ENGINEERING WORKS

AN INVESTIGATION INTO THE USE OF BURNT CLAY AS A POZZOLANA IS REPORTED DUE TO THE SHORTAGE OF CEMENT EXPERIENCED DURING THE PAST, THE CENTRAL ROAD RESEARCH INSTITUTE CONDUCTED FUNDAMENTAL AND APPLIED STUDIES ON THE USE OF BURNT CLAY AS A POZZOLANA WITH A VIEW TO EFFECT ECONOMY IN THE USE OF CEMENT AND IMPROVE THE PROPERTIES OF CONCRETE. AN ATTEMPT HAS BEEN MADE TO UNDERSTAND THE BASIC REACTION THAT TAKES PLACE WHEN SULPHUR IS PROCESSED FOR USE AS POZZOLANA, WHICH HAS LED TO CERTAIN ORIGINAL TRENDS OF THOUGHT. AS A RESULT, THE FUNDAMENTAL ASPECTS OF SURKHI ARE MUCH BETTER UNDERSTOOD NOW. IT has NOW BEEN POSSIBLE TO BRING FORTH FOR THE INDUSTRY AN IMPROVED BUILDING MATERIAL NAMELY Reactive Sorkhi WHICH COULD CONSIDERABLY EASE THE DIFFICULTIES FACED BY BUILDERS DUE TO SHORTAGE OF CEMENT. COMPARED TO THE SURKHI WHICH IS COMMONLY AVAILABLE IN THE MARKET AS A COARSE POWDER DERIVED FROM WASTE BRICKS, THE REACTIVE SURKHI COULD DEVELOP 4 TO 5 TIMES THE STRENGTH WITH LIME IN MORTARS. THE VOLUME CONSISTS OF A SURVEY OF DEPOSITS OF THE CLAYS IN VARIOUS PARTS OF INDIA; CHAPTERS ON INDUSTRIAL EXPLOITATION OF LOCATED DEPOSITS AND UTILIZATION OF REACTIVE SURKHI IN VARIOUS TYPES OF CONSTRUCTION, A BIBLIOGRAPHY ON POZZOLANAS, /1925-1963/, CONSISTING OF 32 PAGES IS APPENDED. /AUTHOR/

Central Road Research Inst of India 1964

ACKNOWLEDGMENT: Highway Res Abstracts Hwy Res Board

2A 212399

ULTRASONIC MEASUREMENTS ON REINFORCED GRAVEL-AGGREGATE CONCRETES

POSSIBLE APPLICATION OF MEASUREMENTS OFULTRASONIC PULSE VELOCITY AS A TEST METHOD FOR PRACTICAL CASES IN CONCRETE BUILDING IS BEING INVESTIGATED. RESEARCH WORK IS ESPECIALLY AIMED AT THE USEFULNESS OF THE VARIATION OF MEASURED VALUES FOR ESTIMATING THE CRACK STATE OF A CONSTRUCTION. A DISTINCT AND REPRODUCIBLE DEPENDENCY OF THE VARIATION OF TEST DATA ON THE DEGREE OF PRE-LOAD WAS ESTABLISHED WITH 27 GRAVEL-AGGREGATE HEAVY-WEIGHT CONCRETES OF DIFFERENT COMPOSITION. THE INVESTIGATIONS HAVE BEEN EXTENDED TO DIFFERENT TRANSVERSAL REINFORCEMENT CONTENTS. WITHIN THE RANGE UP TO 7% TRANSVERSAL STEEL III REINFORCEMENT THERE WAS A SLIGHT INFLUENCE OF THE REINFORCEMENT ON THE ABSOLUTE VALUES OF PULSE VELOCITY MEASURED. NEVERTHELESS, THE CHARACTERISTIC DEPENDENCY OF TEST DATA VARIATION ON THE CRACK STATE COULD BE FULLY ESTABLISHED FOR THIS WHOLE RANGE. /AUTHOR/

Kordina, K Roy, V Waubke, NV Material Prufung /Germany/ Mar. 1967

ACKNOWLEDGMENT: Highway Res Abstracts Hwy Res Board

2A 212555

THE INITIAL CRACKING OF HIGHWAY CONCRETE

SOMETIMES A CONCRETE PAVEMENT CRACKS DURING THE FIRST FEW DAYS AFTER IT HAS BEEN LAID, BEFORE BEING SUBJECT TO TRAFFIC. THIS CRACKING HAS A TWIN ORIGIN. IT IS RELATED TO HYGROMETRIC AND THERMAL SHRINKAGE. HYGROMETRIC, OR DRYING, SHRINKAGE IS IMPORTANT, BECAUSE IT VERY RAPIDLY AFFECTS THE MASS OF THE PAVEMENT. WHEN THE CONCRETE IS PROPERLY PROTECTED AGAINST EVAPORATION, THERMAL SHRINKAGE BECOMES THE MAIN CAUSE OF CRACKING. THE INCREASE IN THE INTERNAL TEMPERATURE OF THE PAVEMENT DURING THE FIRST FEW HOURS IS DUE TO EXOTHERMIC SETTING REACTIONS. THE REDUCTION OF THE INTERNAL TEMPERATURE DEPENDS ON THE MORE OR LESS SUDDEN STOPPAGE OF THE SETTING REACTIONS AND ON THE ENVIRONMENT OF THE PAVEMENT. THE AMBIENT TEMPERATURE DOES NOT SEEM TO BE ONE OF THE MOST IMPORTANT FACTORS INFLUENCING THE INTERNAL TEMPERATURE OF THE PAVEMENT. WHEN AN ISOLATED CRACK APPEARS, ITS CAUSE CANNOT BE FOUND AMONG THE FACTORS WHICH INFLUENCE THERMAL OR DRYING SHRINKAGE. AS A RULE IT HAS AN ACCIDENTAL CAUSE RESULTING FROM THE HAZARDS OF CONCRETE PRODUCTION OR OF THE LAYING OF THE PAVEMENT. IN ORDER TO REDUCE THE RISKS OF CRACKING ON A CONSTRUCTION SITE, IT IS ADVISABLE TO CHOOSE WITH CARE THE AGGREGATES & CEMENT USED, AND TO MAKE SURE THAT PRODUCTION AND LAYING ARE REGULAR. /BLLRPC/

Brachet, M Baron J Bull Liaison Labs Routiers /France/ July 1967

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CONSTRUCTION MATERIALS

2A 212562
THE EARLY STRENGTH OF CONCRETE UNDER NATURAL CONDITIONS OF HARDENING
THE OBJECT OF THE PRESENT ARTICLE IS NOT MERELY TO DESCRIBE THE ALREADY FUNDAMENTALLY KNOWN QUALITATIVE EFFECT OF TEMPERATURE, AGE, KIND OF CEMENT AND WATER/CEMENT RATIO UPON THE EARLY STRENGTHS OF CONCRETE. IN ADDITION, IT INDICATES WAYS AND MEANS WHEREBY THE CONCRETE MANUFACTURER CAN, WITH SIMPLE AND CONVENIENT METHODS ESTIMATE THE ORDER OF MAGNITUDE OF THE EFFECTIVE STRENGTHS OF CONCRETE AT AN EARLY AGE. A TENTATIVE START HAS BEEN MADE WITH CLASS 475 PORTLAND CEMENT (SPECIFIED 28-DAY STRENGTH 475 KG/CM). IT COULD BE ADVANTAGEOUS TO EXTEND THESE INVESTIGATIONS TO INCLUDE OTHER KINDS OF CEMENT. THIS WILL, IT IS TRUE, INVOLVE CONSIDERABLE EXPENDITURE, BUT IS INDEED JUSTIFIED, HAVING REGARD TO THE INCREASE IN OUR KNOWLEDGE OF CONCRETE MATERIALS AND TO THE POSSIBLE EASIER WORKING PROCEDURES THAT WILL RESULT THEREFROM.

2A 212589
APPLICATION OF INSTRUMENTAL METHODS FOR EVALUATING HIGHWAY MATERIALS
A RELIABLE COLORIMETRIC METHOD FOR DETERMINING PLASTIMENT A RETARDER IN HARDENED CONCRETE CONTAINING GRAVEL, LIMESTONE, OR SLAG AGGREGATES HAS BEEN DEVELOPED WHICH GENERALLY YIELDS AN ACCURATE DEGREE OF PLUS OR MINUS 0.4 OZ PER SACK OF CEMENT.

2A 212650
USE OF NEUTRON ACTIVATION TO DETERMINE CEMENT CONTENT OF PORTLAND CEMENT CONCRETE
MANY MILLIONS OF DOLLARS ARE SPENT EACH YEAR BY THE CONSTRUCTION INDUSTRY FOR PORTLAND CEMENT CONCRETE. THEIR USE IN A VARIETY OF MATERIALS MODIFIES CONCRETE PROPERTIES, (1) THE MECHANISMS BY WHICH THESE MATERIALS MODIFY CONCRETE PROPERTIES, (2) THE EFFECTS DEPENDING UPON THE OTHER MATERIALS INVOLVED, THE TYPE OF CONCRETE, AND THE EXISTING TEMPERATURE, (3) THE TYPE OF CONSTRUCTION AND THE CONDITIONS UNDER WHICH THEIR USE IS PARTICULARLY ADVANTAGEOUS, (4) THE PROBLEMS IN CONTROL AND APPLICATION BROUGHT ABOUT BY THEIR USE, (5) THE PROBLEMS OF CONCRETE DESIGN, SPECIFICATIONS, AND (6) RESEARCH UNDER WAY TO PRODUCE EVEN BETTER AND MORE RELIABLE ADMIXTURES ECONOMICALLY.


APPLICATION OF STATISTICAL METHODS TO LABORATORY FREEZE-THAW TEST DATA

FLY ASH IN CONCRETE, AN EVALUATION-ANNOTATED BIBLIOGRAPHY
REFERENCES ARE LISTED ON FLY ASH IN CONCRETE AND RELATED SUBJECTS INCLUDING LIGHTWEIGHT AGGREGATE CONCRETE, CONCRETE AND CEMENT PROPERTIES, PULVERIZED FUEL FLY ASH, CONCRETE ADMIXTURES, POZZOLANS, PULVERIZED COAL ASH, WEATHER RESISTANCE, LEAN CONCRETE PROPERTIES, DURABILITY, AIR CONTENT, WATER RESISTANCE, CORROSION, DAM CONSTRUCTION, AND CONCRETE MANUFACTURING.

2A 212702
SYMPOSIUM ON EFFECT OF WATER-REDUCING ADMIXTURES AND SET-RETARDING ADMIXTURES ON PROPERTIES OF CONCRETE

TESTS OF CERTAIN CEMENTS AND CEMENT BLENDS, REGARDING THEIR SUITABILITY FOR CONCRETE CONSTRUCTION
LABORATORY TESTS WERE PERFORMED ON MIXES CONTAINING UNIVERSAL ATLAS PORTLAND CEMENTS. STATE LINE
FLY-ASH AND LOUISVILLE NATURAL CEMENT. THESE TESTS WERE CONDUCTED TO COMPARE CERTAIN PHYSICAL AND CHEMICAL PROPERTIES OF CONCRETE MADE WITH TYPE I AND TYPE II PORTLAND CEMENTS WITH CONCRETE MADE WITH SUCH PORTLAND CEMENTS AND FLY-ASH AND NATURAL CEMENT SUBSTITUTED FOR A PORTION OF THE PORTLAND CEMENT. THIS COMPARATIVE TEST DATA WAS DESIGNED TO AID IN SELECTING THE PROPER TYPE OF PORTLAND CEMENT OR BLEND TO BE USED IN THE CONSTRUCTION OF ROADS, STRUCTURES, AND SEWERS AND SEWAGE TREATMENT PLANTS IN THE CHICAGO AREA. THE FOLLOWING TESTS WERE PERFORMED: COMPRESSION TEST, FREEZING AND THAWING TEST, VOLUME CHANGE TEST, ABRASION TEST, HEAT OF HYDRATION, SODIUM SULFATE TEST AND SULFURIC ACID TEST. THE BLENDED CEMENT MIXTURES WERE NOT ANY MORE ADVERSELY AFFECTED BY LOWER CURING TEMPERATURES THAN THE TYPE I AND TYPE II PORTLAND CEMENT MIXES TESTED. BLENDED CEMENT MIXTURES SIMILARLY CURED COMPARED FAVORABLY WITH STRAIGHT PORTLAND CEMENT EXCEPT AT EARLY AGES. A MANDATORY REQUIREMENT FOR PRODUCING CONCRETE RESISTANT TO THE ATTACK OF FREEZING AND THAWING WAS A SUFFICIENT AMOUNT OF PURPOSEFUL AIR-ENTRAINMENT. FLY-ASH WAS SHOWN TO HAVE A HEAT EVOLUTION CONSIDERABLY LESS THAN THE PORTLAND AND NATURAL CEMENTS USING FLY-ASH AS AN ADMIXTURE. HOWEVER, INCREASES THE HEAT PRODUCING MATERIAL IN THE MIXTURE SO THAT MORE HEAT IS PRODUCED IN HYDRATING. CEMENT BLENDS OF TYPE I PORTLAND CEMENT WITH FLY-ASH OR NATURAL CEMENT PROVE TO BE MORE RESISTANT THAN MIXES MADE ENTIRELY OF STRAIGHT TYPE I PORTLAND CEMENT IN THE SODIUM SULFATE TEST. THE SULFURIC ACID TEST RESULTS CORROBORATE THE FINDINGS OF THE SODIUM SULFATE TEST. IT IS CONCLUDED THAT CONCRETE CONTAINING TYPE I PORTLAND CEMENT AND SUFFICIENT AIR-ENTRAINMENT SATISFIES THE COMPRESSION STRENGTH AND RESISTANCE OF FREEZING AND THAWING REQUIREMENTS AND PROVIDES SUFFICIENT EARLY STRENGTH TO PERMIT THE PAVEMENT TO BE OPENED TO TRAFFIC AT THE Earliest possible TIME. WHEN THERE IS NO GREAT URGENCY TO OPEN HIGHWAYS TO TRAFFIC, AND EARLY STRENGTH REQUIREMENTS ARE NOT REQUIRED, A BLENDED MIX OF TYPE I PORTLAND CEMENT AND FLY-ASH MAY BE MORE ECONOMICAL.

Chicago Conf Com On Concrete Tests June 1953

2A 212798

Sherwood, PT Ryley, MD
Ministry of Transport, London /UK/ 1966

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 212808
INCREASED STRENGTH IN CEMENT CONCRETE REINFORCED WITH VARIOUS FIBRES, WITH PARTICULAR REFERENCE TO USE IN ROAD CONSTRUCTION. FIRST EXPERIMENTAL RESULTS
LABORATORY EXPERIMENTS WERE CARRIED OUT USING STEEL, NYLON OR ASBESTOS FIBRE. TABLES SHOW THE CALCULATED AND TESTED FLEXURAL AND COMpressive STRENGTHS OF THE REINFORCED CONCRETES AS COMPARED WITH THOSE OF PLAIN CONCRETE OF SIMILAR COMPOSITION. AFTER TESTING TO DESTRUCTION BY FLEXURAL LOADS, RESULTS OF THE EXPERIMENTS SHOWED THAT STEEL FIBERS TEND TO INCREASE FLEXURAL STRENGTH, NYLON WAS USELESS BECAUSE OF INSUFFICIENT ADHESION TO THE MORTAR, THE FIBERS BEING EASILY EXTRACTABLE FROM THE BROKEN SAMPLES, AND ASBESTOS FIBERS HAD VERY LOW TENSILE STRENGTH BUT GOOD ADHESION TO THE MORTAR. IN INITIAL TESTS, FIBERS WERE USED IN THE FOLLOWING PROPORTIONS 0.3 MM DIAMETER STEEL IN PIECES 2 CM LONG COMPRISING 4 PER CENT BY WEIGHT OF THE DRY MIX, 100/1 NYLON FIBRE IN PIECES 2 CM LONG COMPRISING 0.5 PER CENT BY WEIGHT OF THE DRY MIX, AND SHORT LOOSE ASBESTOS FIBERS COMPRISING 0.5 PER CENT BY WEIGHT OF THE DRY MIX. SOME RESULTS OF TESTS WITH GLASS AND SOFT IRON FIBERS ARE ALSO GIVEN. FURTHER LABORATORY TESTS AND PRACTICAL TESTS ON ROADS, VARYING THE AMOUNT AND SIZE OF THE FIBERS, ARE ENVISAGED. /RRL/

Balzano, M Le Strade /Italy/ Feb. 1967

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 212853
EVALUATION OF PLASTICIZERS AND AIR-ENTRAINING AGENTS FOR USE IN CEMENT MORTAR AND CONCRETE A NUMBER OF PROPRIETARY ADMIXTURES, WHICH HAVE HELPED IN DISPERSING CEMENT PARTICLES OR FLOCCULATING THE SAME, HAVE BEEN USED IN CONCRETE CONSTRUCTION TO IMPROVE THEIR QUALITY, STRENGTH AND DURABILITY. FOUR TYPES OF IMPORTED PLASTICIZERS AND FIVE DIFFERENT AIR ENTRAINING AGENTS HAVE BEEN STUDIED WITH A VIEW TO IMPROVE THE WORKABILITY AND STRENGTH OF CEMENT MORTAR AND CONCRETE EFFICACY OF INDIGENOUSLY MADE AIR ENTRAINING AGENTS WITH RESPECT TO IMPORTED ONES HAS BEEN COMPARED. THE STUDY HAS REVEALED THAT BY INCORPORATION OF PLASTICIZERS IN CEMENT MORTAR AND CONCRETE, THERE WAS A DEFINITE IMPROVEMENT IN STRENGTH. AIR ENTRAIN CONCRETE GENERALLY EXHIBITED LOW STRENGTH BUT BY SUITABLE ADJUSTMENT OF SAND: AGGREGATE RATIO, IT WAS POSSIBLE TO COUNTERACT THE LOSS OF STRENGTH AND OBTAIN HIGH COMpressive AND FLEXURAL STRENGTHS IN COMPARISON TO PLAIN CONCRETE MIXES. /CRIC/FRS
/LCPC/RRL/A/

Pais-cuddou, IC Rawal, AC Int! Symp Admix Mortar & Conc. /Italy/ 1967

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 213008
REGULATIONS FOR REINFORCED, AND PRESTRESSED LIGHTWEIGHT AGGREGATE CONCRETE IN VARIOUS COUNTRIES THE SPECIFICATIONS AND RECOMMENDATIONS VALID IN VARIOUS EUROPEAN COUNTRIES, GREAT BRITAIN AND THE U.S.A ARE DISCUSSED. THESE RELATE TO COMPOSITION OF LIGHTWEIGHT CONCRETE, PROPERTIES OF LIGHTWEIGHT CONCRETE, DESIGN OF STRUCTURAL MEMBERS AND RECOMMENDATIONS FOR SPECIFIC MEMBERS. /RRL/

Wesbehe, K Cement & Concrete Assoc, London /UK/ May 1968

ACKNOWLEDGMENT: Road Research Laboratory /UK/
CONSTRUCTION MATERIALS

2A 213172
SYNTHETIC RESINS IN CONSTRUCTION, RILEM SYMPOSIUM, PARTS, 4-6 SEPTEMBER 1967 (VOLUME 1)
"SYNTHETIC RESINS IN CONSTRUCTION" WAS THE THEME AT THE RILEM SYMPOSIUM IN PARIS, FRANCE IN SEPTEMBER 1967. SEVENTEEN PAPERS WERE PRESENTED ON THE THEME "CONCRETE AND MORTARS: IMPROVEMENT BY THE ADDITION OF RESINS" AND EIGHTEEN ON THE TOPIC "CONCRETES AND MORTARS WITHOUT CEMENT". /LCPC-RRL/

Editions Eyrolles /France/ Vol. 1 1970, 475 pp, Figs, Tabs, Photos, Refs

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

2A 213178
EMISSION OF HEAT BY CONCRETE

Zaporozets, ID Okorokov, DD Pariskii, AA
Izdatelstvolit Stroitelstvu /Ussr/ 1966, 300 pp, Figs, Tabs, 138 Ref

2A 213179
THERMAL TREATMENT OF CONCRETE
METHODS USED TO ACCELERATE THE SETTING AND HARDENING OF CONCRETE ARE OUTLINED. A STUDY IS MADE OF THERMAL TREATMENTS WITH PARTICULAR ATTENTION TO THE THERMOCHEMISTRY OF HYDRATION AND THERMAL CURING PROCESSES WHICH ACCELERATE SETTING BY RAISING THE TEMPERATURE OF THE BINDER. THE INFLUENCE OF OTHER A WIDE VARIETY OF SPECIMENS AVERAGE 18.8 PERCENT AND EXCEEDED 30 PERCENT FOR SOME GROUPS OF SPECIMENS. IT IS RECOMMENDED THAT SPECIAL CALIBRATIONS BE PROVIDED FOR EACH MIX OR CHANGE OF AGGREGATE, AND THAT USE OF THE TEST HAMMER ON WEAK OR YOUNG CONCRETE BE KEPT TO A MINIMUM BECAUSE SUCH TESTING MAY PRODUCE SIGNIFICANT SURFACE BLEMISHES. /AUTHOR/


2A 213202
COMPARISON OF TYPE I AND TYPE III PORTLAND CEMENTS FOR SOIL STABILIZATION
TEST DATA ARE PRESENTED WHICH INDICATE THE POSSIBILITY OF SIGNIFICANT ECONOMIC AND/OR STRUCTURAL ADVANTAGES IN USING TYPE III HIGH-EARLY-STRENGTH PORTLAND CEMENT INSTEAD OF TYPE I NORMAL PORTLAND CEMENT FOR SOIL-CEMENT ROAD CONSTRUCTION. THE DATA ALSO INDICATE THAT HIGH ALKALI CONTENT IN TYPE I CEMENT MAY BE BENEFICIAL TO THE STRENGTH OF CEMENT-TREATED SOIL IF THE SOIL CONTAINS A RELATIVELY HIGH PROPORTION OF CLAY-FREE QUARTZ SURFACES. TEST METHODS AND CRITERIA FOR EVALUATING THE STRENGTH AND DURABILITY OF CEMENT-TREATED FINE-GRAINED SOILS ARE PRESENTED AND DISCUSSED. THE MINIMUM TYPE I AND TYPE III CEMENT REQUIREMENTS FOR SOIL-CEMENT INDICATED BY THESE METHODS, FOR THE SANDY, SILTY AND CLAYEY SOILS STUDIED, WERE SURPRISINGLY LOW. /AUTHOR/

Davidson, DT Bruns, BW Highway Research Board Bulletin 1960

2A 213249
FLY ASH UTILIZATION

2A 213194
INVESTIGATION OF THE IMPACT-TYPE CONCRETE TEST HAMMER
THIS WORK DESCRIBES A SERIES OF TESTS DESIGNED TO DETERMINE THE RELIABILITY OF RESULTS, THE FEASIBILITY OF USE, AND THE PRACTICAL APPLICATIONS OF THE TEST HAMMER IN CONSTRUCTION CONTROL. TEST RESULTS ARE COMPOSED TO THE PUBLICATION OF OTHER INVESTIGATORS AND THE RELIABILITY OF CALIBRATION CURVES UNDER VARIOUS TEST CONDITIONS IS CAREFULLY INVESTIGATED. INDICATED STRENGTHS ARE SIGNIFICANTLY AFFECTED BY SPECIMEN SIZE, RESTRAINT OR CLAMPING IN TESTING MACHINE, SURFACE TEXTURE, MIX PROPORTIONS, AND TYPE OF AGGREGATE. COEFFICIENT OF VARIATION OVER A WIDE VARIETY OF SPECIMENS AVERAGE 18.8 PERCENT AND EXCEEDED 30 PERCENT FOR SOME GROUPS OF SPECIMENS. IT IS RECOMMENDED THAT SPECIAL CALIBRATIONS BE PROVIDED FOR EACH MIX OR CHANGE OF AGGREGATE, AND THAT USE OF THE TEST HAMMER ON WEAK OR YOUNG CONCRETE BE KEPT TO A MINIMUM BECAUSE SUCH TESTING MAY PRODUCE SIGNIFICANT SURFACE BLEMISHES. /AUT

186
CONSTRUCTION MATERIALS

Faber, JH Capp, JP Spencer, JD
Bureau of Mines /US/ 1967

2A 213342
GLASS FIBERS REINFORCE CONCRETE
LABORATORY TESTS ARE BEING CONDUCTED ON FYCRETE, A MATERIAL WHICH STRENGTHENS CONCRETE IN MUCH THE SAME WAY THAT GLASS FIBERS REINFORCE PLASTICS. THIS CONCRETE BUILDING MATERIAL SUBSTITUTES SMALL GLASS FIBER RODS FOR CONVENTIONAL STEEL REINFORCING BARS AND COULD SUBSTANTIALLY CUT THE COSTS OF ALL TYPES OF CONCRETE CONSTRUCTION. FLEXIBLE GLASS RODS ARE ADDED TO A BATCH OF CEMENT, AGGREGATE AND WATER AS AN INTEGRAL PART OF THE CONCRETE MIX. THE RODS ARE ABOUT AS LONG AS, BUT THINNER THAN A PIECE OF SPAGHETTI, CONSISTING OF 3,000 GLASS FIBER FILAMENTS EACH ONE-TENTH THE THICKNESS OF A HUMAN HAIR. THE FILAMENTS ARE BOUND TOGETHER WITH AN EPOXY RESIN. THEY ARE SAID TO HAVE SIX TIMES THE TENSILE STRENGTH OF MILD STEEL. ACCORDING TO THE INVENTOR, THE GLASS REINFORCING IS 55 PERCENT CHEAPER THAN STEEL, AND IN SIMPLELY SUPPORTED BEAMS RESULTS IN MEMBERS THAT ARE ONLY 75 PERCENT AS DEEP AS NORMAL ONES. FYCRETE WILL RESIST THE CRACKING OCCURRING IN HIGHWAYS AND ROADWAYS WHICH FREEZE, THEN EXPAND AND CRACK.

Engineering News-record Jan. 1969

2A 213347
CONCRETE PERFORMANCE AS RELATED TO THE BEHAVIOR OF CARBONATE AGGREGATES
THE PROBLEM IS DISCUSSED OF FACTORS WHICH APPEAR TO BE ACTING TO DECREASE THE SERVICE PERFORMANCE OF CONCRETES MADE WITH PREVIOUSLY PROVED CARBONATE ROCKS. BOTH EXPANSIVE AND RIM-DEVELOPING CARBONATE ROCKS ARE BEING USED IN MISSOURI IN HIGHWAY CONSTRUCTION. SINCE GENERAL USE OF DE-ICING SALTS WAS STARTED, AN INCREASED AMOUNT OF CRACKING, WHICH APPEARS TO BE SIMILAR TO THAT ATTRIBUTED TO ALKALI-CARBONATE REACTIVITY, HAS BEEN OBSERVED IN PORTLAND CEMENT CONCRETE PAVEMENTS IN MISSOURI. EVIDENCE HAS BEEN PRESENTED OF EXCESSIVE EXPANSION OF CONCRETE CONTAINING AN UNAPPROVED COARSE AGGREGATE. ALTHOUGH INCREASED CRACKING IS OCCURRING, NO POSITIVE EVIDENCE OF SERIOUS REDUCTION IN SERVICE LIFE HAS BEEN OBTAINED. SINCE BOTH EXPANSIVE AND RIM-DEVELOPING CARBONATE ROCKS ARE BEING USED, THEIR PERFORMANCE IN CONCRETE IS BEING CAREFULLY WATCHED FOR EVIDENCE OF INCREASED RATE OF DETERIORATION. CONSIDERABLE WORK IS BEING CONDUCTED TO DETERMINE (1) THE SOURCE AND AMOUNT OF EXPANSIVE ROCK BEING USED, AND (2) THE PROBLEMS THAT WOULD BE ENCOUNTERED IN CONTROLLING THEIR USE.

Axon, EG Highway Geology Symposium, Iowa State U July 1968

2A 213363
FYCRETE-A NEW CONCRETE BUILDING MATERIAL
A NEW BUILDING MATERIAL, FYCRETE, CONCRETE REINFORCED WITH GLASS FIBER RODS HAS BEEN DEVELOPED AND TESTED TO SUCH AN EXTENT THAT IT IS 50% CHEAPER, SIX TIMES STRONGER IN TENSILE STRENGTH, AND MORE CRACK RESISTANT THAN CONVENTIONAL STEEL-REINFORCED CONCRETE. FYCRETE IS COMPOSED OF SMALL LENGTHS OF GLASS FIBER STRANDS, IMPREGNATED WITH RESIN AND CONCRETE, JOINTLESS HIGHWAYS AND AIRPLANE RUNWAYS, CRACK RESISTANT BOMB SHELTERS, AND RESERVOIRS THAT WITHSTAND FREEZING AND THAWING ARE ALL POSSIBILITIES WHEN CONSTRUCTED WITH THIS NEW MATERIAL.

Concrete Construction Apr. 1969

2A 213376
HIGH-STRENGTH STRAND REINFORCEMENT FOR CONCRETE
A NEW THREE-WIRE STRAND, KNOWN AS BRISTRAND 100, HAVING A GUARANTEED 0.2% PROOF STRESS OF 100,000 LB/IN SQUARES, HAS BEEN DEVELOPED FOR USE AT A PERMISSIBLE WORKING STRESS OF 50,000 LB/IN SQUARES AS REINFORCEMENT IN NORMAL (I.E. NON-PRESTRESSED) CONCRETE CONSTRUCTION. THE DEVELOPMENT AND MANUFACTURE OF THE STRAND ARE EXPLAINED. DETAILS ARE GIVEN OF TESTS ON RECTANGULAR AND T-BEAMS REINFORCED WITH VARIOUS PERCENTAGES OF THREE-WIRE STRAND AND THE RESULTS OBTAINED ARE DISCUSSED AND COMPARED WITH THEORETICAL VALUES GIVEN BY A SUITABLE DESIGN METHOD. PARTICULAR ATTENTION IS PAID TO DEFORMATIONS AND CRACK WIDTHS, WHICH ARE OFTEN THE CRITICAL FACTORS CONTROLLING THE USE OF ULTRA-HIGH-STRENGTH STEEL AS REINFORCEMENT.

Abeles, PW Gill, VL Concrete /UK/ Apr. 1969

2A 213423
CONCRETE DETERIORATION IN BRIDGES
A SURVEY IS MADE OF CONCRETE DETERIORATION IN BRIDGES. RECOMMENDATIONS ARE MADE FOR REMEDIAL ACTION TO SUCH BRIDGES BY REQUIRING: (1) MINIMUM COVER OF 2 1/2 INCHES BE PROVIDED FOR THE TOP REINFORCING STEEL, (2) DESIGNS WITHOUT CURBS TO FACILITATE FLUSHING OF SALT FROM THE DECK BY RAIN AND/OR WATER TRUCKS, (3) A CEMENT FACTOR OF NOT LESS THAN 6 1/2 SACKS BE USED, (4) AIR ENTRAINMENT BE CONTINUED WITH INCREASED ENSUING GIVEN TO CONTROL OF THE AMOUNT AND DISTRIBUTION, (5) LINSEED OIL TREATMENTS BE APPLIED TO ALL NEW CONSTRUCTION BEFORE THE BRIDGE IS OPENED TO TRAFFIC, (6) DE-ICING SALTS NOT BE APPLIED TO STREETS OR近く PAYMENT INTO THE FIRST YEAR OF LIFE, (7) SPECIFICATIONS GOVERNING CONCRETE CONSTRUCTION BE REVISED TO INCLUDE THE RECOMMENDATIONS OF ACI COMMITTEE 605 ON HOT WEATHER CONCRETEING, (8) INCREASED ATTENTION BE GIVEN TO OTHER WELL KNOWN REQUIREMENTS FOR OBTAINING QUALITY CONCRETE, PARTICULARLY ON SUCH MATTERS AS WATER ADDED TO THE MIX AND TO THE SURFACE BY ANY MEANS, AND (9) THE TRAINING LEVEL OF INSPECTORS BE INCREASED.

Yantis, CW Oklahoma Highway & Street Conf Proc pp 17-24, Feb. 1967

2A 213444
PREPLACED AGGREGATE CONCRETE FOR STRUCTURAL AND MASS CONCRETES
USES ARE OUTLINED OF THIS METHOD OF PREPLACED AGGREGATE CONCRETE CONSTRUCTION. SELECTION IS DISCUSSED OF MATERIALS AND GROUT MIX PROPORTIONING. RECOMMENDATIONS FOR FORM PREPARATION, AGGREGATE PLACING, ARRANGEMENT OF PIPING, GROUT PUMPING AND SEQUENCE OF INJECTION, FINISHING, CURING, AND METHODS OF QUALITY CONTROL ARE MADE. FUNDAMENTALS OF GOOD PRACTICE IN PREPLACED AGGREGATE CONSTRUCTION ARE RECOMMENDED BY WHICH, UNANTICIPATED PROBLEMS CAN BE REMEDIED OR AVOIDED. /ACIJP/

Am Concrete Inst Journal & Proceedings Oct. 1969

2A 213529
PLASTIC SHRINKAGE
PLASTIC SHRINKAGE AND PLASTIC SHRINKAGE CRACKING SOMETIMES OCCUR IN THE EXPOSED SURFACE OF FRESHLY-PLACED CONCRETE. THIS SHRINKAGE AND CRACKING IS CAUSED BY A RAPID EVAPORATION OF WATER FROM THE SURFACE OF THE CONCRETE. CONDITIONS THAT DETERMINE THE RATE OF EVAPORATION ARE DESCRIBED. CONSTRUCTION PROCEDURES AND PRACTICES THAT CAN MINIMIZE THE CAUSES OF THIS TYPE OF SHRINKAGE AND CRACKING

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2A CONSTRUCTION MATERIALS

ARE RECOMMENDED. SPECIFIC CASES CITED SHOW HOW APPLICATION OF THESE PROCEDURES HAS SOLVED THE PROBLEM. IT IS BELIEVED THAT THE RECOMMENDED CORRECTIVE MEASURES WILL SOLVE THE PROBLEM OF PLASTIC SHRINKAGE AND PLASTIC SHRINKAGE CRACKING ON CONSTRUCTION PROJECTS. /PCA/

Lerch, W Portland Cement Assoc R & D Lab Bull No 81
ACKNOWLEDGMENT: Portland Cement Assoc R & D Lab Bull, No 228, July 1969

2A 213683 RESEARCH ON CONCRETE PROBLEMS OF RESEARCH IN CONCRETE AND CEMENT ARE CRITICALLY CONSIDERED BECAUSE OF THE PROFIT SQUEEZE EXISTING IN THE INDUSTRY. A PROGRAM OF RESEARCH AND DEVELOPMENT IS ADVOCATED, CARRIED OUT IN WIDELY SEPARATED PLACES, BY PEOPLE OF DIFFERENT BACKGROUNDS, FOR CONTRIBUTINGULTIMATELY TO A UNIFIED UNDERSTANDING OF CONCRETE. THE FUTURE OF THE CONCRETE INDUSTRY DEPENDS TO A LARGE DEGREE ON THE SUCCESS OF MATERIALS SCIENTISTS USE IN FILLING THE GAPS IN KNOWLEDGE RELATING TO THE FUNDAMENTAL NATURE, CONSTITUTION, MICROSTRUCTURE, FABRIC, AND EVOLUTION OF THE SYSTEM KNOWN AS CONCRETE. EVERY MAJOR CONSTRUCTION CONTRACT OF THE U.S. ARMY CORPS OF ENGINEERS CONTAINS A VALUE ENGINEERING INCENTIVE CLAUSE THAT INSTRUCTS THE CONTRACTORS TO COME TO THE CONTRACTING OFFICER WITH PROPOSALS BY WHICH CHANGES WILL BE MADE IN THE SPECIFICATIONS TO INCREASE THE CONTRACTOR'S PROFIT AND DECREASE THE CONTRACT PRICE. IT IS POINTED OUT THAT CONCRETE CAN BE AND HAS BEEN PRODUCED SO THAT IT HAS A UNIT WEIGHT, HARDENED, OF AS LOW AS 10 LB/CU FT OR AS HIGH AS 300 LB/CU FT, SO THAT IT HAS NO MEASURABLE PERMEABILITY, SO THAT WATER FLOWS THROUGH IT AS THROUGH LOOSE SAND, SO THAT IT HAS AN ULTIMATE COMpressive STRENGTH OF LESS THAN 50 PSI OR AS MUCH AS 25,000 PSI, AND WITH COMPARABLE EXTREME RANGES OF NUMEROUS OTHER PROPERTIES. NO WAY IS NOW KNOWN BY WHICH SOME OF THESE EXTREMES CAN BE ATTAINED SIMULTANEOUSLY IN A WAY THAT HAVING FOUND IT WAY IS KNOWN TO HAVE VERY LIGHTWEIGHT CONCRETE ALSO BE OF VERY HIGH STRENGTH. RESEARCHERS SHOULD BE LEARNING WHAT HAPPENS WHEN CEMENT AND WATER ARE MIXED, WHY CEMENT PASTE HARDENS, WHY CEMENT PASTE CHANGES VOLUME ON DRYING, WHAT HAPPENS AT THE BOUNDARY BETWEEN CEMENT PASTE AND AGGREGATE, HOW WATER MOVES A CONCRETE, AND HOW CAN CEMENT BE MADE MORE ECONOMICALLY. RESEARCH NEEDS TO DEVELOP MORE ACCURATE PROCEDURES OF ANALYSIS OF HARDENED CONCRETE TO ESTABLISH THE ORIGINAL PROPORTIONING OF CEMENT AND WATER. THERE IS NEED FOR RELIABLE DETERMINATION OF ORIGINAL WATER-CEMENT RATIO. HOWEVER, IT IS EMPHASIZED THAT RESEARCHERS SHOULD AVOID THE TENDENCY TO BELIEVE THAT MERELY USING A NEW PIECE OF GEAR OR EQUIPMENT WILL SOLVE PROBLEMS. IT IS POINTED OUT THAT IN THE DECADE FROM 1956-65, THE CORPS OF ENGINEERS REALIZED SAVINGS IN COST OF CIVIL WORKS CONSTRUCTION AS RESULT OF RESEARCH, OF MORE THAN FIVE TIMES THE COST OF THAT RESEARCH. CONCRETE RESEARCH HAS AN INCREASINGLY IMPORTANT ROLE TO PLAY IN PROVIDING THE KNOWLEDGE THAT WILL PERMIT SOCIETY TO PROVIDE PAVEMENTS AND OTHER CONCRETE STRUCTURES FOR PEOPLE AND TO REDUCE POLLUTION.

Mather. B Maryland University 1969

2A 213688 INVESTIGATION OF CONCRETE IN SERVICE AN ANALYSIS OF PROCEDURES, TECHNIQUES, AND EXAMPLES OF INVESTIGATION OF CONCRETE IN SERVICE IS NEEDED BECAUSE OF THE INCREASING FREQUENCY WITH WHICH SUCH STUDIES ARE UNDERTAKEN AND BECAUSE NEW METHODS FOR ANALYSIS AND EVALUATION OF CONCRETE IN SERVICE HAS BEEN DEVELOPED RECENTLY. INVESTIGATION OF ANY SUBSTANTIAL FAILURE OF CONCRETE SHOULD BE UNDERTAKEN IN ACCORDANCE WITH AN AGREED-UPON SCOPE, OBJECTIVE, PLAN OF ATTACK, AND PROSPECTIVE TIME SCHEDULE. THE TWO MOST IMPORTANT OBJECTIVES OF THE EXAMINATION OF CONCRETE IN SERVICE ARE: (1) TO ESTABLISH THE PROBABILITY AND EXTENT OF ACTUAL OR IMMINENT FAILURE, AND (2) TO CHOOSE APPROPRIATE REMEDIAL OR PROTECTIVE MEASURES. DIAGNOSIS OF REAL OR APPARENT FAILURE OR UNSATISFACTORY PERFORMANCE OF CONCRETE MAY BE UNDERTAKEN FOR SEVERAL REASONS: (1) CONCRETE INVOLVED IN UNSATISFACTORY PERFORMANCE MIGHT BE INVESTIGATED TO ESTABLISH THE ABILITY OF THE CONCRETE TO CONTINUE TO PERFORM UNDER ANTICIPATED CONDITIONS OF SERVICE, (2) STUDY TO IDENTIFY PROCESSES THAT HAVE CAUSED OR CONTRIBUTED TO UNSATISFACTORY PERFORMANCE, (3) DISCOVER ANY DEFECTS IN THE CONCRETE OR THE CONSTRUCTION THAT CONTRIBUTED TO THE UNSATISFACTORY CONDITION, (4) TO ESTABLISH REMEDIAL OR PROTECTIVE MEASURES THAT SHOULD BE APPLIED TO PROVIDE FOR CONTINUING SERVICE, AND (5) THE FIXING OF FINANCIAL OR LEGAL RESPONSIBILITY FOR THE FAILURE OR UNSATISFACTORY PERFORMANCE. IT IS HOPED THAT THIS CONFERENCE WILL PROVIDE GUIDANCE IN THE DEVELOPMENT OF MORE EFFECTIVE INVESTIGATIONS OF PERFORMANCE OF CONCRETE IN SERVICE.

Mielenz, RC Highway Research Board Special Reports 1970


NTIS PB 190 649; P13221831

2A 213729 DISCUSSION OF REPORT OF COMMITTEE ON CHARACTER AND USE OF ROAD MATERIALS AN EXTENSIVE INVESTIGATION WAS MADE OF ALUMINATE CEMENT IN THE LABORATORY. THE CYLINDERS WERE CURED IN MOIST AIR AND 24 HOUR STRENGTHS WERE COMPARED. TESTS SHOWED THAT A PEAKING OF STRENGTH AT A DOPING OF A FEW DAYS SEEMS TO BE CHARACTERISTIC OF ALL PLOTTED COMPRESSION TESTS OF BOTH CONCRETE AND MORTAR. IN THE MAJORITY OF CASES THE FRACTURE WAS THROUGH THE AGGREGATE EVEN AT VERY EARLY PERIODS, SO THAT IT IS POSSIBLE THAT WITH VERY STRONG AGGREGATES THE COMpressive STRENGTH OF THE CON-
CONSTRUCTION MATERIALS

Concrete would be higher, due to the high cost of aluminosilicate cement. The possibility of mixing it with Portland cement was mentioned. The difficulty with this is obtaining a uniform mixture. The bond was investigated between fresh aluminosilicate cement concrete and old Portland cement concrete. Results indicated that a good bond is easily obtained and the strength of the bond will be increased by painting the concrete with neat aluminosilicate cement. Patching was successfully conducted with aluminosilicate cement in concrete pavements in Michigan. The west results are obtained when no earth or other covering is applied. This giving opportunity for the dissipation of heat no failures occurred where the concrete was cured by the sprinkling only.

Morrison, RL. *Highway Research Board Proceedings* 1926

2A 213731

**Concrete and concrete aggregates**

The sodium sulfate test described in the U.S. Department of Agriculture bulletin is discussed. Aggregates which fail this test are usually sound and durable and some of these aggregates may make concrete of satisfactory durability. Several laboratories are using the repeated freezing and thawing tests in preference to the soundness tests. Other types of accelerated tests for aggregates are being studied. At present, the alternate freezing and thawing test appears to be the best for determining the durability of concrete to weathering. Attention is called to the rapid growth in the use of the cross-bending test as a method of field control over the transverse strength of concrete for road construction. The desirability of ascertaining the effect of shape and surface condition of the constituent aggregate particles on the strength of concrete seems to be a very important problem.

Withy, WO. *Highway Research Board Proceedings* 1927

2A 213615

**Durability of concrete construction**

A brief discussion is presented of the principal features of the nature of concrete which are of importance in developing its durability. The greatest durability progress seems to have been made in connection with the cementitious matrix of concrete, the hardened cement paste. It seems that somewhat less success has been experienced in solving problems of acceptable aggregate in various circumstances is determined very largely by the physical and chemical nature of its component parts. An intensive discussion is presented of voids space, including entrapped air bubbles, capillary cavities, cement gel and macropores which leads to the discussion of porosity of various aggregates, and the permeability of acceptable aggregates. It is shown that the smaller void spaces in aggregate, like the capillaries in cement paste can, under certain circumstances, become partially or wholly filled with water. Freezing of this water can have important consequences for the durability of aggregate. The deterioration of concrete in water is accelerated by the freezing of water therein is described extensively. Tables are presented illustrating the results of controlled tests of the freezing behavior. The role of entrained air in this deterioration process is discussed and it is concluded that entrained air has little intrinsic effect on the sorption or permeability of concrete. The freezing of fresh concrete and the frost resistance afforded by entrained air is illustrated, together with test procedures from frost resistance and freezing and thawing tests of concrete. Five different types of cement are described in relation to the problems of freezing and thawing. Deterioration of concrete in pavements, bridges, and other structures, due to expansive reaction between constituents of some aggregate and aluminosilicates in cement is discussed. Photographs showing advanced cases of cracking concrete structures caused by alkali-silica reaction, as well as methods for avoiding alkali-silica expansion are shown and discussed.

Woods, H. *American Concrete Institute* 1968

Acknowledgment: Am Concrete Inst Journal & Proceedings

2A 213838

**Internal electrical curing of prestressed concrete**

The effects of electrical curing on the bond strength between concrete and prestressing strands is studied to determine if full scale prestressed concrete beams could be produced under plant conditions. The test data indicate that the internal electrical curing method does not adversely affect the quality of the concrete nor the strength of prestressed concrete beams. None of the tests have revealed any adverse effects caused by internal electrical curing which would restrict the use of the method. The tests also indicate that the method is an effective and economical method for curing concrete. The flexibility of the heat output makes the method adaptable to many field conditions including outdoor winter construction. [Author]


2A 213848

**Tti study explores durability of structural lightweight concretes for highway building as part of a program of synthetic aggregate research. The Texas Transportation Institute investigated the physical, mechanical, chemical, and volume change durability of structural lightweight aggregates having at least 10 year service records. Additional, non-commercial aggregates were included whose properties varied over a wider range. Tests indicated that the aggregates continue to absorb water for long periods and have total porosities ranging widely around 25%. That the concrete can be made physically durable if the aggregate is dry when introduced, that coarse lightweight aggregates will abrade over a long period of wear, and that certain lightweight aggregates cause disruptive concrete expansions. Conclusions drawn from these results are: (1) lightweight coarse aggregates more than 25% saturated at mixing time should not be used in concrete exposed to freezing and thawing; (2) an abrasion-resistant surface should be used on such concrete employed in bridge decks or pavements; (3) the aggregates should not be used if concrete prisms made with the exhibit, in the autoclave expansion test, more than 0.0015 strain; and (4) where hydration shrinkage may be a problem, unrestrained shrinkage might be used to predict restrained shrinkage stress for a wide range of curing environments.

2A 213862
AIR-ENTRAINED CONCRETES: A SURVEY OF FACTORS AFFECTING AIR CONTENT AND A STUDY OF CONCRETE WORKABILITY
AIR-ENTRAINED CONCRETES ARE USED EXTENSIVELY IN MODERN ROAD CONSTRUCTION AS THEY ARE ABLE TO RESIST DAMAGE BY FROST AND BY THE USE OF DE-ICING SALTS VARIATIONS IN THE AMOUNT OF ENTRAINED AIR LEAD TO CHANGES IN CONCRETE WORKABILITY AND TO LOSS OF CONCRETE STRENGTH OR DURABILITY DEPENDING UPON WHETHER THERE IS AN EXCESS OR DEFICIENCY OF ENTRAINED AIR. RESULTS ARE GIVEN OF A SURVEY OF THE LITERATURE WHICH WAS MADE IN ORDER TO IDENTIFY THE FACTORS AFFECTING THE YIELD OF ENTRAINED AIR FROM A GIVEN AMOUNT OF ADMIXTURE; SUGGESTIONS ARE MADE FOR LIMITING THE INFLUENCE OF THE MORE IMPORTANT FACTORS ON SITE. THE EFFECT OF ENTRAINED AIR ON CONCRETE STRENGTH IS ALSO DESCRIBED. A STUDY OF THE EFFECT OF ENTRAINED AIR ON THE WORKABILITY OF VARIOUS CONCRETES AS JUDGED BY THE COMPACTING FACTOR TEST AND THE VEBE TEST IS DESCRIBED. THESE WORKABILITY STUDIES SHOWED THAT THE RELATION BETWEEN COMPACTING FACTOR AND VEBE VALUE DEPENDS MARKEDLY UPON THE AGGREGATE USED IN THE CONCRETE. /AUTHOR/

Cornelius, DF
Road Research Laboratory /UK/ 1970

2A 213902
CREEP OF CONCRETE: PLAIN, REINFORCED, AND PRESTRESSED
A COMPREHENSIVE REVIEW OF 1300 PAPERS AND REPORTS DEALING WITH THE CREEP OF CONCRETE IS PRESENTED. TOPICS DISCUSSED DEVELOP A STATE-OF-THE-ART PICTURE AS AN AID IN UNDERSTANDING THE MECHANISM OF CREEP, IN MAKING CONCRETE WITH DESIRED CREEP CHARACTERISTICS, IN PREDICTING THE CREEP UNDER ANY CONDITIONS, AND IN DEALING WITH CREEP IN DESIGN AND CONSTRUCTION. DATA ON CREEP AS A FUNCTION OF ALL KNOWN VARIABLES ARE PRESENTED. /AUTHOR/

Neville, AM
Elsevier Scientific Publishing Feb. 1971

2A 213910
CONCRETE CONSTRUCTION
THE FIRST ELEMENT IN QUALITY CONTROL OF CONCRETE CONSTRUCTION IS PRODUCT CONTROL BY THE CONTRACTOR, AND THE SECOND IS ACCEPTANCE OF THE PRODUCT BY THE OWNER AS PART OF THE COMPLETED WORK, ALTHOUGH THESE PHASES HAVE BEEN COMBINED IN PRACTICE. THE PROPERTIES OF CONCRETE REQUIRED BY SPECIFICATION ARE BASED ON AASHO, ASTM, CSA, OR OTHER RECOGNIZED STANDARDS. HOWEVER, IT IS UNCERTAIN WHAT VARIATIONS IN CONCRETE AND CONCRETE MATERIALS CAN BE TOLERATED BEFORE ADVERSE EFFECTS SHOW UP; THUS THE PERFECT CONCRETE QUALITY SPECIFICATION HAS YET TO BE WRITTEN. CONVENTIONAL TESTS AND INSPECTIONS CAN PROVIDE SATISFACTORY QUALITY ASSURANCE ON MOST JOBS. THE MAIN CHANGE IS IN THE MANNER THESE TESTS ARE INTERPRETED AND APPLIED THROUGH THE USE OF A STATISTICAL BASIS FOR THE ANALYSIS, EVALUATION, AND SPECIFICATION OF CONCRETE STRENGTH AS THE OVERALL CRITERIA FOR CONCRETE ACCEPTABILITY. THIS PERMITS THE PROPORTIONING OF CONCRETE TO MEET REQUIREMENTS WITHOUT REFERENCE TO SUCH SAFEGUARDS AS A FIXED CEMENT FACTOR, WITH CONSEQUENT COST SAVINGS. ALTHOUGH IDEALIZED STATISTICALLY BASED SPECIFICATIONS HAVE BEEN DEVELOPED, THEY ARE NOT YET FEASIBLE, AND FURTHER INVESTIGATIONS ARE BEING MADE.

Smith, P Highway Research Board Special Reports 1971

2A 214003
RECOMMENDED PRACTICE FOR HOT WEATHER CONCRETING: PROPOSED REVISION OF ACI 605-59 CONCRETE MIXED, TRANSPORTED, AND PLACED UNDER CONDITIONS OF HIGH TEMPERATURE, LOW HUMIDITY, OR WIND REQUIRE UNDERTAKEN OF THE EFFECTS SUCH ENVIRONMENTAL FACTORS HAVE ON CONCRETE PROPERTIES AND CONSTRUCTION OPERATIONS. WHEN THESE FACTORS ARE UNDERSTOOD, MEASURES CAN BE TAKEN TO ELIMINATE OR MINIMIZE UNDESIRABLE EFFECTS. THIS RECOMMENDED PRACTICE DEFINES HOT WEATHER, LISTS POSSIBLE UNFAVORABLE EFFECTS AND RECOMMENDS PRACTICES INTENDED TO MITIGATE THEM. AMONG THESE RECOMMENDATIONS ARE SUCH IMPORTANT MEASURES AS PRECOOLING INGREDIENTS, LIMITATIONS OF CONCRETE TEMPERATURE AS PLACED, LENGTH OF HAUL, FACILITIES FOR HANDLING CONCRETE AT THE SITE, AND SPECIAL PLACING AND CURING TECHNIQUES. /AUTHOR/

Wescott, WF Am Concrete Inst Journal & Proceedings July 1971

2A 214011
PROPOSED ACI STANDARD-RECOMMENDED PRACTICE FOR CURING CONCRETE
CURING IS DEFINED AS THE PROCESS OF MAINTAINING A SATISFACTORY MOISTURE CONTENT AND A FAVORABLE TEMPERATURE IN CONCRETE DURING HYDRATION OF THE CEMENTITIOUS MATERIALS SUCH THAT DESIRED PROPERTIES OF THE CONCRETE ARE DEVELOPED. TWO SYSTEMS OF PROVIDING THE REQUIRED MOISTURE ARE EXPLAINED IN DETAIL: (1) MAINTAINING A MOIST ENVIRONMENT BY APPLICATION OF WATER; AND (2) PREVENTING LOSS OF MIXING WATER BY USE OF SEALING MATERIALS. BASIC PRINCIPLES OF SUCCESSFUL CURING ARE OUTLINED, AND COMMONLY ACCEPTED METHODS, PROCEDURES, AND MATERIALS USED TO PROVIDE CURING PAVEMENTS AND OTHER SLABS ON GROUND; FOR STRUCTURES AND BUILDINGS, AND FOR MASS CONCRETE. FOR EACH OF THESE CATEGORIES, METHODS, MATERIALS, TIME AND TEMPERATURE OF CURING ARE RECOMMENDED. BRIEF SECTIONS COMMENT ON CURING REQUIREMENTS FOR PRECAST PRODUCTS, SHOTCRETE, PREPLACED AGGREGATE CONCRETE, REFRACTORY CONCRETE PLASTER, AND OTHER APPLICATIONS. /AUTHOR/

Oleson, CC Am Concrete Inst Journal & Proceedings Apr. 1971

2A 214049 CONCRETE WITHOUT COARSE AGGREGATE
TWO CASES WHERE COARSE AGGREGATE WAS ELIMINATED FROM CONCRETE AND MORTAR WAS USED FOR CONSTRUCTION ARE DESCRIBED. CONSTRUCTION SITES WERE LOCATED IN DESERT AREAS (NORTH AFRICA AND ARABIAN GULF) WHERE DUE TO THE SPECIAL CONDITIONS ELIMINATION OF COARSE AGGREGATE HELPED EXPEDITE CONSTRUCTION WHILE RESULTING IN ECONOMY. TWO NEW METHODS OF MEASURING THE CONSISTENCY OF SAND CONCERNING MATERIAL MORTAR ARE EXPLAINED. THESE METHODS HAVE THE ADVANTAGE THAT THEY CAN BE PERFORMED USING SMALL QUANTITIES OF SAND, I.E., 50-500 G (0.1-1.0 LB) AS COMPARED TO THE 10 KG (22 LB) THAT ARE REQUIRED FOR THE CONVENTIONAL SLUM TEST. /AUTHOR/

Stamatopoulos, AC Kotzias, PC Am Concrete Inst Journal & Proceedings Sept. 1971

2A 214056 USE OF CONCRETES CONTAINING ANTIFROST ADDITIVES DURING THE CONSTRUCTION OF BRIDGES /IN RUSSIAN/
THE EFFECT OF TEMPERATURE (DOWN TO -23 C) AND ANTIFROST ADDITIVES CALCIUM AND SODIUM CHLORIDE ON THE HARDENING, STABILITY, AND STRENGTH OF CONCRETES USED IN THE CONSTRUCTION OF BRIDGES AND WATER PIPES IN THE NORTHERN REGIONS OF THE USSR IS DISCUSSED. THE FROST-RESISTANCE AND STRENGTH OF THE
CONCRETE SET CONTROL FOR VERTICAL SLIPFORMING

THE CONCRETE SETTING TIME CONTROL THAT CAN BE USED BY SET-CONTROLLING ADMIXTURES IS DESCRIBED. STUDIES WERE CONDUCTED ON SUCH PROJECTS AS THE GENTILLY NUCLEAR CENTER, GENTILLY, QUEBEC; THE INTERNATIONAL NICKEL STACK, SUDbury, ONTARIO; THE HUSKY TOWING, CALGARY, ALBERTA; AND NUMEROUS SHIP YARDS. WOOD CHIP AND FED SILOS IN THE UNITED STATES AND CANADA. THE CONCRETE SETTING TIME IS CORRELATED TO SLIPPING TIME AND RATE OF RISE OF THE SLIPFORM, WITH GUIDES TO ADMIXTURE TYPE AND DOSAGE, MIX PROPORTIONS, AND SUCH SUGGESTED PRACTICES.

Fisher, GH Am Concrete Inst Journal & Proceedings Vol. 69 No. 9, Sept. 1972, pp 556-61, 2 Fig, 2 Tab, 1 Phot

2A 214240 FIBROUS CONCRETE-CONSTRUCTION MATERIAL FOR THE SEVENTIES


Gray, BH Williamson, GR Batson, GB Construction Eng Res Lab, Army Ce /US/ Conf Proc No. m-28, Dec 1972, 246 pp

NTIS AD 756 384, 1P32229765

2A 214318 LABORATORY STUDY OF EFFECTS OF ENVIRONMENT AND CONSTRUCTION PROCEDURES ON CONCRETE PAVEMENT SURFACE

FINISHED PAVEMENT MUST NOT ONLY BE SMOOTH RIDING BUT MUST ALSO BE DURABLE, STRUCTURALLY SOUND, AND SAFE (PROVIDE AMPLE SKID RESISTANCE). TO THIS END, A STUDY WAS CONDUCTED TO DEVELOP IMPROVED CONSTRUCTION PRACTICES RELATED TO THE CONSOLIDATION, FINISHING, AND CURING OF CONCRETE PAVEMENTS (CRCP). A TOTAL OF 56 SIDEWALK SIZE SLABS WERE CAST IN CONTROLLED ENVIRONMENTAL ROOMS. PARAMETERs INVESTIGATED INCLUDED TYPES OF SUBBASE, METHOD OF CONSOLIDATION (VIBRATION), TYPE OF FINISH, TYPE OF CURING METHOD, AND CURING ENVIRONMENT. ALSO, THE SLABS WERE USED TO DETERMINE THE EFFECTS OF WIND ON THE EVAPORATION RATE OF WATER FROM THE SURFACE OF THE SLABS. THIS WAS ACCOMPLISHED BY GENERATING WIND OVER THE SURFACE OF THE SLABS. AFTER A 28-DAY CURING PERIOD THE SLABS WERE REMOVED FROM THEIR CURING ENVIRONMENT AND A MINIMUM OF THREE CORES WERE TAKEN FROM EACH. THE CORES WERE STORED WITH WATER IN A FREEZER ALONG WITH THE WAVE LOSS MEASUREMENTS WERE REDUCED, TABULATED, ANALYZED, AND CURVES PLOTTED TO ILLUSTRATE THE RESULTS OBTAINED.

Wrbas, RO Ledbetter, WB Meyer, AH Texas Transportation Institute Nov. 1972, 14 pp, 34 Fig, 15 Tab, 45 Ref

2A 214322 REHABILITATED AASHO ROAD TEST: PART 1--MATERIALS & CONSTRUCTION

THIS REPORT, WHICH IS THE FIRST OF A THREE-PART FINAL REPORT, GIVES A BRIEF RESUME OF THE AASHO ROAD TEST.
CONSTRUCTION MATERIALS

2A 214325
CRUSHED STONE SCREENINGS USED AS FINE AGGREGATE FOR CONCRETE

BECAUSE OF THE SCARCITY OF NATURAL SAND DEPOSITS IN NORWAY, CRUSHED ROCK MATERIALS ARE USED AS AGGREGATE IN CONCRETE. RECOMMENDATIONS ON CONSTRUCTION SOLUTIONS TO EXTEND THE APPLICABILITY TO COVER STRUCTURAL LIGHTWEIGHT CONCRETE, AND COVER AGAINST AGGRESSIVE ENVIRONMENT. THE RECOMMENDATIONS ARE INTENDED PURELY AS ADDITIONS TO CONCRETE REGULATIONS TO EXTEND THEIR APPLICABILITY TO COVER STRUCTURAL LIGHTWEIGHT CONCRETE, AND COVER AGAINST AGGRESSIVE ENVIRONMENT.

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/IRRD 203 015, 2C32235469

2A 214337
SULFUR CONCRETE--A NEW CONSTRUCTION MATERIAL INVOLUNTARY LARGE SCALE PRODUCTION OF SULFUR AS A BYPRODUCT OF NATURAL GAS PRODUCTION HAS RESULTED IN RAPIDLY INCREASING CANADIAN INVESTORIES. THEY ARE EXPECTED TO REACH 22 MILLION TONS BY THE END OF 1975. WITH AN ASSURANCE OF LOW SULFUR PRICES DURING THE FORESEEABLE FUTURE IT IS NOW WORTHWHILE TO CONSIDER SULFUR CONCRETE FOR APPLICATIONS WHERE ITS SPECIFIC PROPERTIES ARE ADVANTAGEOUS. THIS PAPER COMPARES THE PROPERTIES OF SULFUR CONCRETE WITH THOSE OF CONVENTIONAL CONCRETE AND DISCUSSES POSSIBLE ADVANTAGES AND DISADVANTAGES OF THIS NEW MATERIAL. SOME POSSIBLE AREAS OF APPLICATION ARE INDICATED.

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/IRRD 203 015, 2C32235469

2A 214378
TEMPERATURE CHANGES AND THERMAL CRACKING IN CONCRETE PAVEMENTS AT EARLY AGES


ACKNOWLEDGMENT: Transport & Road Research Lab /UK/IRRD 203 015, 2C32235469

Hunt, JG
Cement & Concrete Assoc, London /UK/ / R&d Rpt No. 424, Apr. 1972, 24 pp, 26 Fig, 2 Ref

2A 214379
CALCARE IN ROAD CONSTRUCTION

THE COMPOSITION, DISTRIBUTION, ORIGIN, AND AGE OF SOUTH AFRICAN CALCAREES, ARE BRIEFLY REVIEWED AND A SIMPLE CLASSIFICATION SUITABLE FOR ENGINEERING USE IS DESCRIBED. METHODS OF SEARCHING FOR ECONOMIC CALCARE DEPOSITS AND OF TESTING CALCAREES FOR ROADMAKING ARE CONSIDERED, AND IT IS CONCLUDED THAT SPECIAL METHODS OF LOCATING THESE MUST BE USED AND THAT PRECAUTIONS MUST BE TAKEN DURING TESTING IF THE BEST RESULTS ARE TO BE ACHIEVED. THE ENGINEERING PROPERTIES OF CALCAREES AND SPECIFICATIONS FOR CALCARE ROADS ARE DEALT WITH IN SOME DETAIL. DEPENDING ON THEIR STAGE OF DEVELOPMENT, THESE MATERIALS RANGE IN PROPERTIES FROM THOSE OF AN ALMOST USELESS POWDER TO THOSE OF ROCK, AND THIS AND THEIR UNUSUAL COMPOSITION AND MODE OF FORMATION CAUSE THEM TO EXHIBIT UNUSUAL AND OFTEN BENEFICIAL PROPERTIES.

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/IRRD 203 015, 2C32235469

Colbjoerens, A. Nordisk Betong /Sweden/ Vol. 16 No. 2, 1972, pp 119-32, 9 Fig, 1 Tab, 4 Ref

Hunt, JG
Cement & Concrete Assoc, London /UK/ / R&d Rpt No. 424, Apr. 1972, 24 pp, 26 Fig, 2 Ref

Loov, RE Vroom, AH Ward, MA Prestressed Concrete Institute Journal Vol. 19 No. 1, Jan. 1974, pp 86-95

Netterberg, F
National Institute for Road Research, South Africa 1971

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/IRRD 203 015, 2C32235469

2A 214383
SULFUR CONCRETE-A NEW CONSTRUCTION MATERIAL


ACKNOWLEDGMENT: Transport & Road Research Lab /UK/IRRD 203 015, 2C32235469

Hunt, JG
Cement & Concrete Assoc, London /UK/ / R&d Rpt No. 424, Apr. 1972, 24 pp, 26 Fig, 2 Ref

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/IRRD 203 015, 2C32235469

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ACKNOWLEDGMENT: Transport & Road Research Lab /UK/IRRD 203 015, 2C32235469

2A 214378
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Loov, RE Vroom, AH Ward, MA Prestressed Concrete Institute Journal Vol. 19 No. 1, Jan. 1974, pp 86-95

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/IRRD 203 015, 2C32235469
CONSTRUCTION MATERIALS

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

2A 214394
CONCRETE FOR HIGHWAY PAVEMENTS
This paper is presented in two parts (Part 1, properties of hardened concrete and Part 2, air-entrained concrete) and discusses the mix design and durability of concrete pavements with special reference to the effects of de-icing salts. /TRRL/

Shacklock, BU

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

2A 214405
THE VALUE OF INSULATED FORMS FOR WINTER BRIDGE CONSTRUCTION
New York State is investigating the use of insulated forms for the protection of concrete during the winter construction of bridges. The concrete used in this cold weather construction is for footings, abutments and pier beams. After an evaluation of the use of these forms, tests a specification is being written for cold weather concrete.

Britton, HB
Highway Research Record, Hwy Res Board 1963

2A 214412
ENGINEERING PROPERTIES AND APPLICATIONS OF NUCLEAR EXCAVATIONS
The use of nuclear excavation for engineering projects depends not only on the size of the excavation but also on the properties of the material in and around the excavation. In a nuclear excavation, several general zones are evident, including the true and apparent crater, crater fallback and lip throwout material, ground upheaval, and the rupture and plastic zones. The properties of the material in these zones are dependent on original medium characteristics and the effects of the detonation. The hyperbolic shape of a crater lends itself to good slope stability. The problem of slope stability in soils or highly weathered rock will be more acute than in competent rock. The condition of the rupture zone, the amount of surcharge on the crater lip, and ground shock from later detonations impose additional problems to slope stability evaluation. The fallback material will obtain a certain amount of dynamic compaction as a result of the material falling from heights of several hundred feet. Further foundation stability, if necessary, can be accomplished by standard techniques. Several applications of nuclear explosive use in the highway engineering field appear feasible, including excavation of roadway cuts, aggregate production by open pit mining, drainage diversion or interception by craters, and landslide removal. Encouragement, or stabilization, the feasibility of using large-yield explosions for engineering projects has been demonstrated. During the last 20 yr, many large-yield conventional explosives have been used for excavation, mining, and dam construction. /Author/

Circeo, LJ
Highway Research Record, Hwy Res Board 1964

2A 214431
CONSTRUCTION OF SECTIONAL PAVEMENTS
Design and construction methods for three types of pre-fabricated prestressed concrete pavement were described and illustrated. Developed in the USSR, the pavements have sand and bitumen or cement stabilized bases. The prefabricated constructions method was found economical and effective. Improvements suggested were development of lightweight slabs, high pressure grouting, rotary graders, vacuum-grip laying plant, and multipoint welding equipment.

Stepuro, NT
Avtomobil Nye Dorogi /USSR/


2A 214432
COMPACTING ASPHALTIC CONCRETE PAVEMENT WITH HIGH INTENSITY PNEUMATIC ROLLER
Part II of this study entitles densification due to high intensity pneumatic roller part II.

2A 214433
DENSIFICATION DUE TO TRAFFIC
Part II of this study entitled densification due to traffic correlates density of bituminous pavements after construction with performance as evidenced by progressive densification and depth of longitudinal grooves or ruts caused by traffic up to 36 months after construction. Test sections, consisting of bituminous binder course only and a system of binder and wearing course were constructed on flexible and rigid bases. The test sections were divided into three fields: tests with low contact pressures by varying the compactive effort, i.e., tire contact pressures and number of passes of a pneumatic roller. Periodic surveys made of the pavement density show that regardless of the initial density the rate of density increase is greatest during the first six months the pavement is open to traffic and then tends to taper off and stabilize. It was also found that the least amount of progressive densification took place in test sections that had high initial densities. Measurements of depth of rutting in the test sections were made after 36 months of traffic. In general, the greatest amount of wheel path rutting was noted in sections compacted at low tire contact pressures and the least amount when compacted at high contact pressures and optimum number of passes of the roller. The majority of the test sections, after being opened to traffic for 36 months, have equalled or exceeded the laboratory design density as determined by the 75 blow Marshall procedure. However, no section has shown evidence of flushing. Recommendations are made in the report concerning contact pressures that should be used for pneumatic rollers and the number of passes to be required for bituminous wearing and binder course construction.

Adam. V
Louisiana Department Highways

ACKNOWLEDGMENT:

2A 214439
DETERMINATION OF STATISTICAL PARAMETERS FOR HIGHWAY CONSTRUCTION
This was a 2 year project to determine the range and magnitude of variations of measured characteristics of aggregate base, aggregate course, Portland cement concrete, and bituminous mixtures used in highway construction in West VA.

Data was obtained from /1/ historical records of satisfactorily constructed projects and /2/ from statistically designed experimental projects of current normal construction. The authors analyzed the data by use of computer. It was concluded that the amount of sampling and testing could be reduced in several instances. /2/ Improved sampling methods would materially decrease variations of measured values for several characteristics. /3/ Analysis of standard deviation indicated close compliance with current spec-
CONSTRUCTION MATERIALS

2A

APPLICATION OF STATISTICAL SPECIFICATIONS FOR HIGHWAY CONSTRUCTION

A brief summary is presented of the study titled APPLICATION OF STATISTICAL QUALITY CONTROL METHODS IN THE FORM OF A PAPER FOR PRESENTATION AT A TECHNICAL CONFERENCE, OUTLINING THE APPLICATION OF STATISTICAL QUALITY CONTROL METHODS FOR ANALYSIS OF DATA ON DETERMINATION OF PENETRATION TESTS OF ASPHALT, GRADATION OF AGGREGATE, COMPACTION OF EMBANKMENTS AND THE USE OF CONTROL CHARTS MOVING AVERAGES. THE REPORT DOES NOT ATTEMPT TO SPECIFY FREQUENCY OF SAMPLING NOR DEFINE THE LOT OF MATERIAL. THE STATE IS WORKING TOWARDS THE GOAL OF DEVELOPING MORE ENFORCEABLE SPECIFICATIONS. /BPR/

Watkins, RO

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4601413 68) PB 182 286, 1C33021344

2A 214474

STATISTICAL QUALITY CONTROL OF HIGHWAY CONSTRUCTION MATERIAL

A summary of the findings of several interim reports on statistical quality control of highway construction material is presented. The advantages and limitations of the present control procedures are discussed. The work done to date indicates that statistical specification can be used to the advantage of the highway engineer. During the study some of the problems identified that need additional attention were: personnel training, reproducibility of tests, preservation of engineering judgment, and cost of administration. Possible solutions to these problems are discussed, including determining the precision of test method and procedures for assuring that a laboratory is in operational control one specific procedure, quality control by the moving average using control charts, is proposed. It is anticipated that this procedure will provide control without increasing cost while at the same time supplying management information in the form of charts and graphs. /AUTHOR/

Sherman, GB  Watkins, RO

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4601123 68) PB 180260, 3C33021382
Determination of Statistical Parameters for Highway Construction

Results of Tests on Portland Cement Concrete Pavement indicate that the level and overall coefficient of variation was satisfactory on most projects, but the testing error was somewhat high. Measurements of bituminous paving mixtures show excessive variation in the determination of bitumin content. Thus the state developed a newer method of test, the Pyconometer Method, which showed promise as a better than is cementitious paving materials. The method was determined by the Nuclear Motor which quickly disclosed the variation transversely and longitudinally on the roadway. Perhaps the most important phase of the study was the simulation of statistically derived acceptance plans which proved that the plan is practical in well controlled concrete pavement material and concrete of inferior quality will be paid for at a proportional reduced price.

Statistical Correlation and Variance Project Related to the Quality Control of Highway Materials

Twenty-eight day structural and prestressed concrete historical compressive strength data from 8,000 cylinders prepared in 1964 by central laboratory personnel at the job site was statistically analyzed to estimate conformance to existing criteria. Data from 10,000 cylinders prepared by project based personnel was not used in the analysis. Testing, sampling, material and total variance, standard deviation, mean coefficient of variation, was determined for each project sub lot. Acceptance plans following sampling principles of MIL-STD 414, standard deviation unknown, was proposed for use on a trial basis. Acceptable quality levels (age) of 2.5% for prestressed concrete (5,000 psi minimum) and 6.5% for other structural concrete (3,000 psi minimum) were selected to best approximate computed test values. For concrete used in bridge superstructures an AQL of 1.5% (5.5% estimate of percent defective) was used to reduce the risk of accepting poor quality concrete. An attempt was made to hold alpha and beta risks to a common 5% defective commensurate with sample size, lot size, and criticalness of use. An action and reduced payment plan was suggested for nonconforming concrete. Comparisons were made with ACI 214 suggested maximum 10 percent defective, suggestions were made to revise states existing prestressed concrete specification to reduce the risk of accepting excessively poor quality materials.

Investigation into the Uses of Statistical Procedures in Specification Writing and Quality Control

The application of several methods and techniques of statistical analysis to accepted tests of highway construction materials was demonstrated. The results vary rather widely in numerical values some techniques could and have been put in routine use as a result of the study. Other techniques on certain materials yielded such extreme values that the authors questioned them as being in error or the method being inappropriate. The authors concluded that there are areas where statistical control techniques are suitable for use and other areas exist where there is a need for change in statistical concepts or test methods or both before the S.R.C. proceeds with writing and enforcement of statistically oriented specifications.

Acknowledgment: Bureau of Public Roads / US/ (4601203 69)

Developing and Trial Use of Acceptance Sampling Plans for Asphalt Construction

Previous research indicated that present accepted bituminous pavement construction does not meet specified requirements. Also on projects researched each contractor was paid 100 percent of bid price even though there was a wide range of below specification construction between jobs. A specification developed will accept construction on the basis of the average of 5 test results per lot for (1) nominal largest sieve, #4 sieve, #30 sieve, #200 sieve, AC content, compaction and thickness. Adjustment price schedules are provided for the acceptance of below standard construction. A nuclear gage correlation with densities obtained from cores is included.

Acknowledgment: Bureau of Public Roads / US/ (4601463 68) PB 122 328, 1C33021426

An Investigation of Bituminous Highway Materials & Methods of Production and Construction Control Based on Statistical Procedures

A systematic means of collecting information using various test methods of both compacted and uncompacted samples of bituminous mixes from four different construction projects is described. The results are reported to show the degree of variability of the material that can be expected and a comparison of the laboratory and field test methods employed. Statistical concepts were used to sample, test and analyze quality control of highway construction materials.

Acknowledgment: Bureau of Public Roads / US/ REPORT PENDING, 1C33021315, 1C33021344, 1C33021947

Economic Feasibility of Application of Statistical Concepts and Methods to the Control and Acceptance of Highway Materials and Construction

The probable cost of a statistical quality control system was estimated by projection of current costs of contractors and producers who are currently maintaining voluntary testing programs. Estimates based on data obtained indicate that the cost of an acceptable degree of quality control of...
HIGHWAY MATERIALS OR CONSTRUCTION BY THE CONTRACTOR OR PRODUCER WOULD AVERAGE ABOUT 4 PERCENT OF CONTRACT PRICE. COMPARISONS OF RELATIVE COSTS INDICATE THAT THE OPTIMUM QUALITY ASSURANCE SYSTEM WOULD BE QUALITY CONTROL BY THE CONTRACTOR WITH ACCEPTANCE TESTING BY THE STATE AGENCY. THE DOLLAR COST OF SUCH A SYSTEM IS ESTIMATED TO BE ABOUT 20 PERCENT LESS THAN THAT OF CURRENT PROCEDURES. THE ECONOMIC BENEFITS IN TERMS OF THE DEGREE OF QUALITY ASSURANCE OBTAINED BY THIS SYSTEM AS COM­PA­RE­D TO THE EXISTING SYSTEM ARE APPROXIMATELY THE SAME LEVEL OF TESTING EFFORT WOULD BE REALIZED WHEN A STATE OF STATISTICAL CONTROL OF PRODUCTION AND CONSTRUCTION PROCESSES WAS OBTAINED. /AUTHOR/


ACKNOWLEDGMENT Federal Highway Administration (3501143 72) REPORT PENDING, 3C3302772

2A 214543 HANDBOOK OF APPLICATIONS OF STATISTICAL CONCEPTS TO THE HIGHWAY INDUSTRY, PART I-INITIAL COMPUTATIONS & APPLICATIONS

THIS IS PART I OF A THREE-PART HANDBOOK DEALING WITH PRACTICAL CONCEPTS IN THE FIELD OF STATISTICS AND WITH THEIR APPLICATIONS IN THE CONTROL OF MATERIALS AND PROCESSES IN HIGHWAY CONSTRUCTION. THIS FIRST PART PRESENTS INTRODUCTORY EXPLANATIONS RELATING TO GENERAL PRINCIPLES OF STATISTICS THAT WILL BE USEFUL TO TECHNICIANS IN HIGHWAY ENGINEERING AND TO PRODUCERS OF MATERIALS. THE PRACTICAL APPLICATIONS OF THESE PRINCIPLES ARE SHOWN BY NUMERICAL EXAMPLES THAT ARE WORKED OUT FULLY. THE TERMS AND UNITS OF MEASUREMENTS ARE THOSE IN COMMON USE IN HIGHWAY WORK AND THE VALUES USED IN THE EXAMPLES ARE APPROXIMATELY THE SAME AS WOULD BE OBTAINED DURING CONSTRUCTION OPERATIONS. THE IMPORTANCE OF OBTAINING SAMPLES FOR TESTING BY THE USE OF UNBIASED METHODS IS STRESSED, AND THE USE OF CONTROL CHARTS IS ILLUSTRATED. /FHWA/


ACKNOWLEDGMENT Federal Highway Administration/FHWA P-0013, REPORT PENDING, 2C33032318

2A 214561 RECOR­DING OF QUANTITIES OF MATERIALS INCORPORATED IN BASE AND PAVEMENT PLANT MIXTURES (FINAL REPORT OF SECOND PHASE) THIS IS THE SECOND PHASE OF RESEARCH TO DEVELOP AN INDEPENDENT MONITORING AND RECORDING SYSTEM. A PROPORTIONING BATCH PLANTS. COMPLETELY INDEPENDENTLY FROM THE PLANT OPERATING SYSTEM. IN THIS PHASE A PROTOTYPE SYSTEM INCLUDING FOUR LOAD CELLS SUPPORTING EACH WEIGHT HOPPER, ACTING INDEPENDENTLY FROM THE PLANT LEVER SYSTEM, WAS INSTALLED ON A COMMERCIALLY OPERATED, FULLY AUTOMATED OBSERVATIONS AND COMPARATIVE WEIGHING TESTS WERE MADE. THE PROTOTYPE SYSTEM, REFERRED TO AS THE "MONITOR" WAS NEVER IN ERROR COMPARED TO DEAD WEIGHTS AND IS AT LEAST AS RELIABLE AS PRESENT PLANT SCALING. THE MECHANICAL PROBLEMS, CONSIDERING THAT IT WAS A PROTOTYPE, WERE NEGLIGIBLE AND CORRECTABLE. THE RECORDED WEIGHTS ACCURATELY REPRESENTED THE AMOUNT OF MATERIAL ACTUALLY DELIVERED TO THE WEIGH HOPPER REGARDLESS OF PLANT SCALE SETTINGS OR BEHAVIOR AND CANNOT BE INFLUENCED BY THE OPERATOR. THE MONITOR IS A RELATIVELY INEXPENSIVE, EASILY INSTALLED, ACCURATE WEIGHTING AND RECORDING SYSTEM WHICH CAN GIVE VITAL SURVEY INFORMATION OF THE PLANT OPERATION AND COULD FURNISH AN ALTERNATIVE METHOD OF DETERMINING CONTRACT PAY QUANTITIES.

Pitt, N Racheli, U Obermuller, JC Spickelmire, LS Pitt, Norman, Incorporated, California Department Transportation Final Rept June 1972, 95 pp

ACKNOWLEDGMENT Federal Highway Administration, California Department Transportation/FHWA P-0038, NTIS PB 228656/AS, 3C33023590


Lefebvre, JP Bull Liaison Labs Routers /France/ Jan. 1965

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 214567 WIDER USE SHOULD BE MADE OF LOCAL MATERIALS IN THE CONSTRUCTION OF LOCAL ROADS CEMENT, LIME, BITUMEN AND TAR ARE USED FOR THE STABILIZATION OF LIMESTONE AND SLAG AGGREGATE IN U.S.S.R. ROAD CONSTRUCTION. RECOMMENDATIONS ARE MADE BASED ON THE RESULTS OF LABORATORY TESTS. /LCPC/RRL/

Dolgov, AN Samodurov, SI Automobil Nye Dorogi /Ussr/ Jan. 1965

ACKNOWLEDGMENT: Road Research Laboratory /UK/

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ESSENTIAL CHANGES CONCERNING THE ACTUAL ASPHALT PAVEMENTS. ALTHOUGH OVER 100 TEST ROAD SECTIONS HAVE BEEN CONSTRUCTED FOR ANALYSIS OF DIFFERENT BINDER MATERIALS, ADHESIVE AGENTS, WORKING METHODS, AND THE ECONOMY OF PAVING, THE LENGTH OF PAVED PUBLIC ROADS IN 1964 WAS 1,701 KM, WHICH CAN BE DIVIDED BY PAVEMENT TYPE AS FOLLOWS: ASPHALT CONCRETE 170, BITUMINOUS GRAVEL 329, CUT-BACK ASPHALTIC BITUMEN 169, AND OIL GRAVEL 1,033 KM, OF WHICH 712 KM ARE OLD ROADS. /RRL/

Niemii, B
Tidehti, Helsingi Apr. 1965

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 214583
RESEARCH ON CONCRETE ROAD CONSTRUCTION, RRL AND MINISTRY TESTS WITH SLIP-FORM PAVER

Municipal Engineering /UK/ May 1965

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 214588
FARM ROAD CONSTRUCTION, THIRD REVISED EDITION
DETAILS ARE GIVEN OF THE MATERIALS, EQUIPMENT AND PROCEDURE INVOLVED IN CONCRETE, FARM-ROAD CONSTRUCTION. IT IS CONSIDERED THAT FOR GENERAL PURPOSES THE ROAD SHOULD NOT BE LESS THAN 8 FT WIDE AND, UNLESS IT IS AT LEAST 16 FT WIDE PASSING BAYS SHOULD BE PROVIDED. THE SLAB SHOULD BE 6 IN THICK OR 5 INCHES ON A GOOD SUBGRADE. JOINTS ARE REQUIRED. BUT REINFORCEMENT IS NECESSARY ONLY UNDER CONDITIONS OF HEAVY TRAFFIC OR ON A WEAK SUBGRADE. /RRL/

Cement & Concrete Assoc, London /UK/ June 1965

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 214589
SURFACE REGULARITY DATA FOR RECENT MAJOR ROAD WORKS’ SPECIFICATIONS AND TOLERANCES MEASUREMENTS WERE MADE WITH A MULTI-WHEELED PROFILOMETER OR A BUMP INTEGRATOR ON A NUMBER OF RECENT MAJOR ROAD WORKS. IN ORDER THAT THE STANDARDS OF SURFACE FINISH AND THE VARIABILITY BETWEEN AND WITHIN INDIVIDUAL PROJECTS COULD BE ASCERTAINED AND COMPARED WITH THE CURRENT REQUIREMENTS OF SPECIFICATIONS STANDARDS WERE FOUND TO VARY WIDELY BUT ON NEARLY ALL THE ROADS AN APPRECIABLE PROPORTION OF THE WHOLE SURFACE HAD A FINISH BETTER THAN THE 1/8-INCH STANDARD. IT IS CONSIDERED THAT SUPERVISING ENGINEERS SHOULD AIM PRIMARILY AT MINIMIZING THE VARIABILITY OF SURFACE FINISH IN ORDER TO IMPROVE OVERALL RESULTS. THIS IN TURN IMPLIES EFFICIENT AND ADEQUATE CONTROL OF ALL MATERIALS AND PROCESSES IN CONSTRUCTION. /RRL/

Road Research Laboratory Notes /UK/ June 1965

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 214597
INVESTIGATIONS INTO ROAD BUILDING PRACTICE IN THE TROPICS, SIX STUDIES OF SOME ROAD BUILDING OPERATIONS ON A ROAD CONSTRUCTION SCHEME IN TORTOLA, BRITISH VIRGIN ISLANDS AS PART OF A STUDY OF ASPECTS OF NORMAL ROAD-BUILDING PRACTICE IN THE TROPICS WERE MADE DURING THE CONSTRUCTION OF A CEMENT-STABILIZED BASE IN TORTOLA. THE BASE IS BEING CONSTRUCTED WITH A SINGLE-PASS STABILIZING TRAIN BY ADDING A SMALL PROPORTION OF CEMENT TO A GRANULAR MATERIAL KNOWN LOCALLY AS TARRAS. THE DATA OBTAINED SHOWED THAT WITH THE CONSTRUCTION METHODS USED ADEQUATE STATES OF COMPACTION AND THICKNESSES OF STABILIZED BASE WERE ACHIEVED BUT SHAPING BY PLOWING WAS UNABLE TO PRODUCE A SURFACE OF ACCEPTABLE REGULARITY. /RRL/

Tunner, J5 Road Research Laboratory Notes /UK/ Sept. 1965

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 214599
IMMERSED TUBE METHOD. WORLDS FIRST SIX-LANE TUNNEL IN SWEDEN
THE TINGSTAD TUNNEL UNDER THE GOTA RIVER AT GOTEBOURG IS CONSTRUCTED ON THE SUNK TUNNEL PRINCIPLE, AND COMPRIS ES AN ENCLOSED COFFERDAM STRETCH OF 455 M WITH A 60 M LONG APPROACH RAMPS AT EITHER END. THE TUNNEL CONSISTS OF 5 SECTIONS, EACH APPROX. 93 M LONG, WHICH ARE PRECONSTRUCTED, CLOSED, TOWED OUT AND SUNK INTO POSITION ON THE FOOTINGS PREPARED BEFOREHAND. HEADROOM IN THE CARRIAGeways IS 4.55 M, THE THICKNESS OF THE STRUCTURAL CONCRETE IS 100 CM FOR OUTER WALLS AND BOTTOM, 82 CM FOR THE ROOF AND 50 CM FOR INBOARD DIVIDING WALLS. DETAILS ARE GIVEN OF ADDITIONAL WATER INSULATION, CONSTRUCTING THE UNITS IN THE BUILDING DOCK, SINKING OF UNITS, DIMENSIONING, VENTILATION, SOIL EXPLORATION AND EXPERIMENTATION. /RRL/

Gustafson, T Contract Journal /UK/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 214615
PEAT BLASTING IN IN SCHLESWING-HOLSTEIN AND BAVARIA 1958-1963
IN THE CONSTRUCTION OF THE E3 FROM HAMBURG THROUGH RENDSBERG, SCHLESWIG AND FLENSBURG, A NUMBER OF PEAT BOGS WEST OF RENDSBERG AND SOUTH OF SCHLESWIG, UP TO 360 METERS IN LENGTH AND WITH DEPTHS UP TO 17 M METRES WERE DISCOVERED. SOUTH OF RENDSBERG ON THE B202, PEAT BOGS WITH 70 AND 110 METRES LENGTH AND DEPTHS UP TO 3 M METRES WERE DISCOVERED, ON A RELIEVING BYPASS NEAR FLENSBURG, A STRETCH OF BOG 140 METRES LONG WITH A MAXIMUM DEPTH OF 24 M METRES WAS DISCOVERED. THE AUTHOR REPORTS THESE STRENGTHS, WHICH HAVE BEEN IN TRAFFIC USE FOR BETWEEN TWO AND FOUR YEARS, AND FOR WHICH PEAT-BLASTING WAS USED, SINCE, OWING TO THE EXCESSIVE DEPTH, HIGH WATER CONTENT AND SOFT CONSISTENCY OF THE PEAT, NEITHER COMPLETE STRIPPING NOR SAND-DRAINAGE COULD BE USED. THE PEAT-BLASTING METHODS USED IN THE INDIVIDUAL CONSTRUCTION SECTIONS ARE DESCRIBED IN DETAIL, MENTIONING THE SOIL CLASSIFICATION, PEAT AND SLUDGE BEDS, CONSUMPTION OF EXPLOSIVES AND COSTS AND WITH MANY SECTIONAL AND BLASTING DIAGRAMS. /RRL/FGL

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Garras, A
Strassen Und Tiefbau /Germany/
July 1965

Acknowledgment: Read Research Laboratory /UK/

2A 214617
SOFT-GROUND TUNNELLING DESIGN AND CONSTRUCTION
THis paper deals with various design and construction techniques employed in soft-ground tunnelling. The past development, as well as the latest trends, are discussed. The first part of the paper deals with shield-driven tunnels and reviews the tunnelling shield, compressed air and ground treatment, tunnel lining, vehicular tunnels, sunken-tube tunnels are described in the second part of the paper. A general description of the method is given. Reviewing various types of vehicular tunnels, conditions which affect the feasibility of this method are summarized and the more important details of the construction procedures are discussed. The paper is confined to a broad review of soft-ground tunnelling. /CGRA/

Noskiewicz, TM Ramsay, JA
Canadian Good Roads Association Proc
Oct. 1964

2A 214621
QUALITY CONTROL OF ASPHALT PAVEMENT CONSTRUCTION
Because of the limited information available in the field of quality control of asphalt pavements, an intensive study was made of hundreds of test results from actual paving projects to determine the actual variations which do occur in control tests. The mean values and standard deviation values were calculated and histograms showing variation were plotted for asphalt penetration, asphalt content, aggregate gradation, surface density, air voids, Marshall stability and flow, asphalt surface thickness variation. The test results were compared to design values and specifications. The results indicate the percentage of test results which can be expected to fall outside of specification limits and indicate the usefulness of quality control charts in interpreting data. /CGRA/

Huculak, NA
Canadian Good Roads Association Proc
Oct. 1964

2A 214627
CONSTRUCTION OF A FULL-SCALE ROAD EXPERIMENT AS PART OF A UNIT-PRICE CONTRACT
An experimental pavement comprising 36 test sections was constructed, as part of a unit-price highway contract, between May and September, 1965. Special provisions were introduced into the contract documents dealing with the special construction sequences, tolerances, testing, and the control of traffic during construction. Construction control and contract specifications are described and the degree of uniformity of materials, compaction, moisture contents, layer thicknesses, etc., achieved within the framework of the contract is reported. The special provisions are mentioned in this report and the degree of compliance as measured by a comprehensive series of tests during construction, is described. It is concluded that a generally acceptable standard of control was achieved and the experimental pavement was constructed in a very short time. /Author/

Schonfeld, R
Canadian Good Roads Association Proc 1967

Acknowledgment: Canadian Good Roads Association

2A 214628
SPEEDY COMPACT CONCRETE PUMPING UNITS PRODUCE SAVINGS AND A NEW CONTRACTOR
Compact and mobile concrete pumping rigs are competitive in cost and speed and often more easy to handle than conventional crane and bucket or truck and buggy combinations. Here are the benefits of pumping. /1/ Concrete placement tends to be a more steady, uninterrupted operation and is generally faster than conventional methods. /2/ Form pressures and wear are reduced because of elimination of surges. /3/ Concrete can be cast in locations otherwise completely inaccessible to crane or buggies. /4/ Costs are usually comparative with, or better than moving concrete by other methods. Labor requirements are also reduced. /5/ The quality control of the mix built right into the pump means better and stronger final product. /6/ Cranes are freed from bucket-swinging duty to be more productively deployed. Conveyor systems are often teamed up with pumps for long distance or high volume pours, and /7/ The pipelines deliver the mix right to the final location, and in such a manner that other trades or operations are not interrupted during the pour. Buggy runways are eliminated. /CGRA/

Rooke, W
Heavy Construction News /Canada/
Apr. 1967

Acknowledgment: Canadian Good Roads Association

2A 214638
DEVELOPMENTS IN ASPHALT COMPACTION BY VARIABLE TIRE PRESSURE ROLLERS
Pavements are currently compacted in the field in two stages. The first stage consists of rolling at high temperatures during construction, and it may be continued for an hour or two after the mix leaves the spreader. The second stage is compaction by traffic, which takes place at normal service temperatures, and it ordinarily continues from two to four years to achieve ultimate density, which corresponds to 100% of laboratory compacted density. Poor compaction by rolling during construction leaves a pavement with a high air voids content. The higher this content, the faster the asphalt cement in the pavement hardens, and the shorter is the pavement's service life. Consequently, there is a need to combine this two-stage pavement compaction into a single stage. This means that pavements should be rolled during construction to 100% of laboratory compacted density. Experience shows that rolling to 100% of laboratory compacted density cannot be achieved by steel wheel rollers. It could probably be attained by the proper use of pneumatic-tire rollers equipped for rapid change of tire inflation pressure. Some improvements in the latter type that are needed to accelerate this development are reviewed. Compacting pavements during construction to 100% of laboratory compacted density lowers the load carrying capacity of binder and surface courses, and particularly of asphalt base courses, per inch of thickness. Low viscosity asphalt cements, because of their low viscosities at high temperature, tend to give poor mixtures with much less resistance to compaction by rolling, and this would be highly disadvantageous for: (1) Assisting properly operated pneumatic-tire rollers with rapidly adjustable tire pressure to attain 100% of laboratory compacted density by rolling during construction.

Acknowledgment: Canadian Good Roads Association
CONSTRUCTION MATERIALS

(2) ACHIEVING MUCH FASTER COMPACTION BY TRAFFIC TO 100% OF LABORATORY COMPACTED DENSITY, WHERE THIS IS NOT ATTAINED BY ROLLING, AND (3) ACHIEVING COMPACTED DENSITY TO MUCH HIGHER DENSITY BY ROLLING DURING COLD WEATHER CONSTRUCTION. /AUTHOR/

McLeod, NW Canadian Good Roads Association Proc Sept. 1967

ACKNOWLEDGMENT: Canadian Good Roads Association

2A 214640
CANADIAN CONSTRUCTION ASSOCIATION PROCEEDINGS OF THE 49TH ANNUAL MEETING

Canadian Construction Association Proc Jan. 1967

ACKNOWLEDGMENT: Canadian Good Roads Association

2A 214652
INTERRELATION BETWEEN PAVEMENT DESIGN, CONSTRUCTION AND MATERIALS SPECIFICATIONS AND THEIR ENFORCEMENT IN CANADA
AN EXTENSIVE REVIEW OF THE SPECIFICATIONS AND THE TESTS USED DURING CONSTRUCTION IN EACH OF CANADA'S PROVINCES AND IN THREE FEDERAL DEPARTMENTS IS PRESENTED. THE MATERIALS EXAMINED ARE ASPHALT, ASPHALT CONCRETE, PORTLAND CEMENT CONCRETE, BASE COURSE, SUB-BASE, AND SUBGRADE. THE IMPLICATIONS OF THESE SPECIFICATIONS AND THEIR ENFORCEMENT DURING CONSTRUCTION ARE TRACED BY REFERENCE TO THE PAVEMENT MANAGEMENT SYSTEM OF THE CANADIAN GOOD ROADS ASSOCIATION. IN ORDER TO EVALUATE THE PAVEMENT DESIGN METHODS USED BY THESE AGENCIES IT IS SUGGESTED THAT ADEQUATE HISTORIES OF THE MATERIALS USED BE MAINTAINED. PROBLEM AREAS DEFINED BY THIS STUDY ARE LISTED AND SUGGESTIONS REGARDING SPECIFICATIONS AND QUALITY CONTROL ARE PRESENTED. /CGRA/

Sebastyan, GY
Canadian Department Transport. Ottawa Sept. 1969

ACKNOWLEDGMENT: Canadian Good Roads Association

2A 214665
POSSIBLE APPLICATIONS OF SONIC AND ULTRASONIC DEVICES IN HIGHWAY CONSTRUCTION
RESEARCH WAS INITIATED TO EVALUATE /1/ THE PRESENT USAGE OF HIGH-FREQUENCY VIBRATIONS IN VARIOUS INDUSTRIAL AND SCIENTIFIC FIELDS, AND /2/ THE FEASIBILITY OF POSSIBLE APPLICATIONS OF SONIC AND ULTRASONIC MECHANICAL VIBRATIONAL ENERGY IN HIGHWAY ENGINEERING. THE STUDY WAS DIRECTED SPECIFICALLY TOWARD EVALUATION OF POTENTIAL APPLICATIONS OF SONIC ENERGY /60 CPS TO 25 MC/. A STUDY WAS MADE OF TECHNICAL LITERATURE AND RESEARCH REPORTS ON PRESENT USAGE OF SONIC AND ULTRASONIC ENERGY. APPLICATIONS OF SONIC ENERGY TO PREPARATION AND EVALUATION OF HIGHWAY MATERIALS WERE STUDIED EXPERIMENTALLY. THE INVESTIGATION RESULTED IN /1/ COMPLETION OF AN EXTENSIVE LITERATURE SURVEY. /2/ THE VIBRATORY COMPACTATION OF HIGHWAY MATERIALS, ESPECIALLY SOILS, WAS STUDIED AS THE FIRST POTENTIAL APPLICATION. /3/ PRELIMINARY TESTING OF VIBRATION TESTS WERE MADE IN PIEZO-ELECTRIC AND AIR-DRIVEN BALL TRANSUDERS, AND /4/ LIMITED TESTS WERE CONDUCTED ON MIXING AND COMPACTION OF OTHER HIGHWAY MATERIALS SUCH AS ASPHALTIC MIXTURES AND GRANULAR MATERIALS. IT WAS CONCLUDED THAT /1/ SONIC ENERGY CAN PROVIDE POTENTIAL BENEFIT IN HIGHWAY CONSTRUCTION AND ENGINEERING. /2/ MORE FUNDAMENTAL KNOWLEDGE IS NEEDED ON THE DYNAMIC BEHAVIOR OF HIGHWAY MATERIALS AT LOW AND HIGH FREQUENCIES AND THEORETICAL AND EXPERIMENTAL WORK NEEDED IN AREAS OF VIBRATION OF NON-HOMOGENEOUS MEDIA LIKE SOILS AND CONCRETE. /3/ BASIC EFFORT SHOULD BE DEVOTED TO THE LOWER /AUDIO/ FREQUENCY RANGE FOR PROBLEMS SUCH AS COMPACTION OF COHESIVE MATERIALS. EXCAVATION AND CUTTING IN COHESIVE SOILS AND SIMILAR APPLICATIONS. /4/ IS NEEDED OF RUGGEDIZED TRANSUDERS. FEEDBACK-CONTROLLED POWER SUPPLIES, AND TRANSUDER SYSTEMS OPERABLE FROM FIXED FREQUENCY ROTATING MOTOR-GENERATOR SETS.

Moenvenzadeh, F Memaster, RC Highway Research Board Nchp Reports 1966

2A 214666
CONSTRUCTION PRACTICES-FLEXIBLE PAVEMENTS
THIS BIBLIOGRAPHY IS CONCERNED WITH CONSTRUCTION REQUIREMENTS, EQUIPMENT, MATERIALS FOR VARIOUS LAYERS, AND PROCESSING. IN ADDITION TO THE ITEMS CONCERNING CONSTRUCTION PRACTICES OF FLEXIBLE PAVEMENTS THERE ARE ITEMS ON SUBGRADES, BASES AND SUBBASES PERTINENT TO THIS TYPE OF CONSTRUCTION. THE BIBLIOGRAPHY IS PRESENTED IN THREE PARTS. A TECHNICAL LITERATURE SURVEY WITH LISTING OF COVERAGE, PUBLICATION COVERAGE OF ENGINEERING NEWS-RECORD AND OF ROADS & STREETS, BOTH FROM 1955 THROUGH 1964. KEY WORDS ARE INDICATED FOR EACH ARTICLE. ARTICLES ARE LISTED FOR EACH KEY WORD.

Highway Research Board Bibliography 1966

2A 214675
PRACTICAL APPLICATIONS OF THE AREA CONCEPT TO COMPACTION CONTROL USING NUCLEAR GAGES
THE RATE OF PLACEMENT OF EARTHWORK IN HIGHWAY CONSTRUCTION HAS GREATLY EXPANDED SINCE WORLD WAR II. HOWEVER, THE ACCEPTANCE OR REJECTION OF THIS EARTHWORK COMPACTION HAS BEEN BASED ON PREWAR METHODS THAT ARE GEARED TO LOWER PRODUCTION RATES. THE CALIFORNIA DIVISION OF HIGHWAYS HAS BEEN DEVELOPING A NEW TESTING METHOD FOR ACCEPTING OR REJECTING EARTHWORK COMPACTION. THIS METHOD HAS THREE IMPORTANT FACTORS: /1/ A MODIFIED STATISTICAL APPROACH. /2/ THE USE OF NUCLEAR SOIL GAGES. /3/ AN AREA CONCEPT. THE STATISTICAL APPROACH CONSISTS OF OBTAINING SEVERAL IN PLACE DENSITIES OF THE COMPACTED EARTHWORK IN AN AREA TO BE TESTED. THE ACCEPTANCE OR REJECTION IS BASED ON THE AVERAGE RELATIVE COMPACTION AND THE PERCENTAGE FALLING BELOW THE REQUIRED RELATIVE COMPACTION VALUE. THE TEST SITES ARE SOMEWHAT RANDOMLY SELECTED IN AN AREA READY FOR TESTING. THE AREA IS PASSED OR FAILED

199
CONSTRUCTION MATERIALS


Weber, WG Smith, TW Highway Research Record, Hwy Res Board 1967


Madowell, C Highway Research Record, Hwy Res Board 1967

2A 214682 QUALITY CONTROL FOR PRECAST CONCRETE CONSTRUCTION QUALITY CONTROL FOR PRECAST CONCRETE CONSTRUCTION SHOULD BE BASED ON THE ASSUMPTIONS THAT /1/ EACH MEMBER WILL BE ACCURATELY CAST TO DESIGN DIMENSIONS, /2/ THE MEMBERS WILL FIT WHEN JOINED TOGETHER, /3/ THE STRUCTURE WILL POSSESS AN ADEQUATE FACTOR OF SAFETY, AND /4/ MATERIAL EXPOSED TO VIEW WILL HAVE THE FINISHED APPEARANCE INTENDED BY THE DESIGNER. INADEQUATE PLANNING AND THE NEED FOR UNIFORM QUALITY-CONTROL PRACTICES LEAVES ROOM FOR IMPROVEMENT. SUBSTANTIAL ECONOMY CAN BE OBTAINED IN PRECAST CONCRETE CONSTRUCTION IF THE PLANNING AND DESIGN EFFORTS ARE INCREASED. CONTRACTORS MUST BE REQUIRED TO PLAN, COORDINATE AND CHECK THE SHOP DRAWINGS BEFORE FABRICATION.

Anderson, AR Civil Engineering Ace Mar. 1966


Thomas, DA Rocky Mountain Construction Aug. 1966

ACKNOWLEDGMENT: Highway Res Abstracts Hwy Res Board


Waddell, JJ Concrete Construction Oct. 1966

2A 214696 COMPUTER EVALUATION OF CONCRETE QUALITY PROBLEMS AND PITFALLS OF PRESENT SPECIFICATIONS AND PROCEDURES FOR CONTROL TESTING OF CONCRETE ARE DISCUSSED AND IT IS SUGGESTED THAT THESE ARE IN NEED OF REVIEW TO PLACE THEM ON A SOUNDER STATISTICAL BASIS USING ACCELERATED TESTS, ESPECIALLY FOR CONCRETE STRENGTH WHEREVER POSSIBLE. MODERN METHODS OF DATA PROCESSING, STORAGE AND RETRIEVAL ARE SHOWN TO OFFER POTENTIAL FOR FASTER HANDLING OF INFORMATION. NEW REPORTING SYSTEMS HAVE BEEN ESTABLISHED TO FEED CONCRETE DATA TO A COMPUTER. THE DATA ARE THEN PROCESSED, STORED, RETRIEVED AND EVALUATED AS NEEDED FOR THE CONTROL OF QUALITY AT THE TIME OF CONSTRUCTION. THE SELECTION OF CONCRETE BEST SUITED TO A PARTICULAR STRUCTURAL DESIGN OR FOR THE STUDY OF PERFORMANCE. THE SHORT TERM BENEFIT IS IN BETTER CONTROL OF CONCRETE QUALITY AT THE TIME OF CONSTRUCTION. THE LONG TERM, AND PERHAPS EVEN MORE IMPORTANT BENEFIT, SHOULD BE THAT THE PROPERTIES OF CONCRETE WHICH INFLUENCE PERFORMANCE CAN BE IDENTIFIED AND BETTER SPECIFICATIONS PREPARED FOR FUTURE WORK. /AUTHOR/

Smith, P Ontario Dept Hwys, Downsview /Canada/ Jan. 1967
CONSTRUCTION MATERIALS

ACKNOWLEDGMENT: Highway Res Abstracts Hwy Res Board

2A 214697
JOB-RIGGED SPREAD PAVES 35-DEGREE SLOPES
A SPECIAL THREE-RIG PAVING TRAIN THAT CAN POUR AND FINISH CONCRETE TO TOLERANCES WITHIN 1/8 IN. WHILE TILTED 35 DEG WAS DESIGNED BY A BRUSSELS CONTRACTOR TO PLACE THE STEEP BANKS OF AN AUTOMOBILE TEST TRACK IN LOKHEM, BELGIUM. THE BANKED CURVES ARE 36 FT WIDE IN PLAN, BUT VARY 11 FT 4 IN. IN HEIGHT. THIS MEANS THAT ALTHOUGH EACH OF THE SIX LANES IS 6 FT WIDE IN THE STRAIGHTWAY, THEY RANGE FROM 6 TO 6.95 FT IN WIDTH ON THE BANKS. ALL THREE PAVING MACHINES ADJUST IN WIDTH AND ARE SELF-PROPELLED ON RAILS. THE FIRST IS AN AUGER THAT SPREADS A 5-IN LIFT OF CRANE-DUMPED CONCRETE. AFTER WIRE MESH REINFORCING HAS BEEN PLACED BY HAND, THE SECOND MACHINE ALSO POURS AND VIBRATES THE UPPER 2-8 IN. LIFT, SMOOTHING THE SURFACE WITH AN EXTRUDING PLATE. THE THIRD RIG IN THE TRAIN, A STANDARD FINISHER, CARRIES MOVING SCREEDS THAT WORK AT A 30-DEG ANGLE TO THE DIRECTION OF TRAVEL. WORKING CONCRETE TOWARD THE LANES UPPER EDGE, IT BRINGS THE CONCRETE WELL WITHIN THE 1/8 IN. TOLERANCE CALLED FOR IN Specs. THE 2 2/3-MI TRACK IS MADE UP OF TWO 1,970 FT-LONG STRAIGHT STRETCHES LINKED BY THE EXCAVATED TUNNEL. RUBBER-TIRED HAULING EQUIPMENT EASILY FRACTURED TRAPROCKS. COMMENTS WERE MADE ON THICK-LIFT PAVING OF TWO 1,970-FT-LONG STRAIGHT STRETCHES LINKED BY THE EXCAVATED TUNNEL. RUBBER-TIRED HAULING EQUIPMENT EASILY FRACTURED TRAPROCKS. COMMENTS WERE MADE ON THICK-LIFT PAVING OF TWO 1,970-FT-LONG STRAIGHT STRETCHES LINKED BY THE EXCAVATED TUNNEL. RUBBER-TIRED HAULING EQUIPMENT EASILY FRACTURED TRAPROCKS. COMMENTS WERE MADE ON THICK-LIFT PAVING OF TWO 1,970-FT-LONG STRAIGHT STRETCHES LINKED BY THE EXCAVATED TUNNEL. RUBBER-TIRED HAULING EQUIPMENT EASILY FRACTURED TRAPROCKS. COMMENTS WERE MADE ON THICK-LIFT PAVING OF TWO 1,970-FT-LONG STRAIGHT STRETCHES LINKED BY THE EXCAVATED TUNNEL. RUBBER-TIRED HAULING EQUIPMENT EASILY FRACTURED TRAPROCKS. COMMENTS WERE MADE ON THICK-LIFT PAVING OF TWO 1,970-FT-LONG STRAIGHT STRETCHES LINKED BY THE EXCAVATED TUNNEL. RUBBER-TIRED HAULING EQUIPMENT EASILY FRACTURED TRAPROCKS. COMMENTS WERE MADE ON THICK-LIFT PAVING OF TWO 1,970-FT-LONG STRAIGHT STRETCHES LINKED BY THE EXCAVATED TUNNEL. RUBBER-TIRED HAULING EQUIPMENT EASILY FRACTURED TRAPROCKS. COMMENTS WERE MADE ON THICK-LIFT PAVING OF TWO 1,970-FT-LONG STRAIGHT STRETCHES LINKED BY THE EXCAVATED TUNNEL. RUBBER-TIRED HAULING EQUIPMENT EASILY FRACTURED TRAPROCKS. COMMENTS WERE MADE ON THICK-LIFT PAVING OF TWO 1,970-FT-LONG STRAIGHT STRETCHES LINKED BY THE EXCAVATED TUNNEL. RUBBER-TIRED HAULING EQUIPMENT EASILY FRACTURED TRAPROCKS. COMMENTS WERE MADE ON THICK-LIFT PAVING OF TWO 1,970-FT-LONG STRAIGHT STRETCHES LINKED BY THE EXCAVATED TUNNEL. RUBBER-TIRED HAULING EQUIPMENT EASILY FRACTURED TRAPROCKS. COMMENTS WERE MADE ON THICK-LIFT PAVING OF TWO 1,970-FT-LONG STRAIGHT STRETCHES LINKED BY THE EXCAVATED TUNNEL. RUBBER-TIRED HAULING EQUIPMENT EASILY FRACTURED TRAPROCKS. COMMENTS WERE MADE ON THICK-LIFT PAVING OF TWO 1,970-FT-LONG STRAIGHT STRETCHES LINKED BY THE EXCAVATED TUNNEL. RUBBER-TIRED HAULING EQUIPMENT EASILY FRACTURED TRAPROCKS. COMMENTS WERE MADE ON THICK-LIFT PAVING OF TWO 1,970-FT-LONG STRAIGHT STRETCHES LINKED BY THE EXCAVATED TUNNEL. RUBBER-TIRED HAULING EQUIPMENT EASILY FRACTURED TRAPROCKS. COMMENTS WERE MADE ON THICK-LIFT PAVING OF TWO 1,970-FT-LONG STRAIGHT STRETCHES LINKED BY THE EXCAVATED TUNNEL. RUBBER-TIRED HAULING EQUIPMENT EASILY FRAC

ACKNOWLEDGMENT: Highway Res Abstracts Hwy Res Board

2A 214714
QUALITY ASSURANCE THROUGH PROCESS CONTROL AND ACCEPTANCE SAMPLING
QUALITY ASSURANCE FOR HIGHWAYS INCLUDE PROPER ORDERING OF THE THINGS NECESSARY TO PERFORM THE SERVICES AND ASSURANCE THAT WHAT WAS ORDERED WILL BE RECEIVED. THE SPECIFIC CHARACTERISTICS THAT MUST BE CONTROLLED AND THEIR QUANTITATIVE LEVEL OR UNIFORMITY OF DIMENSIONS OR PERFORMANCE ARE INVESTIGATED BECAUSE OF THE VOLUME, SPEED, LEGAL AND FINANCIAL REQUIREMENTS OF HIGHWAY CONSTRUCTION. IMPROVED QUALITY ASSURANCE METHODS ARE NEEDED. STATISTICAL DEFINITIONS AND CONCEPTS NEEDED FOR APPLICATION IN SPECIFICATION WRITING ARE GIVEN.


ACKNOWLEDGMENT: Highway Res Abstracts Hwy Res Board IC33021088, 3C33084583

2A 214726
WHAT CONTRACTORS SHOULD KNOW ABOUT STATISTICAL SPECIFICATIONS

Roads and Streets Apr. 1967

2A 214731
EVALUATION OF CONSTRUCTION CONTROL PROCEDURES-INTERIM REPORT
VARIATIONS INHERENT IN AGGREGATE GRADATIONS IN WIDELY DIFFERENT GEOGRAPHICAL LOCATIONS WERE EVALUATED. STATISTICAL TECHNIQUES WERE USED FOR DETERMINING THE RELATIVE EFFECT OF TESTING ACURACY, SAMPLING METHODS, AND SEGREGATION, WITH RELATION TO THE EVALUATION AND ACCEPTANCE OF COARSE AGGREGATE USED FOR HIGHWAY CONSTRUCTION. A PRECISION STATEMENT DEVELOPED THERE FROM INCLUDES A GRADATION TEST, AND A METHOD OF DRAFTING A REALISTIC AND ADEQUATE ACCEPTANCE GRADATION SPECIFICATION FOR COARSE AGGREGATES. THE STANDARD DEVIATION FOR THE REPEATABILITY OF THE GRADATION TEST ON COARSE AGGREGATE, UNDER ROUTINE CONDITIONS, IS APPROXIMATELY 4 PERCENT. RECOMMENDED METHODS OF INCORPORATING THE RESULTS OF THIS STUDY INTO HIGHWAY CONSTRUCTION SPECIFICATIONS AND PRO-
2A CONSTRUCTION MATERIALS

CEDURES ARE PRESENTED IN THE FORM OF A COMPLETE MODEL SPECIFICATION FOR GRADED COARSE AGGREGATE.

Highway Research Board Ncbrp Reports 1967

2A 214735 EXPERIENCES WITH THE USE OF WEDGES AGAINST FROST HEAVING

OBSERVATIONS OF THE FROST HEAVINGS IN THE ROAD CONSTRUCTION USING WEDGES FOR PREVENTION OF THE INFLUENCE OF FROST WERE CONDUCTED. OBSERVATIONS WERE MADE ON FROST-SUSCEPTIBLE GROUND ON ROAD PARTS SITUATED ON BOTH SIDES OF CULVERTS. THE FOLLOWING CASES WERE OBSERVED: 1/ CULVERTS WITHOUT ANY TRANSITION WEDGES, 2/ CULVERTS WITH SHORT IRREGULAR WEDGES, FILLED WITH SAND, 3/ CULVERTS WITH LONG REGULAR SAND WEDGES, AND 4/ WEDGE FILLED WITH INSULATING LIGHTWEIGHT AGGREGATE. THE INVESTIGATION RESULTED IN A PROPOSAL FOR THE SHAPE AND DIMENSIONS OF THE FROST DISPLACEMENT WEDGE OF THE CULVERT TO PREVENT FROST HEAVING.

Taivainen, CA Intl Conf Struct Design Asphalt Pmts Jan. 1967

2A 214737 RESPONSIBILITY FOR QUALITY IN HIGHWAY CONSTRUCTION

THE PROBLEMS OF RESPONSIBLE CONTROL FOR QUALITY IN HIGHWAY CONSTRUCTION ARE DISCUSSED. PERFORMANCE DEPENDS ON THE DESIGN OF THE PAVEMENT STRUCTURE AT LEAST AS MUCH AS ON THE QUALITY OF MATERIALS AND CONSTRUCTION. THE ULTIMATE CONCEPT IN RESPONSIBILITY WOULD BE HAVING THE CONTRACTOR OR GOVERNMENT AGENCY REQUIRED TO DESIGN, BUILD, AND GUARANTEE THE PERFORMANCE OF THE HIGHWAY. HOWEVER, INITIATIVE IN USING NEW CONSTRUCTION METHODS MUST NOT BE HAMPERED. CONSTRUCTION CONTROL TOLERANCES AND THE RESPONSIBILITY FOR QUALITY CONTROL TESTING ARE DISCUSSED.


2A 214740 RECOMMENDED PRACTICE FOR CONCRETE FORMWORK

PRESENTS BRIEF INTRODUCTORY STATEMENT ON THE NEED FOR FORMWORK STANDARDS BASED ON THE FACT THAT 15 TO 60 PERCENT OF THE TOTAL COST OF THE CONCRETE WORK IN A PROJECT IN THE UNITED STATES IS IN THE FORMWORK. A SECTION IS GIVEN ON ENGINEER-ARCHITECT SPECIFICATIONS NOTING THE KIND AND AMOUNT OF SPECIFICATION THE ENGINEER OR ARCHITECT SHOULD PROVIDE THE CONTRACTOR. SINCE THE COMMITTEE CONCLUDES THAT FORMWORK DESIGN, SPECIFICATIONS, OF THE CONTRACTOR, MUST BE THE RESPONSIBILITY OF THE CONTRACTOR. THE RECOMMENDATIONS CONTAINED IN THE REPORT ARE DIRECTED TO THAT GROUP. HOWEVER, AN UNDERSTANDING OF THE RECOMMENDATIONS BY ENGINEERS AND ARCHITECTS WILL AID THESE GROUPS IN THEIR SPECIFICATION FUNCTIONS. THE REPORT IS DIVIDED INTO FIVE CRUSHERS, 1. FORMWORK, 2. FORMWORK FOR FORMWORK, 4. FORMS FOR SPECIAL STRUCTURES, AND 5. FORMWORK FOR SPECIAL METHODS OF CONSTRUCTION. /AUTHOR/

Ahmad, MS Roads Maintenance Circle/Pakistan/ June 1967

2A 214752 FEASIBILITY OF COLD WEATHER EARTHWORK IN INDIANA

THE EFFECTS OF COLD AND INCLEMENT WEATHER ON MEN, MACHINES, AND MATERIALS INVOLVED IN HIGHWAY EARTHWORK WERE REVIEWED. THE COLD WEATHER EARTHWORK EXPERIENCE OF THE NORTHERN STATES OF THE UNITED STATES, THE PROVINCES OF CANADA, AND THE SCANDINAVIAN COUNTRIES HAS BEEN REVIEWED WITH THE AIMS OF DETERMINING, (1) HOW WEATHER AND SOIL CONDITIONS TEND TO RESTRICT THE LENGTH OF THE CONSTRUCTION SEASON, AND (2) WHAT COLD WEATHER CONSTRUCTION PRACTICES MIGHT BE APPROPRIATE IN INDIANA. THE SEASONAL VARIATIONS OF WEATHER AND CERTAIN SOIL CONDITIONS IN INDIANA HAVE BEEN STUDIED. THE INCREASED COSTS OF VARIOUS EARTHWORK OPERATIONS IN INDIANA DURING COLD WEATHER HAVE BEEN ESTIMATED. THE PROBABLE BENEFITS OF (1) REDUCED INTEREST AND INFLATION COSTS, (2) REDUCED ACCIDENT AND INCORRECTIVE COSTS, AND (3) BETTER UTILIZATION OF THE RESOURCES OF LABOR, CONTRACTORS, AND THE STATE HIGHWAY COMMISSION HAVE BEEN WEIGHTED AGAINST HEIGHTENED TECHNOLOGICAL DEMANDS. A HYPOTHETICAL EXAMPLE HAS BEEN DEVELOPED WHICH SHOWS THAT COLD WEATHER EARTHWORK IS FEASIBLE ON AN INTERSTATE HIGHWAY CONSTRUCTION PROJECT IN NORTHERN INDIANA AND THAT YEAR-ROUND CONSTRUCTION SCHEDULING CAN PRODUCE AN ECONOMIC BENEFIT. /AUTHOR/

Osborne, AM Purdue & Ind State Hwy Comm Jrnp June 1967

2A 214766 CRUSHED BRICK IN ROAD CONSTRUCTION

THERE ARE LARGE AREAS IN PAKISTAN WHERE STONE AGGREGATE IS NOT AVAILABLE IN THE VICINITY OF ROAD CONSTRUCTION. LONG HAULAGE OF STONE MAKES THE ROAD CONSTRUCTION EXPENSIVE. SIMILAR CONDITIONS EXIST ELSEWHERE IN MANY PARTS OF THE WORLD. WORK HAS BEEN DONE AT THE ROAD RESEARCH INSTITUTE LAHORE TO INVESTIGATE THE USE OF AGGREGATE OBTAINED FROM CRUSHING BURNT BRICK IN SUCH AREAS FOR USE IN ROAD CONSTRUCTION. THIS STUDY HAS BEEN DIRECTED TOWARDS THE DISCUSSION ON THE EXISTING PRACTICES RELATING TO USE OF BRICKS IN ROAD CONSTRUCTION. USE OF CRUSHED BRICK IN SUBSTITUTION OF WHOLE BRICKS, AND REPLACEMENT FOR ONE AGGREGATE WITH CRUSHED BRICK WOULD BE ECONOMICALLY FEASIBLE. BRICK AGGREGATE MADE BY CRUSHING BUILDING BRICKS HAS BEEN CHECKED FOR ITS USE IN SUBBASE, BASE AND ASPHALTIC CONCRETE MIX. EXPERIMENTAL ROADS WERE BUILT ON THE BASIS OF RESULTS OBTAINED IN THE LABORATORY. RESULTS OF THE BOTH LABORATORY AND FIELD EXPERIMENTS HAVE BEEN DETAILED, WHICH INDICATE THAT BRICK AGGREGATE OFFERS GOOD PROSPECTS OF REPLACING CRUSHED STONE IN THE AREAS OF STONE SCARCITY AND A BETTER STRUCTURAL SUBSTITUTE FOR WHOLE BRICK IN CONVENTIONAL ROAD CONSTRUCTION. /AUTHOR/

Ahmad, MS Roads Maintenance Circle/Pakistan/ July 1967

2A 214767 SWISS ROAD BUILDERS SEEK WAYS TO REDUCE BAD WEATHER RISKS

SOME OF THE LARGER SWISS ROAD BUILDING CONSTRUCTION JOBS REQUIRE 400 MEN ON THE JOB. THE INVESTED VALUE OF EQUIPMENT AVERAGES OUT TO 62,500 SWISS FRANS PER MAN WHICH MEANS THAT EVERY HOUR OF WORK LOST BECAUSE OF RAIN RESULTS IN A CONSIDERABLE LOSS OF RETURN ON INVESTMENT. SOME MEANS OF REDUCING WEATHER RISK USED ARE: USE OF SCRAPEDOZERS WHICH WORK SUCCESSFULLY UNDER ALL KINDS OF CONDITIONS, AND THE USE OF CRUSHED BRICK AGGREGATE WHERE SHORT DISTANCES ARE INVOLVED. LAYING LIME FOR SOIL STABILIZATION OFFERS ONE MEANS OF COMPACTING WATERLOGGED MORaine AFTER FIVE DAYS OF RAIN.

Mojen, H World Construction Oct. 1967
CONSTRUCTION MATERIALS 2A

2A 214768
NATIONAL CONFERENCE ON STATISTICAL QUALITY CONTROL METHODOLOGY IN HIGHWAY AND AIRFIELD CONSTRUCTION

2A 214780
ESTIMATING CONCRETE WORK VI
TECHNIQUES ARE DESCRIBED FOR REMOVING ITEMS FOR PRICING FROM THE QUANTITY TAKEOFF SHEETS TO THE RECAP SHEET. A LABOR OUTPUT TABLE IS PRESENTED FOR USE IN PRICING LABOR FOR FORM WORK ERECTION, THREE ITEMS OF STATISTICAL EVALUATION TECHNIQUES ARE PRESENTED FOR FORM WORK MATERIAL COST, ERECTION LABOR PER DAY AND STRIPPING LABOR PER DAY. THE ERECTION TIME INCLUDES A CARPENTER AND ONE-HALF LABORER PER DAY. THE STRIPPING TIME INCLUDES ONE LABORER PER DAY.

Lejeune, EG Concrete Construction Nov. 1967

2A 214782
ESTIMATING CONCRETE WORK IV
TECHNIQUES ARE DESCRIBED FOR REMOVING ITEMS FOR PRICING FROM THE QUANTITY TAKEOFF SHEETS TO THE RECAP SHEET. A LABOR OUTPUT TABLE IS PRESENTED FOR USE IN PRICING LABOR FOR FORM WORK ERECTION, THREE ITEMS OF STATISTICAL EVALUATION TECHNIQUES ARE PRESENTED FOR FORM WORK MATERIAL COST, ERECTION LABOR PER DAY AND STRIPPING LABOR PER DAY. THE ERECTION TIME INCLUDES A CARPENTER AND ONE-HALF LABORER PER DAY. THE STRIPPING TIME INCLUDES ONE LABORER PER DAY.

Lejeune, EG Concrete Construction Oct. 1967

2A 214783
ESTIMATING CONCRETE WORK III
PROCEDURES AND TECHNIQUES ARE PRESENTED FOR ESTIMATING CONCRETE WORK FOR INTERIOR AND EXTERIOR COLUMNS, INTERIOR AND EXTERIOR BEAMS, SHORED FLAT SLABS, AND METAL OR FIBERGLASS PAN SLABS.

Lejeune, EG Concrete Construction Sept. 1967

2A 214785
ESTIMATING CONCRETE WORK II
PROCEDURES AND TECHNIQUES ARE PRESENTED FOR ESTIMATING CONCRETE WORK FOR INTERIOR AND EXTERIOR COLUMNS, INTERIOR AND EXTERIOR BEAMS, SHORED FLAT SLABS, AND METAL OR FIBERGLASS PAN SLABS.

Lejeune, EG Concrete Construction Apr. 1967

2A 214794
SLURRY-TRENCH TECHNIQUES FOR DIAPHRAGM WALLS IN DEEP FOUNDATION CONSTRUCTION
BENTONITE SLURRY IS BEING SUCCESSFULLY USED IN TRENCH EXCAVATION AROUND THE WORLD. THE CONSTRUCTION OF UNDERGROUND CONCRETE DIAPHRAGM WALLS BY USE OF BENTONITE SLURRY-TRENCH TECHNIQUES OFFERS MANY ADVANTAGES FOR FOUNDATION AND UNDERGROUND CONSTRUCTION. THEIR USE PROVIDES A RIGID, WATERTIGHT WALL THAT PERMITS SUBSEQUENT DewaterING AND EXCAVATION WITHOUT CAUSING SETTLEMENTS AND GROUND WATER DRAWDOWN THAT MIGHT DAMAGE ADJOINING STRUCTURES. THUS, UNDERPINNING IS ELIMINATED OR MINIMIZED AND DEEP EXCAVATIONS ARE FACILITATED. SHORT LENGTHS OF WALL ARE EXCAVATED BY CLAMSHELL BUCKET OR OTHER MEANS AND ARE HELD FROM CAVING BY SLURRY UNTIL EXCAVATION IS COMPLETE AND CONCRETE CAN BE PLACED BY TREMIE METHODS. A
NEW DEVELOPMENT IS USE OF VERTICAL (SOLDIER) BEAMS TO ESTABLISH WORK AREAS AND THEN SERVE AS STRUCTURAL REINFORCEMENT. BUILDING FOUNDATION WALLS IN THIS WAY ALLEVIATES MOVEMENT OF SOIL AND OF GROUND WATER.

Gerwick, BC  Civil Engineering Asce  Dec. 1967

2A 214798
THE ART OF TUNNELLING

Szczesny, K
Akademia Kaido /Hungary/  891 pp. 1966

2A 214800
QUALITY CONTROLS FOR STEEL CONSTRUCTION DEVELOPMENTS IN THE STEEL INDUSTRY PERMITTING THE USE OF A WIDE VARIETY OF STRUCTURAL STEELS. THE EVER-INCREASING USE OF WELDED DESIGN AND THE RAPID PACE OF TODAY'S CONSTRUCTION ARE PLACING GREAT RESPONSIBILITY ON THE INSPECTION PHASE OF STRUCTURAL-STEEL PRODUCTION, FABRICATION AND ERECTION. BETTER AND MORE CLOSELY SUPERVISED INSPECTION OF STEEL IS REQUIRED FROM ROLLING MILL THROUGH FABRICATION PLANT TO ERECTION AND FINAL PAINTING. THE SUPPLIER FACSES THE CONFLICTING INTERESTS OF LOW COST VS. A QUALITY PRODUCT. THE FIRST OF THESE PRACTICE OF ARCHITECTS HAVING FIELD INSPECTION OF BUILDINGS PERFORMED ON THE BASIS OF INFREQUENT VISITS TO THE SITE BY THE DESIGNING ENGINEER IS SUBJECT TO CRITICISM, BECAUSE OF A LACK OF UNDERSTANDING BY THOSE ON THE JOB AS TO THE BASIC DESIGN REQUIREMENTS AND BEHAVIOR OF MATERIALS, THIS PRACTICE OFTEN LEADS TO COSTLY CORRECTIVE ACTION OR INFERIOR WORK.

It is strongly recommended that this practice be given close scrutiny by the engineering profession.

Brumer, M  Stahl, F  Civil Engineering Asce  Oct. 1965

2A 214806
THE SEARCH FOR BETTER QUALITY ASSURANCE FOR ASPHALT PAVEMENTS
CONTENTS: THE BASIC PROBLEMS OF QUALITY ASSURANCE QUALITY ASSURANCE REQUIREMENTS FOR BITUMINOUS CONSTRUCTION SUGGESTED TOLERANCES BASIS FOR TOLERANCES.

Halstead, WJ
Transportation Department /US/  1968

2A 214812
QUALITY CONTROL OF ASPHALT PAVEMENT CONSTRUCTION
DATA WERE COLLECTED FROM NINE ASPHALT PAVEMENT CONSTRUCTION PROJECTS TO DETERMINE THE VARIATIONS IN TESTING, ROAD DENSITIES, AIR VOIDS, MARSHALL STABILITY AND FLOW VALUES, PAVEMENT THICKNESS, AND ASPHALT CEMENT PENETRATION, STANDARD DEVIATIONS FOR EACH ARE PRESENTED IN GRAPHS. THE DESIGN OF A QUALITY CONTROL CHART IS PRESENTED AS THE ESTABLISHMENT OF THE PROBABLE LIMITS OF RANDON FLUCTUATION AND THE NUMBER OF DEFECTIVES FOUND PER UNIT VOLUME REPRESENTED BY A SERIES OF SAMPLES. THE TECHNIQUE IS INTRODUCED AS A NATURAL FOLLOW-THROUGH IN THE STUDY VARIATION IN PHYSICAL PROPERTIES USED TO DESCRIBE THE QUALITY OF PAVEMENT MIXTURES. THE USE OF QUALITY CONTROL CHARTS SHOULD PROVE TO BE A VALUABLE TOOL IN PAVEMENT PRODUCTION BEYOND AN INVALUABLE HISTORICAL ACCOUNT OF QUALITY-CHARACTERISTICS.

Hucink, NA
Canadian Department Public Works  Feb. 1968

2A 214815
INVESTIGATIONS INTO ROAD BUILDING PRACTICE IN THE TROPICS, A STUDY OF THE COMPACIATION OF EARTHWORKS AT THE NEW INTERNATIONAL AIRPORT FOR KUALA LUMPUR, MALAYSIA

Bulman, JN  Rrl Reports, Road Research Lab /UK/  1967

2A 214818
STATISTICAL QUALITY CONTROL IN HIGHWAY CONSTRUCTION
CALIFORNIA'S EXPERIENCE IN MAKING A STATISTICAL STUDY OF ITS QUALITY SPECIFICATIONS FOR HIGHWAY AND BRIDGE CONSTRUCTION MATERIALS IS DESCRIBED. FOUR YRS OF RESEARCH ON SAMPLING AND TESTING OF MATERIALS SUCH AS COMPACTED EMBANKMENT, PLASTIC CONCRETE, CEMENT TREATED BASE, STRUCTURAL CONCRETE AGGREGATE, UNTREATED BASE MATERIAL AND AGGREGATE SUBBASE MATERIAL ARE BEGINNING TO PROVIDE INFORMATION CONCERNING VARIATIONS DUE TO SAMPLING, TESTING, AND THOSE INHERENT IN THE MATERIALS ITSELF, SUGGESTED IN PLACE OF TRADITIONAL METHODS IS STATISTICAL QUALITY CONTROL (SQC) THE USE OF SQC COULD SHIFT THE QUALITY CONTROL RESPONSIBILITY TO THE CONTRACTOR WITH THE BUYER BASING HIS PURCHASE
ON A STATISTICALLY SOUND END POINT EVALUATION, PROBLEMS ARISING IN THE USE OF SQC MAY BE MET BY TRAINING IN THE TECHNOLOGY OF STATISTICAL CONTROL, RECOGNITION OF THE FACT THAT THERE IS NO NEED TO SUPPLY STATISTICAL SPECIFICATIONS TO EVERY CONSTRUCTION ITEM, THE ESTABLISHMENT OF NEW SPECIFICATION LIMITS, AND A REVISION OF TESTING PROCEDURES. /AUTHOR/


**2A 214824**

**EFFECT OF CEMENT HYDRATION ON CONCRETE FORM PRESSURE**

The pressure of concrete on forms as affected by cement hydration and individual concrete ingredients at 70 F (21 C) was studied. The effect of cement hydration was investigated by comparing the behavior of concrete with and without a water-reducing set retarding agent to the nonhydrating mixture containing fly ash which had about the same plastic properties as concrete. Oil filled pressure cells were adapted to measure pressure in a form 10 ft. (3.05m) high x 3 ft. (0.91 m) wide x 1 ft. (0.30 m) thick. Results indicated that under these conditions, workable concrete having a 2 to 4 in. (76 to 102 mm) slump does not behave as fluid for any appreciable time without some outside energizing force such as vibration. The arching action of the aggregate is the earliest factor to limit the lateral pressure to 5 to 6 psi (0.35 to 0.42 kg/cm²) equivalent to 5 to 6 ft. (1.52 to 1.83 m) of head. With the method of placement and vibration used, hydration of the cement tended to limit form pressure under the normal vibration used. The effect of cement hydration was investigated by comparing the behavior of concrete with and without a water-reducing agent to the nonhydrating mixture containing fly ash which had about the same plastic properties as concrete. Oil filled pressure cells were adapted to measure pressure in a form 10 ft. (3.05 m) high x 3 ft. (0.91 m) wide x 1 ft. (0.30 m) thick. Results indicated that under these conditions, workable concrete having a 2 to 4 in. (76 to 102 mm) slump does not behave as fluid for any appreciable time without some outside energizing force such as vibration. The arching action of the aggregate is the earliest factor to limit the lateral pressure to 5 to 6 psi (0.35 to 0.42 kg/cm²) equivalent to 5 to 6 ft. (1.52 to 1.83 m) of head. With the method of placement and vibration used, hydration of the cement tended to limit form pressure under the normal vibration used. But did not prevent an increase in pressure brought about by re-vibration until after 4 hours. The effect of set retarding agent on cement hydration did not significantly alter the pressure. /AUTHOR/

Ore, EL Straughan, JJ *Am Concrete Inst Journal & Proceedings* Feb. 1968

**2A 214832**

**P.C. CANTILEVER ERECTION METHOD USING PRECAST UNITS**

The P.C. cantilever erection method using precast box-type girders and epoxy resin into joints is considered for the engineering of prestressed concrete. This method was used in Japan for the continuous expressway viaduct work where the Tokyo Metropolitan Expressway crosses over radial route 3. Results are described of tests carried out on specimen to obtain needed design data, and the results of experiments executed on actual bridge, as well as several technical problems of the method. This method is applied since: (1) the erection period can be shortened because the precast blocks are manufactured when substructure works are going on; (2) the quality variance of each unit is less because sufficient control can be performed in the production stage; (3) almost no deformation, due to day shrinkage and creep of concrete, is observed because the curing period between precasting and prestressing is long enough, and (4) no timbering is needed because of simple erecting apparatus. /AUTHOR/

Miyasuchi, N *Japan Road Association Annual Reports* 1967

**2A 214835**

**QUALITY CONTROL OF CONSTRUCTION BY STATISTICAL TOLERANCES**

Two years work and study are reported in the field of statistical control of construction tolerances by the Alabama highway department. Three construction projects were examined in detail: (1) a grading project, (2) a base and bituminous pavement project, and (3) a base and Portland cement concrete pavement project. The projects were examined in detail and strict compliance with the recommendations contained in the statistical approach to quality control and highway construction published as a research guide by the Bureau of Public Roads in April, 1965. The computer program for the analysis of variance used is based on the proposition that the variance of the material, plus the variance of the sampling, plus the variance of the testing is equal to the overall variance of the end result. The asphalt concrete used in the project included in the study was placed in three layers. Results are described of tests carried out on actual bridge, subgrade and pavement designs, paving equipment and paving costs at no sacrifice in pavement quality. /AUTHOR/

David, JH *Ohio State Highway Department* May 1967

**2A 214841**

**AN ANALYSIS OF FACTORS INFLUENCING CONCRETE PAVEMENT COST**

The basic elements of concrete pavement construction costs are briefly discussed and evaluated. A cost analysis for an assumed project in a midwestern location is given to illustrate the effects of variations in design and construction practices on construction costs. Some of the cost factors discussed are: (1) distributed steel and plain concrete paving, (2) paving equipment and construction procedures, (3) differences in modulus of subgrade reactions, and (4) single-lane and dual-lane constructions. A principal objective is to show that detailed analysis of individual projects using local material and labor prices will reveal the most economical design for the anticipated traffic, subgrade, and climatic conditions of the pavement. Such an analysis will result in reduced pavement costs at no sacrifice in pavement quality. /AUTHOR/


**2A 214853**

**RETAINING WALLS**

Retaining walls are treated as to their design, construction, stability, displacement, and earth pressures against them. Soil pressure cells are discussed. /AUTHOR/

Highway Research Information Service Feb. 1969

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CONSTRUCTION MATERIALS

2A 214854
EXPERIMENTAL BASES DESIGNED TO MEET BUDGETARY LIMITATIONS
EXPERIMENTAL WORK WAS CONDUCTED ON CONSTRUCTING TWO AND THREE-COURSE COMBINATION BASES USING LOCALLY AVAILABLE MATERIALS FOR BITUMINOUS SURFACES ON SECONDARY ROADS. ANOTHER PROMISING DEVELOPMENT IN SECONDARY BASE CONSTRUCTION IS THE EMPLOYMENT OF COMPOSITE BASES, USING TWO OR MORE MATERIALS, WITH OR WITHOUT STABILIZING AGENTS, BUT GENERALLY WITH A BITUMINOUS SURFACE. THE STABILIZATION OF NON-COMMERCIAL AND LOCAL BASE MATERIALS HAS BEEN ACCOMPLISHED THROUGH THE USE OF SUCH AGENTS AS CEMENT, ASPHALT, LIME, SALT AND CALCIUM CHLORIDE, TO PRODUCE A DENSE, WATER-REPELLANT BASE AT A COST WITHIN BUDGET BOUNDARIES APPLICABLE TO SECONDARY FARM-TO-MARKET ROADS. THE COMPOSITE BASES CONSISTING OF LOW-COST LOCAL MATERIAL FOR THE SUBBASE, COVERED WITH A HIGHER-CLASS AND MORE EXPENSIVE UPPER BASE MATERIAL, APPRECIABLY REDUCE COSTS. THE TWO-COURSE BASES HAVE ADVANTAGES BECAUSE THE FIRST COURSE GRANULAR MATERIAL GIVES BETTER VERTICAL AND HORIZONTAL DRAINAGE. THE TOP COURSE OF GRADED CRUSHED AGGREGATE GIVES A SURFACE WITH GOOD RIDING QUALITIES AND A GOOD SURFACE FOR THE APPLICATION OF A LOW-COST BITUMINOUS MILEMENT; THIS TYPE OF CONSTRUCTION IS AN ADAPTATION OF THE MULTI-LAYER BASES INCORPORATING DIFFERENT MATERIALS USED IN THE CONSTRUCTION OF TOLL ROADS.

Cooney, JG  Better Roads: May 1954

2A 214857
MOISTURE REQUIREMENTS FOR SOIL-CEMENT CONSTRUCTION
LABORATORY RESEARCH SHOWS THAT THE OPTIMUM MOISTURE CONTENT (POINT AT WHICH MAXIMUM DENSITY IS OBTAINED) AS DETERMINED BY THE STANDARD MOISTURE-DENSITY TEST IS REASONABLY IN AGREEMENT WITH THE OPTIMUM MOISTURE CONTENTS AT WHICH MAXIMUM DURABILITY AND MAXIMUM STRENGTH ARE OBTAINED.

Catton, MD  Portland Cement Assoc. Soil Cement Serv.: Sept. 1943

ACKNOWLEDGMENT: Highway Research Board Bibliography

2A 214863
ROLLED CONCRETE ROADS, SOIL-CEMENT EXPERIMENTS
SIX SECTIONS OF SOIL-CEMENT ROAD HAVE BEEN CONSTRUCTED. ATTEMPTS TO SLIGHTLY INCREASE THE PROPORTION OF CEMENT AT THE SURFACE OF ADDING CEMENT SLURRY WERE NOT SUCCESSFUL, AS THE LAYER SO FORMED QUICKLY SCALED OFF.

Darwin, DV  Roads & Road Construction, London /UK/: July 1943

ACKNOWLEDGMENT: Highway Research Board Bibliography

2A 214869
OCRACOKE'S BEACH SAND ROADS
THE CONSTRUCTION OF A ROAD ON OCRACOKE ISLAND, N.C., IN WHICH SURFACING CONSISTS OF BEACH SAND STABILIZED WITH CEMENT, IS DESCRIBED. THE SAND CONTAINS A HIGH PROPORTION OF SHELLS. CEMENT AND SAND WERE USED IN THE PROPORTION OF APPROXIMATELY 1:3 BY WEIGHT. NO REINFORCEMENT AND NO EXPANSION JOINTS WERE USED.

Morrison, JI  Public Works, Road Abstracts /UK/: 1951

ACKNOWLEDGMENT: Highway Research Board Bibliography

2A 214870
CONSTRUCTION OF CONCRETE ROADS
OXTN EXPERIMENTAL ROAD IN NOTTINGHAMSHIRE CONSISTS OF PLAIN AND REINFORCED SLABS OF VARYING THICKNESS LAID ON VARYING THICKNESSES OF SOIL-CEMENT BASE ON UNIFORM SUBGRADE. SIX IN. PLAIN SLABS FAILED AFTER 5 YEARS OF TRAFFIC, WHEREAS 3-AND 4-IN. REINFORCED CONCRETE SLABS WERE STILL SERVICEABLE. EXPERIENCES WITH PRESTRESSED ROADS AND JOINT SPACING ARE MENTIONED.

Collins, AR  Surveyor and Municipal Engineer /UK/; Engineering Index Dec. 1953

ACKNOWLEDGMENT: Highway Research Board Bibliography

2A 214871
SOME PROBLEMS IN MIXING GRANULAR MATERIALS USED IN ROAD CONSTRUCTION, PART 1. MIXTURES OF SOIL AND CEMENT
A REPORT IS PRESENTED OF MIXING STUDIES UNDERTAKEN AT THE ROAD RESEARCH LABORATORIES USING MIXING MACHINES DESIGNED FOR SOIL STABILIZATION WORK. THE STUDIES ARE CONCERNED WITH DEFINING THE DEGREE OF MIXING REQUIRED AND WITH DEVELOPING METHODS OF EVALUATING, QUANTITATIVELY THE MIXING ACHIEVED BY MACHINES IN USE.

Clarke, KF  Road Research Laboratory /UK/: 14 pp, Nov. 1954

ACKNOWLEDGMENT: Highway Research Board Bibliography

2A 214872
SUPERVISION OF CONTROL TESTS AT FERRY FRYSTON ESTATE, CASTLEFORD, U.D.C.
THIS REPORT GIVES AN ACCOUNT OF THE WORK UNDERTAKEN BY THE ASSOCIATION TO ASSIST WITH THE CONSTRUCTION OF SOIL-CEMENT BASES FOR HOUSING ESTATE ROADS AT FERRY FRYSTON, CASTLEFORD. DETAILS ARE GIVEN OF THE METHOD OF CONSTRUCTION EMPLOYED, TOGETHER WITH THE RESULTS OF FIELD TESTS ON A PRELIMINARY AREA OF APPROXIMATELY 1,350 SQ. YARDS. EXTRACTS FROM THE SPECIFICATION ARE INCLUDED.


ACKNOWLEDGMENT: Highway Research Board Bibliography

2A 214873
THE CONSTRUCTION OF A TEST TRACK FOR MOTOR VEHICLES (IN GERMAN)
A NEW TEST TRACK HAS BEEN CONSTRUCTED FOR THE VOLKSWAGEN FACTORY AT WOLFSBURG, THE DESIGN AND CONSTRUCTION OF THE PRESTRESSED CONCRETE RACING TRACK WHICH FORMS PART OF IT ARE DESCRIBED. IT IS 30 FT. WIDE, ROUGHLY OVAL IN PLAN, WITH A TOTAL LENGTH OF 5,900 FT., AND CONSISTS OF TWO CURVES OF 1,090 FT. (RADIUS 525 FT.) AND 847 FT. (RADIUS 482 FT.), TWO STRAIGHTS OF 755 FT., AND FOUR CLOTHOID TRANSITION CURVES WHICH ARE 587 OR 640 FT. LONG. THE SUPER-ELEVATION IN THE CURVES IS DESIGNED TO ALLOW A SPEED OF 93 MI. PER HR. WITHOUT THE VEHICLE'S BEING SUBJECT TO COMPONENT FORCES; THE MAXIMUM DEGREE OF INCLINATION IS 56 DEGREES. THE CONCRETE SLAB IS 6 IN. THICK OVER A SOIL-CEMENT STABILIZED BASE. THE HOLZMANN SYSTEM WAS EMPLOYED FOR THE PRESTRESSING.

Zern, W  Beton Und Stah/betonbau /Germany/: Road Abstracts /UK/: 1957

ACKNOWLEDGMENT: Highway Research Board Bibliography

2A 214875
STANDARD SPECIFICATIONS FOR CONSTRUCTION OF AIRPORTS
DIVISION II ON PAVING CONSTRUCTION DETAILS MENTIONS: SUBBASE COURSE, CRUSHED AGGREGATE BASE COURSE, SOIL CEMENT BASE COURSE, CEMENT TREATED BASE COURSE, PORTLAND CEMENT CONCRETE PAVEMENT.

Federal Aviation Administration /US/: 1964

ACKNOWLEDGMENT: Portland Cement Association
CONSTRUCTION MATERIALS

2A 214877
CONSTRUCTION PRACTICES-EARTHWORK
These references on earthwork construction practices include consolidation of fine-grained soil by drain wells, bog blasting for road construction, theories for sand drains, vertical sand drain installations, soil mechanics in the design and construction of an airport, settlement correction at an airport, tunnel engineering, and pre-wetting embankment soils.

Highway Research Information Service  Feb. 1970

2A 214886
HIGHWAY CONCRETE MIXING PLANTS, CONTROL DURING AND AFTER PRODUCTION (IN FRENCH)
The results are described of controls and measurements carried out on the constituents and on the production of a highway concrete, as part of a series of observations on a motorway concreting site. The controls related to the characteristics of the cement used, notably in relation to the content of the secondary constituents, the blaine fineness and mechanical strengths; the characteristics of the various aggregates, in particular, grain size and cleanliness; the concrete produced; cone settlement, ease of handling, occluded air content, mechanical strengths whenever possible. The production of concrete was controlled by means of continuous recording of the parameters of production, involving weighing of the various constituents, energy consumed by mixing, temperature of constituents, and resistivity of sands. The results obtained make it possible to assess the variability of the characteristics of the concrete and their constituents. Moreover, the recording of the parameters and continuous control during production can make it possible (1) to avoid using batches with characteristics which are incompatible with a proper surfacing and durability of the pavement, and (2) to detect and localize operating faults in the production equipment sufficiently in time to ensure that the concrete produced will not fall below standard. It was believed that cables constructed of shop-fabricated and socketed parallel-wire strands would combine all of the advantages of these two cable types and render them both obsolete. Pilot work was undertaken, and culminated in a successful development project carried out during 1965 with the consultation of the firm of Steinman, Boynton, Gronquist & London, which reported favourably on the method. Standard anchorage designs were not considered to be advantageous for use with parallel-wire strands. Bethlehem, therefore, designed a pipe-type anchor where all of the usual complicated tension linkages are eliminated. The development of the Bethlehem cable system and its application to the Newport Bridge is described.

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 214891
COMPARATIVE METHODS OF SUSPENSION BRIDGE CONSTRUCTION
Recent developments in structural steel and other construction materials and fabricating and erection techniques have had important effects on the costs of suspension bridge construction. Some of these developments are described from the viewpoint of the fabricator and erector so that the designer is fully aware of the present-day capabilities of the construction industry. Some guide lines are offered for comparison of costs for different grades of steel and fabricating procedures. The full potential of suspension bridge design can be fully appreciated only by taking advantage of all the improvements available today in the construction industry.

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 214900
ADVANCEMENTS IN SUSPENSION BRIDGE CABLE CONSTRUCTION
In the early 1960s, Bethlehem Steel Corporation initiated a program to improve the construction of suspension bridge cables as a part of this effort, research and development were conducted in the areas of weather protection of bridge cables, cable construction techniques, and cable anchorage design. Bethlehem developed jointly with the E.I. Du Pont de Nemours & Company a weather-tight, long-life cable covering consisting of glass reinforced acrylic resin. This plastic covering was first used in 1965 on the Bidwell Bar Bridge in California, where it supplanted the originally specified paint and wire wrapping. In the late 1960s there have been two principal types of suspension bridge cables which are field-constructed using the common "spinning" procedure, and strand-type cables, made up of socketed helical-wire strands fabricated in the shop and easily erected in the field. It was believed that cables constructed of shop-fabricated and socketed parallel-wire strands would combine all of the advantages of these two cable types and render them both obsolete. Pilot work was undertaken, and culminated in a successful development project carried out during 1965 with the consultation of the firm of Steinman, Boynton, Gronquist & London, which reported favourably on the method. Standard anchorage designs were not considered to be advantageous for use with parallel-wire strands. Bethlehem, therefore, designed a pipe-type anchor where all of the usual complicated tension linkages are eliminated. The development of the Bethlehem cable system and its application to the Newport Bridge is described.

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 214906

ACKNOWLEDGMENT: Concrete Research Laboratory /UK/

2A 214909
BRITISH STANDARD CODE OF PRACTICE: COMPOSITE CONSTRUCTION IN STANDARD STEEL AND CONCRETE. PART 2. BEAMS FOR BRIDGES
This part deals with simply-supported and continuous bridge beams, other than filler beams, composed of either rolled or built-up structural steel sections, with or without concrete encasement, acting in a flexural function with an integrally reinforced concrete slab. The two elements being interconnected so as to form a composite section acting as a whole.
2A CONSTRUCTION MATERIALS

British Standards Institution Sept. 1967
Acknowledgment: Transport & Road Research Lab /UK/

2A 214921
INSTRUCTIONS FOR THE CONSTRUCTION OF BITUMINOUS SURFACINGS USING THE HOT-LAID METHOD OF CONSTRUCTION /IN GERMAN/
Information is presented on the building of the road structure, definitions, construction principles, dimensioning, building materials, composition and production of the mix, and placing and compaction. The dimensioning is based on four types of surfacing. /FG/RRL/

Road Research Society /Austria/ 1966
Acknowledgment: Road Research Laboratory /UK/

2A 214923
CHANGES IN TEMPERATURE OF BITUMINOUS MIXTURES DURING CONSTRUCTION /IN GERMAN/
The publication deals with the temperature conditions in bituminous road courses after they have been placed on the subbase. The aim is to describe the changes in temperature by means of the physical dimensions valid for heat conduction and heat transfer. The temporal course of temperatures in bituminous mixtures has previously only been examined theoretically during the transporting of the mixture from the mixing site to the place of application. Consideration of this part of the problem showed that cooling of the hot mixture, the thickness of the amount loaded onto the vehicle, and in particular by the various conditions of heat transfer, the principal of which are air speed and the effect of insulating materials starting from these facts the change in temperature during the placing of bituminous mixtures was investigated. The resulting information was put into a form suitable for practical use, and explained by examples. /FG/RRL/

Bossempier, HR
Darmstadt Technical University /Ger/ 1966
Acknowledgment: Road Research Laboratory /UK/

2A 214927
PREFABRICATION IN CARRIAGEWAY CONSTRUCTION /IN GERMAN/
For ten years prefabricated slabs have been used for the repair of motorways; they shorten the road closure times, are economic and can be used practically without limitation. At present slabs of 9.99 x 3.74 m. in size and 18 cm. thick with prestressed longitudinal and transverse reinforcement are mostly used. They are placed on a bituminous substructure, pressed down with cement mortar to the desired height and connected with screw dowels. On the basis of recent tests longitudinal and transverse prestressed slabs, joined with cement or plastic mortars and laid on a reinforced base are now proposed. /FG/RRL/

Eisenmann, J Strassen Und Tiefbau /Germany/ 1967
Acknowledgment: Road Research Laboratory /UK/

2A 214933
MACHINE FOR THE TRANSVERSE ROUGHENING TREATMENT AND PULVERIZING A CURING COMPOUND ON FRESH CONCRETE /IN FRENCH/
Details are given of a prototype machine, developed by the Centre De Recherches Routieres, for transverse roughening of concrete roads and for pulverizing curing compound on fresh concrete. The machine is fully automatic, and the roughening device can have metal blades or tufts of metal, coconut fibre or P.V.C. Special devices control the quantity of curing compound applied, prevent the clogging of the jets, ensure a constant homogenization of the curing compound and prevent it from being blown away by the wind. This roughening facilitates the rapid drainage of surface water, and gives a high degree of roughness in wet weather enabling vehicles to travel at high speed. It does not impair the riding quality of the pavement and has the advantage of reducing glare. /CRIC/ESR/LCPC/A/RRL/

Leyder, JP Technique Routiere, Brussels /Belgium/ Mar. 1968
Acknowledgment: Road Research Laboratory /UK/

2A 214952
TECHNOLOGY OF THE CONSTRUCTION OF PRESTRESSED CONCRETE SURFACINGS /IN RUSSIAN/
Results are presented of investigations into conditions of stress and deformation and technological processes concerning the construction of prestressed concrete surfacings. Characteristics of this type of surfacing built in the USSR are described. Special mention is made of methods used for increasing the resistance of concrete to cracking during construction and under traffic. Emphasis is placed on the need for further studies with a view to determining the optimum prestress value of surfacings. /LCPC/RRL/

Soyuzdornii /Ussr/ 1967
Acknowledgment: Road Research Laboratory /UK/

2A 214954
THE CONSTRUCTION OF EARTH SUBGRADES UNDER DIFFICULT NATURAL CONDITIONS. WORK CARRIED OUT BY THE SOYUZDORNII (FEDERAL STUDY AND RESEARCH INSTITUTE IN THE USSR) /IN RUSSIAN/
The construction is studies of earth roads on compressible soil, peat, mud, wet backfill soil, etc. The high cost of the conventional construction method, which consists in removing the existing soil and replacing it with borrow, led to research into the improvement of construction methods which use compressible soil under embankments. Findings are presented and recommendations are outlined for the establishment of projects for building earth subgrades on compressible soil. The titles of the articles are as follows: (1) Problems concerning planning the construction of earth subgrades on compressible soil, (2) Special features of projects and construction of earth subgrades in the marshes of Western Siberia, (3) The use of rigid slabs in the construction of road embankments on marshland, (4) Stability of subgrades built on wet backfill soil, (5) Influence of highly soluble salts on the physical and mechanical properties of soil with a high salt content, (6) Structural and mechanical properties of soil with a high salt content, (7) Principle for drawing up specifications relating to the complementary wetting of the soil during the construction of earth in Kazakhstan, and (8) Winter construction of embankments using powder and cohesive soil. /LCPC/RRL/

Trudy Soyuzdornii /Ussr/ 1967
Acknowledgment: Road Research Laboratory /UK/
CONSTRUCTION MATERIALS

2A 214095
REPORT ON CONCRETE, PART II, SITE SUPERVISION AND TESTING
THE REPORT IS DIVIDED INTO 2 SECTIONS: (1) SITE SUPERVISION; (2) THE TESTING OF CONCRETE AND CONCRETING MATERIALS. SECTION 1 CONTAINS ARTICLES ON MATERIALS FOR CONCRETE; CONCRETE MIXES; BATCHING; MIXING; TRANSPORTING, PLACING AND COMPACTING; CONCRETING IN COLD WEATHER; CURING, AIR-ENTRAINED CONCRETE; REINFORCEMENT; FORMWORK; FINISHING; PRECAST MEMBERS. SECTION 2 CONTAINS ARTICLES ON SAMPLING; TESTING CEMENTS; TESTING AGGREGATES; WATER; WORKABILITY OF FRESH CONCRETE; AIR CONTENT OF FRESH CONCRETE; TESTING OF HARDENED CONCRETE. /RRL/ Acknowledgement: Road Research Laboratory /UK/ 1967

2A 214060
PAVING MATERIALS
DURING THE PAST DECADE, NEW ENGINEERING PROCEDURES FOR THE CONSTRUCTION OF THE ASPHALT PAVEMENTS AND NEW METHODS FOR QUALITY CONTROL HAVE BEEN DEVELOPED AMONG THE NEW METHODS WHICH ARE COMMANDING ATTENTION ARE: (1) AUTOMATION FOR CONTROL OF BITUMINOUS CONCRETE PLANTS; (2) ELECTRONIC SENSING DEVICES FOR GRADE CONTROL OF THE LAY-DOWN MACHINES; (3) NUCLEAR DEVICE FOR FAST ON-THE-SPOT MEASUREMENTS OF PAVEMENT DENSITY; (4) LOAD/DEFLCTION DEVICES FOR ON-THE-SPOT SURVEYS OF PAVEMENT STRUCTURAL STRENGTH; AND (5) FULL WIDTH AND DEEP LIFT PAVEMENT COURSES. EACH OF THESE NEW USES AND NEW METHODS OF APPLICATION IN THE USE OF ASPHALT IN PAVEMENT STRUCTURES IS DESCRIBED. /RRL/A/
Izatt, JE
World Petroleum Congress Proc 1967
Acknowledgement: Road Research Laboratory /UK/

2A 215007
THE UTILIZATION OF CEMENT-STABILIZED WASTE MATERIALS IN ROAD CONSTRUCTION
IT IS IN THE NATIONAL INTEREST TO MAKE USE OF LOW-GRADE AND WASTE MATERIALS FOR ROAD CONSTRUCTION AS THIS CONSERVES THE SUPPLIES OF GOOD QUALITY ROAD MAKING MATERIALS AND ASSISTS IN PROBLEMS ARISING FROM THE DISPOSAL OF UNWANTED MATERIALS. IN ADDITION ECONOMIC CONSIDERATIONS MAKE IT LIKELY THAT THE COST OF AGGREGATES WILL INCREASE IN THOSE AREAS WHERE THEY ARE ALREADY IN SHORT SUPPLY WHEREAS LOW-GRADE AND WASTE MATERIALS ARE OFTEN AVAILABLE AT LOW COST. THIS PAPER THEREFORE CONSIDERS THE EXTENT TO WHICH THE ROAD CONSTRUCTION INDUSTRY CAN USE LOW-GRADE AND WASTE MATERIALS FOR BASE AND SUB-BASE CONSTRUCTION. THE ADVANTAGES AND DISADVANTAGES OF THE USE OF SUCH MATERIALS ON PRACTICAL, ECONOMIC AND AESTHETIC CONSIDERATIONS ARE DISCUSSED. FOUR GROUPS OF MATERIALS: CHALK, PULVERISED FUEL ASH, COLLERY SHALE, AND QUARRY WASTES ARE DEALT WITH IN DETAIL. THEY ALL OCCUR IN LARGE QUANTITIES AND WHEN STABLED WITH CEMENT THEY CAN ALL BE MADE SUITABLE FOR USE IN ROAD PAVEMENT CONSTRUCTION. /RRL/Author/
Acknowledgement: Road Research Laboratory /UK/

2A 215045
INVESTIGATIONS INTO ROAD-BUILDING PRACTICE IN THE TROPICS, STUDIES OF THE MIXING AND COMPACTING OF CEMENT STABILIZED BASES ON TWO ROAD CONSTRUCTION SCHEMES IN SIERRA LEONE
INVESTIGATIONS WERE CARRIED OUT ON TWO ROAD-CONSTRUCTION SCHEMES IN SIERRA LEONE. TWO ASPECTS OF ROAD BUILDING WERE EXAMINED: (1) THE SPREADING AND MIXING PROCESSES IN THE CONSTRUCTION OF CEMENT-STABILIZED ROAD BASES, AND (2) THE COMPACTION OF CEMENT-STABILIZED ROAD BASES AND NATURAL SUB-GRADES. THE INVESTIGATION SHOWED THAT THE RESULTS BEING ACHIEVED ON THESE TWO SCHEMES ARE SIMILAR TO THOSE FOUND PREVIOUSLY IN EAST AFRICA. IN PARTICULAR THE IMPORTANCE OF THE SPREADING OPERATION IN THE CONSTRUCTION OF STABILIZED-SOIL ROAD BASES IS AGAIN APPARENT. /A/RRL/
Acknowledgement: Road Research Laboratory /UK/

2A 215016
THE EFFECT OF CONSTRUCTION TECHNIQUES ON THE DESIGN OF ROADS
THE DEVELOPMENT IS OUTLINED OF CONSTRUCTION TECHNIQUES WITH REFERENCE TO EXCAVATION AND EARTHWORKS, DRAINAGE, AND SUB-BASE. BASE AND SURFACING CONSTRUCTION. EXAMPLES ARE QUOTED FROM CONSTRUCTION WORK ON THE N.1 MOTORWAY. DEVELOPMENTS IN CONCRETE ROAD CONSTRUCTION, PARTICULARLY THE SLIP FORM PAVER, AND ITS STEEL AND CONCRETE BRIDGES ARE DESCRIBED. A DISCUSSION IS APPENDED. /RRL/
Oliver, FR Inti Hvy Engineers Journal, London /UK/ Mar. 1969
Acknowledgement: Road Research Laboratory /UK/

2A 215040
APPLICATION OF COMPUTERS TO ROADSTONE SUPPLY
THE APPLICATIONS OF COMPUTERS TO THE PROGRAMMING AND PLANNING OF DELIVERIES OF ALL CLASSES OF ROADSTONE TO ITS VARIOUS USERS ARE CONSIDERED. THE PROBLEMS OF PRODUCTION AND DISTRIBUTION ARE EXAMINED MAINLY FROM THE SUPPLIER'S POINT OF VIEW. /RRL/
Rhodes, FG Surveyor, Longon /UK/ Sept. 1969
Acknowledgement: Road Research Laboratory /UK/

2A 215064
MODERN TUNNELLING METHODS
MODERN TUNNELLING METHODS AND EQUIPMENT ARE REVIEWED. ASPECTS BRIEFLY TREATED INCLUDE, GROUND CONDITIONS, SETTLEMENT, SHAFTS AND LININGS, ECONOMICS OF SOFT GROUND TUNNELLING, WATERPROOFING AND WATER CONTROL, AND SURVEYING. REFERENCE IS MADE TO RECENT TUNNEL PROJECTS IN ENGLAND (POTTERS BAR, VICTORIA LINE, AND LONDON AIRPORT), AND A DISCUSSION IS APPENDED. /RRL/
Donovan, HJ Pub Wks & Munic Serv Cong & Exhib Cncl 1968
Acknowledgement: Road Research Laboratory /UK/

2A 215055
FREE-CANTILEVER CONSTRUCTION OF PRESTRESSED CONCRETE BRIDGES AND MUSHROOM-SHAPED BRIDGES
NEW CONSTRUCTION TECHNIQUES BASED ON RESEARCH, IN BOTH MATERIALS AND METHODS, ARE IMPROVING QUALITY AND SHORTENING COST IN THE CONSTRUCTION OF PRESTRESSED CONCRETE BRIDGES. FREE-CANTILEVER AND MOVABLE SCAFFOLD SYSTEMS SAVE TIME AND IMPROVE SAFETY BY...
CONSTRUCTION MATERIALS

REPLACING CONVENTIONAL SCAFFOLDS AND FALSEWORK. THE FREE-CANTILEVER METHOD PERMITS SAFE AND EFFICIENT CONSTRUCTION OF LONG SPANS WITHOUT HIGH FORMWORK COSTS. MATERIALS AND METHODS DEVELOPMENT INCLUDE THREADED PRESTRESSING BARS FOR IMPROVED ANCHORAGE, STUDIES IN STRESS-CRACK CORROSION, DIAGONAL PRESTRESSING TO SAVE DEAL WEIGHT IN LONG SPANS, AND A MOVEABLE-JOINT DESIGN THAT PERMITS USE OF CONTINUOUS ASPHALT PAVEMENT WITHOUT RUPTURE. BRIDGE TYPES DESCRIBED INCLUDE MUSHROOM, STRESS-RIBBON, AND SUSPENSION, IN ADDITION TO MANY EXAMPLES OF FREE-CANTILEVER CONSTRUCTION.

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 215064
AN APPLICATION OF OPERATIONAL RESEARCH TO CONCRETE ROAD CONSTRUCTION
USES OF OPERATIONAL RESEARCH IN CONCRETE ROAD CONSTRUCTION, AND A METHOD OF REPRESENTING WORKING TIMES AND CONTINUOUS PROGRESS BY MATHEMATICAL MODEL OR DIAGRAM ARE EXAMINED. AS A RESULT OF THE ANALYSIS, THE FACTORS WHICH WILL LEAD TO GREATER PRODUCTIVITY IN TERMS OF LENGTH OF ROAD CONSTRUCTED PER DAY CAN EASILY BE LISTED. /RRL/A/

Lilley, AA
Cement & Concrete Assoc, London /UK/ July 1969

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 215095
CONSTRUCTION PRACTICES ON CEMENT-TREATED SUBGRADES FOR CONCRETE PAVEMENTS
ALL CONCRETE PAVEMENTS CONSTRUCTED BY THE CALIFORNIA DIVISION OF HIGHWAYS HAVE BEEN PLACED ON SPECIALTY TREATED OR HARDENED SUBGRADES IN THE MAJORITY OF CASES PORTLAND CEMENT HAS BEEN USED, ALTHOUGH IN SOME CASES SANDY SUBGRADES WERE TREATED WITH ASPHALTS. THE RESULTS ARE ENCOURAGING. FOR EXAMPLE, THE FIRST PROJECT AFTER 13 YEARS IS STILL IN EXCELLENT CONDITION. THE PROBLEMS ASSOCIATED WITH PUMPING JOINTS HAVE BEEN ELIMINATED. MOREOVER, THE ASPHALT TREATED SUBGRADES SEEM TO PERFORM EQUALLY WELL TO THE CEMENT-TREATED SUBGRADES. FURTHERMORE, EJECTION OF MATERIAL ALONG THE EDGES OF THE SLABS-KNOWN AS 'BLOWING'-IS VIRTUALLY UNKNOWN IN CALIFORNIA.

Hveem, FN
Highway Research Board Bulletin 1960

2A 215098
CONSTRUCTION PRACTICES FOR MATERIALS CONTROL AND BATCHING OPERATIONS FOR RIGID PAVEMENT
THE TRAINING AND SPECIFIC DUTIES OF THE BATCH PLANT INSPECTOR ARE EXPLAINED IN DETAIL. TRAINING CAN TAKE PLACE DURING THE WINTER AND CLASSES SHOULD BE SMALL OF NOT MORE THAN TEN OR TWELVE MEN. THE LOGICAL SEQUENCE FOR INSPECTING IS DIVIDED INTO TECHNICAL CASES PRIOR TO INSPECTION, OPERATIONAL CONTROL, AND REPORTS. PRELIMINARY INSPECTION INCLUDES APPROVAL OF PLANT LAYOUT AND STOCKPILING, INSPECTION OF EQUIPMENT, AND MATERIALS, AND MIX DESIGNS. OPERATIONAL CONTROL INVOLVES CHECKING AGGREGATE MOISTURE, SCALE CHECKING, PREPARATION OF TEST SPECIMENS, MAINTENANCE OF STOCKPILES, AND DAILY CEMENT CHECKS. UNIFORMITY IS THE GOAL IN REPORTING.

Stingley, WM
Highway Research Board Bulletin 1960

2A 215102
REPORT OF THE TECHNICAL COMMITTEE ON LOW COST ROADS
CONTENTS. GENERAL ACTIVITY REPORT MANUAL AND MECHANICAL METHODS FOR HIGHWAY CONSTRUCTION AND MAINTENANCE REGIONAL AND NATIONAL SURVEYS OF ROADMAKING MATERIALS INFLUENCE OF ENVIRONMENT ON THE DESIGN OF ROADS VARIOUS QUESTIONS AND INFORMATION UNESCO MANUAL ON THE CONSTRUCTION AND MAINTENANCE OF ROADS IN DEVELOPING COUNTRIES CONCLUSIONS

Perm Intl Assoc Road Congresses Proc 1967

2A 215109
CONCRETE DOWN THE SPOUT
EQUIPMENT, CONSTRUCTION TECHNIQUES AND PRIMARY REQUIREMENTS FOR THE SUCCESSFUL PLACEMENT OF TREMIE CONCRETE ARE DESCRIBED. TREMIE CONCRETE IS A NAME GIVEN TO THE METHOD OF PLACING CONCRETE UNDER WATER BY MEANS OF A PIPE CALLED A TREMIE PIPE. CONCRETE OF HIGH SLUMP IS NECESSARY IN ORDER TO ACHIEVE HIGH-QUALITY CONCRETE WITH THIS METHOD. CONCRETE MUST BE POURLED BELOW THE SURFACE OF THE WATER AND THEN INTRODUCED BELOW THE PREVIOUSLY PLACED FRESH CONCRETE IN A CONTINUOUS OPERATION, CAUSING AN OUTWARD AND UPWARD FLOW. ADVANTAGES OF TREMIE CONCRETE ARE: (1) IT IS UNNECESSARY TO DE-WATER THE CAISSON OR COFFERDAM, (2) IT IS POSSIBLE TO PLACE LARGE VOLUMES OF CONCRETE VERY QUICKLY AT GREAT DEPTHS, (3) THE CURING CONDITIONS ARE PERFECT, AND (4) Voids AND HONEYCOMBS ARE ELIMINATED PROVIDED THE TREMIE SEAL IS NOT BROKEN.

Concrete Construction July 1968

2A 215110
HIGHWAY CONSTRUCTION PROBLEMS INVOLVING PLASTIC VOLCANIC ASH
ALONG THE EASTERN SHORES OF THE ISLAND OF HAWAII ARE SOILS DERIVED BY WEATHERING OF VOLCANIC ASH USED IN THE MAINTENANCE OF CONTINUOUS ROADWAYS. THIS HAS RESULTED IN A VERY PLASTIC TYPE OF SOIL WITH NATURAL MOISTURE CONTENT GENERALLY CLOSE TO 200 PERCENT. THE CONTAINED MOISTURE IS NOT FREE WATER AND HENCE CANNOT BE DRAINED. DUE TO THE ALMOST CONTINUOUS RAINFALL, THE DEEPER LAYERS MAINTAIN THEIR HIGH MOISTURE CONTENT. THE SURFACE LAYERS, MEASURING 6 FT. IN THICK, ARE SUBJECT TO DRYING EFFECTS. AS A RESULTANT BOGGING DOWN OF EQUIPMENT AND SLIDING, THE UNDER SOIL MUST BE QUICKLY COVERED WITH 18 IN. OF SELECT ROCKY MATERIAL TO FORM A TEMPORARY SURFACE (WHICH LATER BECOMES THE SUB-BASE) FOR TRUCKS HAULING AWAY THE EXCAVATED MATERIAL. CARRIAGETRENCHES MUST BE IN THE SOIL. CARRIES FITTED WITH ATHEE TRACKS HAVE ALSO PROVEN SUCCESSFUL UNDER CERTAIN CONDITIONS. EMBANKMENTS ARE BEST CONSTRUCTED IN ALTERNATE LAYERS OF 5 FT. OF ASH AND 18 IN. OF STABLE ROCKY MATERIAL. THE LATTER SERVES AS A TEMPORARY STABLE SURFACE OVER WHICH EQUIPMENT SUCH AS TRUCKS AND TRAC-FITTED CARRY-
ALLS CAN BRING UP MATERIAL. COMPACTION IS DEPENDENT UPON CONSTRUCTION TRAFFIC ENTIRELY. THIS LAYER METHOD ACHIEVES SATISFACTORY COMPACTION WITHOUT DANGER OF TOO INTENSIVE WORKING OF THE MATERIAL. END-DUMP METHODS CAN BE USED FOR RELATIVELY LOW AND SHORT EMBANKMENTS. FOR LONG EMBANKMENTS AND FOR HEIGHTS OVER 15 FT., END-DUMP METHODS RESULT IN TOO INTENSIVE WORKING OF THE MATERIAL WITH CONSEQUENT DANGER OF SLIDES. /AUTHOR/

Hirashima, KB Highway Research Board Bulletin 1951

2A 215111 INVESTIGATION OF STRENGTH, FROST-RESISTANCE AND IMPERMEABILITY OF CONCRETE CONSTRUCTION JOINTS THE LIFE SPAN AND RELIABILITY OF MONOLITHIC CONCRETE STRUCTURES DEPENDS TO A GREAT DEGREE ON CORRECT METHODS OF PLACING CONCRETE DURING CONSTRUCTION. THE STRENGTH OF CONNECTION OF CONCRETE WITH CONSTRUCTION JOINTS AND INTERVAL BETWEEN CONCRETING UP TO 8 HOURS DECREASES UP TO 12%, IN THE CASE WITH SPECIFIC TREATMENT OF JOINT SURFACE THE STRENGTH OF CONNECTION OF CONCRETE WITH CONSTRUCTION JOINTS AND INTERVAL BETWEEN CONCRETING UP TO 16 HOURS TO 15 DAYS DECREASES BY 18 TO 29% BY COMPARISON WITH STRENGTH OF TEST PIECES WITHOUT JOINTS, IN THE CASE WITH CORRECT AND CAREFUL TREATMENT OF JOINT SURFACES. FOR EACH TYPE OF CEMENT ONE SHOULD CAREFULLY ASCERTAIN MAXIMUM ALLOWABLE TIME BETWEEN STAGES OF CONCRETING WITHOUT JOINTS, OR CONSTRUCTION JOINTS, THAT IS, WITHOUT TREATMENT OF THE JOINT SURFACE. THE FROST-RESISTANCE OF CONCRETE WITH CONSTRUCTION JOINTS, IF PREPARED BY AN ACCEPTED METHOD ENSURES ADEQUATE LIFE-SPAN FOR MONOLITHIC REINFORCED-CONCRETE STRUCTURES. THE COMPOSITION OF THE CLINKER HAS NO REAL EFFECT ON STRENGTH OF CONCRETION OF CONCRETE JOINTS, NOR ON FROST-RESISTANCE (WHEN TESTED UP TO 100 CYCLES), NOR ON IMPERMEABILITY. HOWEVER, THE PERSENCEN IN THE CEMENT OF A LARGE AMOUNT OF GYPSUM (IN THE FORM OF A SEMIHYDRATE) CAUSES RAPID STIFFENING AND LESS OF WORKABILITY OF CONCRETE MIXES, AND THIS MAKES FOR DIFFICULT CONCRETE PLACING AND MAY HARM THE STRUCTURE OF THE CONCRETE. /AUTHOR/

Trainer, BD Hydrotechnical Construction Sept. 1967


Highway Research Board Special Reports 1962

2A 215129 QUALITY CONCRETE FOR HIGHWAY CONSTRUCTION WITH CENTRAL MIXING PLANT CENTRAL MIXED CONCRETE, DELIVERED TO JOB BY NEW AGITATED TRUCK BODIES, OFFERS GREAT OPPORTUNITY FOR FAST PLACEMENT, NEW METHODS OF QUALITY CONTROL, AND VERSATILITY IN RESPECT TO PLACEING CONCRETE IN BRIDGES AND THE NUMEROUS OTHER STRUCTURES AS WELL AS THE SLAB ITSELF. THE METHOD IS FUNDAMENTALLY OLD. FIGURES WILL SHOW WORK IN OHIO DURING 1951. THE FIRST LARGE SCALE OPERATION ALONG MODERN LINES WAS THE CONCRETING ON ONE SECTION OF THE OHIO TURNPike IN 1954. THERE WERE TWO LARGE SCALE OPERATIONS IN 1955 AND NUMEROUS SMALLER OPERATIONS WHERE ONLY PART OF THE CONCRETE WAS MIXED. IMPROVED PLANTS SUCH AS STATIONARY TRUCK MIXERS, AND STATIONARY PLANT MADE THE USE OF EQUIPMENT ALREADY AVAILABLE THIS WAS AFFECTED ON THE GARDEN STATE PARKWAY WIDENING, JUNE 1955, AND ODD PARTS OF US 14 IN OHIO NEAR RAVENNA, SUCH AS BRIDGE APPROACHES, INTERSECTIONS, AND THE LIKE. THE NEED IS SHOWN FOR NEW EQUIPMENT INCLUDING A SPREADER TO CONVEY AND DEPOSIT THE CONCRETE EVENLY ACROSS A FULL 25 FOOT WIDTH OF PAVEMENT. PORTABLE, OR SEMI-PORABLE, CONCRETE MIXING PLANTS ARE ALREADY AVAILABLE WHICH CAN BE TRANSPORTED IN PARTS FOR RAPID TRAVEL AND ERECTION. THESE PLANTS SHOULD INCORPORATE COMPLETE FACILITIES FOR AUTOMATIC WEIGHING, RECORDING AND TESTING. IT IS PROPOSED THAT THE HEAVY MEDIA METHOD OF TESTING FOR CEMENT CONTENT BE ENLARGED TO TEST THE FIRST, MIDDLE, AND LAST PARTS OF THE CONCRETE AS DISCHARGED FROM THE CENTRAL MIXING PLANTS. THE METHOD UNIVERSALITY OF MIXING, IN RESPECT TO PLACING CONCRETE IN THE SLAB A DEVICE SHOULD BE TRIED FOR CONSOLIDATING BY USING BOTH PRESSURE AND VIBRATION IN ORDER TO SUCCESSFULLY PLACE CONCRETE ON ONE INCH OR LESS SLUMP. WITH THE ADDED FLEXIBILITY AND SPEED, CENTRAL MIXED CONCRETE MAY WELL IMPROVE QUALITY AND REDUCE COST OF CONCRETE IN THE COUNTRY'S NEW HIGHWAY PROGRAM. /AUTHOR/

Mason, G Highway Research Board Bulletin 1956


Lovell, CW Osborne, AM Highway Research Record, Hwy Res Board 1968

2A 215145 STATISTICAL EVALUATION OF HIGHWAY MATERIALS SPECIFICATIONS A STATISTICAL EVALUATION OF SOME OF THE MAJOR HIGHWAY MATERIALS SPECIFICATIONS IS REPORTED, THE DATA FOR ANALYSIS AND EVALUATION WERE OBTAINED FROM HISTORICAL SOURCES, WITH LIMITED AMOUNTS FROM RESEARCH SOURCES FOR ASPHALTIC CONCRETE, BASE COURSE, AND CONCRETE CHARACTERISTICS. THE DATA WERE ANALYZED BY COMPUTER AND STANDARD STATISTICAL PROCE-
CONSTRUCTION MATERIALS

DURIES. THE ANALYSIS INDICATES THAT (A) MOST OF THE HISTORICAL DATA TEND TO FOLLOW NORMAL DISTRIBUTION, (B) IN GENERAL, THERE IS CONSIDERABLE VARIATION IN PRODUCTION AND CONSTRUCTION CONTROL BETWEEN DIFFERENT CONTRACTORS, AND (C) FURTHERMORE, THERE IS A LACK OF COMPATIBILITY BETWEEN CURRENTLY USED SPECIFICATION LIMITS AND STATISTICAL PARAMETERS. THE REPORT DESCRIBES THE VARIOUS SINGLE-SAMPLING PLANS FOR LOT ACCEPTANCE. THE USE OF CONTROL CHARTS FOR CONTROL AND ACCEPTANCE OF PORTLAND CEMENT AND ASPHALTIC CONCRETE IS ALSO DEMONSTRATED. /AUTHOR/

Shah, SC Adam, V Highway Research Record, Hwy Res Board 1968

2A 215162 CONCRETE CONSTRUCTION HANDBOOK THE HANDBOOK IS A PRACTICAL, CONCISE VOLUME DESIGNED TO SERVE AS AN UP-TO-DATE REFERENCE BOOK. THE BOOK DISCUSSES THE USE OF PLASTICS IN FORMWORK. THE LATEST DEVELOPMENTS IN MACHINERY AND EQUIPMENT, AND SLIP FORM PAKERS AND PLASTICS USED IN THE REPAIR OF CONCRETE. ALSO IN DETAIL ARE GEOPHYSICAL AND AERIAL AGGREGATE SURVEYING METHODS, AGGREGATE BENEFICIATION, NEW ELASTOMERS FOR JOINT SEALANTS, THE USE OF ADHESIVES, NEW STUDIES IN CONCRETE TOUGHNESS AND CREEP, & THE APPLICATION OF STATISTICAL METHODS TO CONCRETE TESTING. OTHER TOPICS INCLUDE RESISTANCE WELDING OF REINFORCING STEEL, A DETAILED DISCUSSION OF THE PROPERTIES OF CONCRETE AS RELATED TO MATERIALS AND PERFORMANCE, SAMPLING AND TESTING MATERIALS, METHODS OF COMPUTING SIZE AND NUMBER OF BATCHERS, MIXERS, AND BATCH TRUCKS, AND COMPUTATIONS ON HEATING AND COOLING REQUIREMENTS FOR MAINTAINING CONCRETE TEMPERATURE WITHIN SPECIFIED LIMITS. /AUTHOR/

Waddell, JJ Mcgraw Hill Book Company 898 pp, 1968

2A 215165 CONSTRUCTION OF ASPHALT PAVEMENTS IN THICK LIFTS ASPHALTIC CONCRETE PAVEMENT CONSTRUCTION IS DESCRIBED IN THE STATE OF WASHINGTON. AN INVESTIGATION WAS CONDUCTED ON THE EFFECT OF LIFT THICKNESS ON DENSITY AND PNEUMATIC COMPACTION METHODS. AN EXPERIMENTAL PROJECT WAS CONDUCTED TO INVESTIGATE THE EFFECT OF LIFT THICKNESS AND RIDING QUALITIES OF ASPHALT CONCRETE. COMPACTION EQUIPMENT INCLUDED THREE TYPES OF STEEL WHEEL ROLLERS AND FOUR HIGH PRESSURE PNEUMATIC TIRED ROLLERS. COOLING CURVES WERE OBTAINED IN EACH SECTION BY INSERTING THERMOCOUPLES IN THE MIX AT VARIOUS LEVELS. SMOOTHNESS MEASUREMENTS WERE MADE BY A BPR ROUGHOMETER, A CALIFORNIA TYPE FILOGRAPHER AND A WASHINGTON STATE ROUGHOMETER. ON THREE LEVELS OF LIFT THICKNESS, ROLLING PATTERNS WERE VARIED BY USING BOTH STEEL AND PNEUMATIC ROLLERS FOR BREAKDOWN COMPACTION, FOLLOWED IN ALL CASES BY STEEL FINISH ROLLING. TEST RESULTS SHOW THAT: (1) REGARDLESS OF LIFE THICKNESS PNEUMATIC BREAKDOWN PROVIDED THE HIGHEST DENSITY, (2) EQUAL OR HIGHER DENSITIES WERE OBTAINED ON OTHER TYPES OF SINGLE LIFT, (3) THE RIDING QUALITIES OF THE FINISHED PAVEMENT WERE NOT AFFECTED BY THE DEPTH OR LIFT OR METHOD OF SPREADING THE BASE COURSE, AND (4) THE ROCK SPREADER PROVED TO BE A FULLY SATISFACTORY MACHINE FOR SPREADING THE BASE COURSE MIX. ANOTHER RESEARCH PROJECT WAS CONDUCTED TO ESTABLISH THE ROLLER WEIGHT, TIRE PRESSURE, AND NUMBERS OF PASSES THAT WOULD INSURE UNIFORM optimum DENSITY AND PRODUCE AN ACCEPTABLE PAVEMENT SMOOTHNESS. AN ATTEMPT TO SHOW A DIRECT CORRELATION BETWEEN COMPACTIVE EFFORT, DENSITY AND PERMEABILITY WAS SUCCESSFUL ON THICK LIFT BASE COURSE. REASONABLE DENSITIES WERE OBTAINED OVER A WIDE RANGE OF COMPACTION VARIABLES, BUT THE MOST UNIFORM RESPONSE OCCURRED WITH THE 20 TON ROLLER. RESPONSE WAS MORE UNIFORM WITH INCREASED PASSES. /AUTHOR/

Minos, CE Am Asoc State Highway Officials Proc 1966

2A 215167 QUALITY ASSURANCE IN HIGHWAY CONSTRUCTION, PART I-INTRODUCTION AND CONCEPTS THIS ARTICLE IS THE FIRST OF A CONTINUING SIX-PART SERIES SUMMARIZING A RESEARCH EFFORT INITIATED TO IMPROVE QUALITY ASSURANCE METHODS IN HIGHWAY CONSTRUCTION. IN ADDITION TO THE REPORT THE PRESENTATION WILL CONSIST OF THE FOLLOWING: (1) QUALITY ASSURANCE OF EMBANKMENTS AND BASE COURSES, QUALITY ASSURANCE OF PORTLAND CEMENT CONCRETE (2) VARIATIONS OF BITUMINOUS CONSTRUCTION (3) SUMMARY OF RESULTS FOR QUALITY ASSURANCE OF AGGREGATES, (4) AND CONTROL CHARTS, STATISTICALLY BASED QUALITY-CONTROL METHODS HAVE BEEN USED SUCCESSFULLY IN INDUSTRY, PARTICULARLY IN THE DEFENSE PROGRAM, FOR MANY YEARS. ACCORDING TO RESEARCH RESULTS, STATISTICAL QUALITY-ASSURANCE METHODS ALSO SHOULD BE ADAPTABLE TO HIGHWAY CONSTRUCTION, PROVIDED THAT CONTROL SPECIFICATIONS ARE PROPERLY STATED AND WITHIN SPECIFIED LIMITS. SAMPLING AND TESTING VARIATIONS ESTABLISHED TO CONFORM TO THE CONDITIONS OF THE LOCALITY IN WHICH THEY WILL BE APPLIED. /AUTHOR/

Monahan, TF Halstead, WI Public Roads, Us Bureau Public Roads Feb. 1969

2A 215179 WINDY CITY COMPLETES MAJOR RESURFACING PROJECT THE PROJECT INCLUDED PATCHING THE CONCRETE HIGHWAY, OVERLAYING IT WITH THREE INCHES OF HOT-MIX ASPHALT, INSTALLING IMPROVED GUARD RAILS, AND REPLACING EXISTING SIGN SUPPORTS WITH BREAKAWAY POSTS. THE PROJECT WAS CARRIED OUT WHILE TRAFFIC WAS MAINTAINED. THE EXISTING PAVEMENT ON THE EXPRESSWAY CONSISTED OF A TEN INCH PORTLAND CEMENT SLAB Laid OVER A 6 INCH GRANULAR SUBBASE. TO GET THE PAVEMENT IN SHAPE FOR RESURFACING, DAMAGED OR CRACKED SLAB WAS REMOVED AND REPLACED WITH FULL DEPTH AND PARTIAL PATCHES. THE MIX WAS Laid IN TWO COURSES OF ONE INCH EACH. THE FIRST COURSE BEING BURNISHED, THE SECOND COMPRISING TWO LAYERS OF THE MIX. LARGER WHEELS WERE USED BEHIND THE ASPHALT FINISHER WHILE PLACING THE SURFACE COURSE. THIS MECHANICAL LEVELING DEVICE SUPPLEMENTED THE ELECTRONIC SCREW CONTROLS USED IN PLACING THE BINDER COURSE. ALTHOUGH THE GUARD RAIL AND SUPPLEMENTAL WORK WAS PERFORMED ON A 24-HOUR BASIS PAVING WAS LIMITED TO 12 HOURS PER DAY, SEVEN DAYS A WEEK.

Paving Forum /Napa/ June 1969

2A 215184 COL CO HIGHWAY 551: HOW MCB-8 BUILT THE FIRST PERMANENT HIGH-SPEED ROAD IN VIETNAM'S I CORPS A PERMANENT HIGHWAY WAS EXTRAPOLATED CONSTRUCTED USING LINKLESS CONCRETEauce, THE ANCIENT IMPERIAL CAPITAL OF VIETNAM, AND A COASTAL PORT SEVEN MILES TO THE NORTH EAST. THIS SEABEE PROJECT WAS CONSIDERED NECESSARY AS A SUPPLY LINK TO PERMANENT LST AND LCU FACILITIES. BECAUSE OF CERTAIN GEOGRAPHIC SIMILARITIES THE ROAD WAS DIVIDED INTO THREE PARTS: (1) THE NARROWEST PART THROUGH A ONE-TIME WEALTHY RESIDENTIAL SUBURB OF HUE, (2) A SECTION PARALLELING A LARGE NAVIGABLE CANAL WITH A DENSE GROWTH OF BANANA TREES AND BAMBOO HUTS ON ITS EASTERN SHOULDER, AND (3) AREAS THROUGH THE RICE PADDIES WHICH REQUIRED AS MUCH AS SIX FEET OF FILL IN MANY AREAS. OVER 20,000 CUBIC YARDS OF DREDGE SAND WAS REQUIRED FOR THE ROADWAY
CONSTRUCTION MATERIALS

Embarkment through the rice paddies. A six-inch sand lift was retained under the soil cement of part of the laterite subgrade to drain off instead of being confined by the overlying soil cement, and to permit flood waters to equalize on either side of the road. The 3.4 miles of sand fill roadway in the rice paddies could not be left exposed to rain and floods during the monsoons. The topsoil of the surrounding rice paddies was removed from the slopes by dozers. This was compacted with a grid roller and graded to extend the slope to 4 to 1. This provided the necessary confining pressure to give the sand the shear strength required for designed loads. Various types of cement spreaders were tried, but none worked satisfactorily. Over 100 Vietnamese laborers were contracted to perform manual labor on the road, and many of these assisted in bag laying and breaking. Lack of local rock deposits presented the problem of obtaining 37,000 tons of 21/2 inch base rock. Rock was barged from Danang. Part 1 is completely paved, Part II and III’s six-inch base course is completed and only paving and finish slope work remains.

Schroeder, IA  Navy Civil Engineer  Oct. 1968

2A  215191

Acceptance Testing of Bituminous and Portland Cement Concrete in the Field

The sampling and testing of highway materials in the state of Virginia in the past five years has developed along the line of performing as much of the final acceptance sampling and testing at the origin. Sources as possible. Eight laboratory laboratories have been constructed, which are 4 x 83 feet, two stories high. The laboratories were equipped with testing equipment similar to that used in the central laboratory for testing bituminous concrete. Equipment was also provided for testing Portland cement concrete. At the same time, the installation of a penalty and rejection system was made, whereby borderline materials could be used. But at a reduced cost, the installation of this system has required that the state provide: (1) more intensive training for the inspectors as well as industry personnel, (2) more thorough on-the-job supervision of inspectors, (3) more frequent and more extensive plant inspections of bituminous laboratories, and (4) more decentralization of laboratory testing. Developments in regard to these requirements are described and discussed. In addition to record sampling of concrete, progress samples are also obtained of cement and fine and coarse aggregates, at the rate of one of each type or size per project, with no less than one sample for each 5000 tons of aggregate used. These samples are obtained at the batching source of concrete. Virginia feels that this is the minimum amount of sampling and testing that can be conducted, and still provide some assurance of obtaining acceptable products.


2A  215219

Evaluation of Construction Control Procedures: Aggregate Gradation Variations and Effects

Four individual studies concerned with the gradation of aggregates used in highway construction were conducted on: (1) effect of variations in gradation of coarse aggregate on characteristics of Portland cement concrete, (2) variation in gradation of aggregates in bituminous hot-mix plants, (3) effect of increment size on sampling accuracy, and (4) mathematical study of the pattern of variations in gradation of aggregates. A statistically designed experiment was used to determine the effect of gradation variations on the workability and compressive strength of the resultant concrete. Investigation was made of variations in gradation of both fine and coarse aggregates and asphalt content at seven plants in the production process of bituminous hot-mix plants. An experiment was conducted to establish the practical relationship between maximum particle size and minimum increment size for determining the graduation of a lot of aggregate. Several lots of known gradation were prepared and sampled with sampling scoops of predetermined capacity. It appeared that variations in the graduation of aggregates followed an inherent pattern. Data were analyzed to determine the possibilities for selecting a single sieve for use as a quick check on compliance with gradation specifications. The concrete study indicates that savings in manpower and testing time can be effected by reducing the filtering of coarse aggregates for concrete. The most significant finding was that compressive strength remained substantially constant, regardless of large variations in the gradation of the coarse aggregate, provided the slump was maintained at a uniform level. Rescreening or resizing coarse aggregates is not necessary, and it is recommended that restrictive gradation specifications be broadened to accommodate gradation variations actually found to exist. The hot-mix bituminous paving plant study found that indicated variations in the gradation of binned aggregates were largely due to within-batch variation. It is recommended that compliance with job-mix formula gradation re-
CONSTRUCTION MATERIALS

Although sand is a preferred material for backfilling because it provides good strata support, coal-mine refuse and other materials are often used. A slurry of this material and water is used. Grout-gravel columns are used for building over mined areas in the Pittsburgh area. The grout-gravel column is presented in detail.

**Civil Engineering Asce Nov. 1968**

**2A 215231**

The Army Corps of Engineers has announced a new concept to reduce the time and cost of highway construction under adverse soil conditions. Use of a plastic wrapper to encase the subgrade material of a road provides protection as a waterproof seal against migration of subsurface moisture into the material. This enables builders to substitute fine grained subgrade materials for a granular base course. The wrapper consists of polypropylene film and is inserted into a large process that reinforces a distributor application of asphalt to form a membrane. Asphalt is applied to the polypropylene strip after it has been laid over the selected road site. The subgrade material is filled in, compacted, and covered by another strip of the material. The two sheets are then sealed to encase the material.

**Army Research & Development Aug. 1969**

**2A 215235**

Application of construction management to the paving process: the application of construction management to the paving process by the contractor consists of the following operations: interpreting the specifications, obtaining, organizing and controlling man, equipment, and materials to construct a pavement at the right cost. Every step of the paving process must be planned from the moment a work order is accepted by the awarding agency, a paving operation schedule should be detailed and exact to the last minute detail. A safety program must be designed to prevent accidents and avoid injuries, and must be consistently employed and enforced in every phase of the paving process. Supervision must be provided that has experience, drive, determination, & the ability to communicate, to interpret specifications, carry out the paving process, stay on schedule, and maintain a safe operation.

**Porter, R.L. Sixth Paving Conference Proc pp 107-113, 1968**

**2A 215237**

Something new on the E4 highway. Construction practices being used on the Swedish E4 highway just south of Stockholm are reviewed. Because of the poor nature of the clay soil, a considerable amount of leek is used for the embankments. This lightweight material helps to prevent excessive settlement. It is generally placed in 6-foot sections by a vibratory roller and is placed directly over the gravel subbase with a 4-ton tractor-drawn vibratory roller making six passes. After the base course is put down it is covered with a layer of fines and a water truck sprinkles it down. The tanker uses detergents in the water to give the water 2 to 3 times more coverage. The contractor is using a barb-tipped nozzle with a 100 psi pressure and a 10-ton vibrating roller. A layer of gravel is spread between each layer of asphalt at the cut off point each day. The next day, before laying is recom
CONSTRUCTION MATERIALS

MENCED, THE MEN CUT ACROSS THE WIDTH OF THE ROAD WITH A COBRA PETROL-POWERED PAVEMENT BREAKER AND ROLL THE LAYERS BACK CLEANLY. THIS MAKES FOR SMOOTH TRANSITIONARY SURFACE AND GOOD ADHESION BETWEEN ADJACENT SECTIONS. THE CONTRACTORS LAY ABOUT 500 TONS OF ASPHALT PER 11-12 HOUR DAY. THE ASPHALT HAULERS HAVE ONE RATE OF PAY FOR THE RUN TO THE SITE, AND A LOWER RATE FOR THE EMPTY RUN BACK TO THE PLANT. THE IDEA IS TO ENCOURAGE A HASTY RETURN.

World Construction Nov. 1969

2A 215238

TURKISH ROAD PROGRESS

IMPROVEMENTS IN THE HIGHWAY SYSTEM IN TURKEY ARE DESCRIBED. CONSTRUCTION OF A PARALLEL ROAD ALONG THE EXISTING ONE ON THE 14-KM DISTANCE BETWEEN TWO TOWNS IS DESCRIBED. THE BASE COURSE FOR THIS PROJECT CONSISTS OF THREE LAYERS. THE FIRST LAYER WAS MECHANICALLY STABILIZED WITH 5 CM SCREENED MATERIALS LAID DIRECTLY ON THE PREPARED SUBGRADE TO A DEPTH OF 30 CM. THE SECOND LAYER WAS STABILIZED WITH CEMENT LAYED IN A 20 CM LAYER AND TOPPED WITH A SEAL COAT. A THIRD LAYER OF BITUMINOUS WAS PLACED TO 10 CM THICKNESS AND CAPPED WITH A 5 CM BINDER COURSE AND A 3 CM WEARING COURSE. GRAVEL AND SAND HAD TO BE BROUGHT IN FROM 35 TO 50 KM AWAY AND STONE FROM 18 KM. THE WORK IS SCHEDULED FOR COMPLETION BY THE END OF 1969, AND EMPLOYS 9 CONTRACTORS AND 14 SUBCONTRACTORS.

Somer, S World Construction Nov. 1969

2A 215270

HOW TO BUILD A SLURRY WALL

ONE OF THE MOST COMPLICATED CONSTRUCTION SECTIONS OF THE SAN FRANCISCO PORTION OF THE BAY AREA RAPID TRANSIT SYSTEM IS ALONG MARKET STREET, THE CITY'S MAIN ARTERY. CONTRACTS CALL FOR CONSTRUCTION OF DEEP, MASSIVE COFFERDAM WALLS WITHIN WHICH CUT-AND-COVER STATION CONSTRUCTION WILL FOLLOW. WORKING ENTIRELY FROM STREET LEVEL, IN TIGHT QUARTERS, THE CONTRACTOR MUST: (1) DRILL SLURRY-FILLED HOLES FOR INSTALLATION OF 405 STEEL SOLDIER PILES 5 FT, 10 IN. APART, (2) EXCAVATE SLURRY-FILLED SLOTS BETWEEN PILES, AND (3) FILL SLOTS WITH TREMIE-PLACED CONCRETE. THE FIRST STEP IS TO SET SEVERAL LAYERS OF TIMBER MATS ASTRIDE THE CENTER LINE OF A WALL SECTION TO PROVIDE A LEVEL WORKING AREA FOR A CRANE. SLURRY IS PREPARED NEARBY IN-SITE MIXING TANKS. POWDERED BAROID BENTONITE IN BAGS IS ADDED TO WATER IN MEASURED QUANTITIES TO PRODUCE A STABLE SUSPENSION WITH A DENSITY OF 65-70 LB PER CU FT. SLURRY IS CONTAINED AND CONTROLLED AND TESTED REGULARLY AS TO PROPER WEIGHT, VISCOSITY, WATER LOSS AND SAND CONTENT. A BATTERY OF DIESEL-POWERED VAC-SEAL PUMPS CIRCULATES SLURRY FROM TANKS THROUGH A PIPE WITHIN A PIPE. WHEN A LINE OF PILES IS INSTALLED, THE NEXT STEP IS TO EXCAVATE ALL SOIL IN "SLOTS" BETWEEN PILE FLANGES. A HYDRAULICALLY OPERATED BUCKET WAS DEVELOPED THAT QUICKLY AND ACCURATELY GRABS A 1 1/2-YD BITE, EVEN AT DEPTHS OF 100 FEET. THE RIG CONSISTS OF A PIPE WITHIN A PIPE. THE INNERPIPE SERVES AS A RAM WHICH OPENS AND Closes THE BUCKET. WHEN A SLOT IS COMPLETELY EXCAVATED, A SOLDIER PILE HALFWAY BETWEEN THE TWO DRIVEN PILES, IS INSTALLED, RESULTING IN A FINAL PILE SPACING OF 2.25 M. THE BOTTOM OF THE PIPE IS APPROXIMATELY 2-3 M BELOW THE ROAD SURFACE, DEPENDING ON THE BEARING CAPACITY OF THE SOIL.

/B/ SAD /D/ World Construction Apr. 1970

2A 215280

A NEW METHOD OF CONSTRUCTING ROADS ON SOFT SOIL (IN GERMAN)

THE NEW DESIGN COMPRISSES A THIN REINFORCED CONCRETE SLAB, 10-15 CM THICK, BONDED TO A SUPPORTING SYSTEM WHICH CONSISTS OF VERTICAL PRECAST REINFORCED CONCRETE PIPES ASSEMBLED IN THE SOIL BENEATH THE SLAB. THE PIPES HAVE AN EXTERNAL DIAMETER OF 1-1.5 M AND A WALL THICKNESS OF 7-10 CM. THE DISTANCE BETWEEN THE PIPES IS 2.25 M. THE BOTTOM OF THE PIPE IS APPROXIMATELY 2-3 M BELOW THE ROAD SURFACE, DEPENDING ON THE BEARING CAPACITY OF THE SOIL.

Sedijatmo, RM Bauingenieur /Germany/ 1970

2A 215296

METHODS FOR CONSTRUCTING SMOOTH RIDING BITUMINOUS SURFACES

CUSTOMARY AND IMPROVED METHODS AND RESULTS ARE DESCRIBED FOR: SURFACE TREATMENT TYPES, MIXED-IN-PLACE TYPES, PREMIXED-MADE-COLD TYPES, PREMIXED-PLACED TYPES, AND PENETRATION MACADAM. AN IMPORTANT DEVELOPMENT IS THE USE OF MECHANICAL SPREADERS AND FINISHERS.

Conner, CN Highway Research Board Proceedings 1928

2A 215297

APPLICATION OF PRESENT KNOWLEDGE IN THE CONSTRUCTION AND MAINTENANCE OF BITUMINOUS MACADAM AND BITUMINOUS CONCRETE

THE IMPROVEMENT OF BITUMINOUS MACADAM AND BITUMINOUS CONCRETE TYPES OF SURFACES HAS BEEN DEVELOPED BY LONG CONTINUED EXPERIENCE RATHER THAN BY PLANNED RESEARCH. A NUMBER OF PERTINENT SUGGESTIONS FOR DETAILS OF CONSTRUCTION AND MAINTENANCE THAT HAVE BEEN PROVEN TO BE SATISFACTORY, ARE GIVEN.

Henderson, GH Highway Research Board Proceedings 1928

2A 215309

CONSTRUCTION VIEW POINTS ON VIBRATED CONCRETE

DATA WERE OBTAINED FROM PERSONAL OBSERVATION AND STUDY IN THE FIELD AND FROM REPORTS SUBMITTED BY VARIOUS PROJECT ENGINEERS ON CONSTRUCTION WORK. THE STUDY INCLUDES INTERNAL VIBRATORS ON STRUCTURES AND VIBRATORS ON SIX PAVEMENT PROJECTS, COVERING WORK WITH MIXED AGGREGATES AND COARSE AGGREGATES AS USED IN HIGHWAY CONSTRUCTION IN KANSAS. GENERALLY, VIBRATORS WERE ENTIRELY SATISFACTORY AS THE VIBRATED CONCRETE HAD STRENGTH COMPARABLE WITH NON-VIBRATED CONCRETE HAVING A GREATER CEMENT CONTENT.

Wills, RB Highway Research Board Proceedings 1935

2A 215312

METHODS OF VIBRATION OF CONCRETE ACCORDING TO FRENCH PRACTICE

FRENCH PRACTICE WENT IN FOR HEAVY VIBRATING OR TAMING OF PAVEMENT CONCRETE. BRIEF DESCRIPTIONS OF SEVERAL MACHINES WERE GIVEN, SOME OF WHICH RAN ON SIDE RAILS AND OTHERS RESTED DIRECTLY UPON THE FRESH CONCRETE. A FEATURE OF THE PRACTICE WAS A BRUSHING MACHINE FOR ROUGHENING THE SURFACE TO
MAKE IT SKID PROOF BY REMOVING THE FINE MATERIAL DURING THE SETTING AND HARDENING PERIOD. ONE BELIEF WAS IN USING LEAN MIXTURES WITH ENOUGH VIBRATION OR RAMMING TO FORCING THE INDIVIDUAL PIECES OF LARGE SIZE AGGREGATE INTO SUCH INTIMATE POSITIONS THAT WERE SECURELY BONDED TO EACH OTHER BY A MINIMUM AMOUNT OF CEMENT. ALMOST NO CRACKING AND LITTLE WEAR WAS OBSERVABLE ON TEN YEAR OLD PAVEMENTS, IN THE HEART OF PARIS, LAID BY THESE METHODS. /AUTHOR/

Crandell, JS Highway Research Board Proceedings 1937

2A 215325 REVETMENT CONSTRUCTION BY FABRIFORM PROCESS
THE FABRIFORM PROCESS EMPLOYS HIGH STRENGTH, WATER-PERMEABLE SYNTHETIC FABRIC AS A CONCRETE FORMING MATERIAL. WATER/CEMENT RATIO IS REDUCED BY FORCING VEHICLE WATER THROUGH FABRIC, CAUSING SUBSTANTIAL INCREASE IN STRENGTH AND VERY RAPID STIFFENING. PROPER FABRIC DESIGN IS ESSENTIAL TO AVOIDING MORTAR LOSS. APPLIED TO CONSTRUCTION OF EROSION-CONTROL REVETMENTS, DUAL WALL FABRIC IS PLACED ON THE SURFACE TO BE PROTECTED AND FILLED WITH MORTAR. THE TWO LAYERS OF FABRIC MAY BE WOVEN TOGETHER AT REGULAR INTERVALS TO FORM FILTER POINTS PROVIDING RELIEF FROM HYDROSTATIC UPLIFT. A UNIFORM CROSS SECTION IS ALSO AVAILABLE, CONTAINING INTERNAL FIBER REINFORCING. /ASCE/


2A 215339 PRESENT-DAY INADEQUACIES AND NEEDED IMPROVEMENTS IN THE TECHNOLOGY OF CUT-AND-COVER CONSTRUCTION
THE CUT-AND-COVER TUNNELING IS MORE FREQUENTLY EMPLOYED FOR BUILDING ROAD TUNNELS IN CITIES THAN ROCK AND SOFT-GROUND TUNNELING. SEVENTEEN COUNTRIES COMPLETED THE QUESTIONNAIRES ON THE CUT-AND-COVER CONSTRUCTION METHOD. THE MAIN INADEQUACIES OF THE CUT-AND-COVER CONSTRUCTION METHOD ARE: (1) LARGE CONSTRUCTION SITES CAUSING HINDRANCE TO LOCAL RESIDENTS, BLOCKING ACCESS TO SHOPS AND BUSINESSES, DISRUPTING INFRASTRUCTURE AND OCCUPYING ADJACENT ROAD SPACE FOR CURRENT WORK AND STORAGE DUMPS, AND (2) NOISE CAUSED THROUGH NOISE, VIBRATION, DIRT AND THE EFFECTS OF SETTLEMENT ON NEARBY BUILDINGS DURING CONSTRUCTION AND THROUGH ANY SUBSEQUENT MOVEMENT OF THE STRUCTURE AND LOWERING OF THE WATER-TABLE. THE WALLS OR WALL ELEMENTS FOR UNDERGROUND CONSTRUCTION WORK USED TO BE CONSTRUCTED BY PILE DRIVING, WHICH IS GENERALLY NO LONGER ALLOWED IN CITIES OWING TO THE NOISE AND VIBRATION. NO-NOISE METHODS HAVE BEEN DEVELOPED, SUCH AS SETTING THE I-BEAMS IN PREVIOUSLY BORED HOLES, BORED PILE RETAINING WALLS, AND BENTONITE REPLACEMENT WALLS. THE DISADVANTAGES OF THESE TECHNIQUES INCLUDE THE INCONSISTENT PLACEMENT, UNCONTROLLED WASTE OF MATERIALS, AND THE RISK OF INUNDATION WHEN THE CONSTRUCTION SITE IS NOT PROTECTED. /ASCE/

2A 215341 INADEQUACIES AND NEEDED IMPROVEMENTS IN THE TECHNOLOGY OF IMMERSED TUNNELS
THE TERM "IMMERSED TUNNELS" MEANS TUNNELS COMPOSED OF ELEMENTS ATTACHED TO A DRY-DOCK OR ON A SLIPWAY AND SUBSEQUENTLY TRANSPORTED TO THE CONSTRUCTION SITE, WHERE THEY ARE SUNK, PLACED ON A FOUNDATION AND CONNECTED TOGETHER UNDER WATER. THIS METHOD OF CONSTRUCTION OFFERS ADVANTAGES ONLY IN A RELATIVELY LIMITED FIELD, VIRTUALLY NO COUNTRY HAS BUILT A LARGE NUMBER OF IMMERSED TUNNELS. STANDARDIZATION OF CONSTRUCTION METHODS AND DEVELOPMENT OF SPECIAL EQUIPMENT HAS BEEN ALMOST NON-EXISTENT DURING THE LAST TEN YEARS EXPERIENCE HAS BEEN MAINLY CONCENTRATED IN THE UNITED STATES, BELGIUM, DENMARK AND THE NETHERLANDS. UNITED STATES TECHNOLOGY IS MOSTLY BASED ON CIRCULAR STEEL TUNNEL HULLS CONSTRUCTED ON SLIPWAYS. THE CONCRETE IS PLACED WHILE THE HULLS ARE IN A FLOATING POSITION AND THEY ARE SUBSEQUENTLY LOWERED ONTO AN ACCURATELY-FINISHED FOUNDATION BED. IN THE LOW-LYING COUNTRIES OF EUROPE REINFORCED-CONCRETE TUNNEL ELEMENTS, MOSTLY OF A RECTANGULAR CROSS-SECTION, ARE CONSTRUCTED IN A DRY-DOCK. THEY ARE FOUND ON PILES OR PLACED ON TEMPORARY FOUNDATIONS AND SUBJECTED TO BoostING WATER IN ORDER TO IMPROVE THE Satisfactions. THE MAJOR PROBLEM WITH THE PRESENT-DAY STATE OF TECHNOLOGY, THE MOST IMPORTANT NEED FOR IMPROVEMENTS APPEARS TO BE IN THE FIELD OF BASIC KNOWLEDGE OF GEOLoGY, HYDROLOGY AND SOIL MECHANICS AND DREDGING AND MEASURING TECHNIQUES. IN THE CASE OF BASIC KNOWLEDGE, THE FUNDAMENTAL RESEARCH IN MOST CASES IS BEEN DONE BY UNITIES, WHEREAS RESEARCH INSTITUTIONS CARRY OUT INVESTIGATIONS FOCUSED ON APPLICATIONS. THERE IS NO CO-ORDINATION OF THESE ACTIVITIES, AND INTERNATIONAL EXCHANGES ARE INSUFFICIENT. THE MOST IMPORTANT NEEDS ARE FOR: (1) A STANDARD CLASSIFICATION OF ROCKS AND SOILS TO ACHIEVE A COMMON UNDERSTANDING OF GEOLOGICAL CONDITIONS, (2) IMPROVED TECHNIQUES FOR DETERMINATION OF ACTIVE AND PASSIVE EARTH PRESSURE, WALL FRICTION IN RELATION TO WALL DISPLACEMENT AND SIZE DISTRIBUTION OF SOILS, (7) IMPROVED RESEARCH METHODS TO DETERMINE THE PROPORTIONS OF GROUNDWATER AND THE RATE OF GROUNDWATER FLOW IN STRATA OF DIFFERING PERMEABILITIES, (8) IMPROVEMENTS OF METHODS OF DETERMINING THE COMPACTION OR COMPACTNESS OF THE SOILS IN CRAMPED WORKING SPACES, AND (9) DEVELOPMENT OF METHODS FOR DETECTING OBSTACLES AND HOLES. /AUTHOR/

Schmidbauer, Oecd, Paris /France/ June 1970

CFSTI PB 197286, HRIS 33 213480, HRIS 33 213479, IP33213476, HRIS 33 213478, HRIS 33 213477, HRIS 33 213475

2A 215341 INACTIVE AND PASSIVE EARTH PRESSURE, WALL FRICTION IN RELATION TO WALL DISPLACEMENT AND SIZE DISTRIBUTION OF SOILS, (7) IMPROVED RESEARCH METHODS TO DETERMINE THE PROPORTIONS OF GROUNDWATER AND THE RATE OF GROUNDWATER FLOW IN STRATA OF DIFFERING PERMEABILITIES, (8) IMPROVEMENTS OF METHODS OF DETERMINING THE COMPACTION OR COMPACTNESS OF THE SOILS IN CRAMPED WORKING SPACES, AND (9) DEVELOPMENT OF METHODS FOR DETECTING OBSTACLES AND HOLES. /AUTHOR/

Schmidbauer, Oecd, Paris /France/ June 1970

CFSTI PB 197286, HRIS 33 213480, HRIS 33 213479, IP33213476, HRIS 33 213478, HRIS 33 213477, HRIS 33 213475
CONSTRUCTION MATERIALS

COMMONLY USED FOR MEASURING DEPTH RELY ON THE ECHO SOUNDER AND THE MARINER'S SOUNDING LEAD.

Oecd. Paris /France/ June 1970

CFSTI PB 193286, HRIS 33 213477, HRIS 33 213476, IP33213478, HRIS 33 213479, HRIS 33 213475, HRIS 33 213480

2A 215342
PRESENT-DAY INADEQUACIES AND NEEDED IMPROVEMENTS IN THE TECHNOLOGY OF SOFT GROUND TUNNELLING

THE PRESENT-DAY INADEQUACIES AND IMPROVEMENTS NEEDED IN THE TECHNOLOGY OF SOFT-GROUND TUNNELLING ARE SUMMARIZED FROM THE REPLIES RECEIVED FROM 17 COUNTRIES TO THE OECD QUESTIONNAIRE. THE APPROACH MOST FREQUENTLY ADOPTED WAS TO DEDUCE SITE CONDITIONS FROM GENERAL GEOLOGICAL AND HYDROLOGICAL DATA, AMPLIFIED BY CORE SAMPLING, EXPLORATORY PITS AND TRENCHES, AND GROUND WATER INVESTIGATIONS. LITTLE USE WAS MADE OF GEOPHYSICAL INVESTIGATIONS, PILOT TUNNELS, DATA ACQUISITION BY BOREHOLE INSPECTIONS, ETC. GEOLOGICAL INVESTIGATIONS WERE COMMONLY CONSIDERED AS INEXPENSIVE AND COSTLY IN RELATION TO THE FRAGMENTARY AND IMPRECISE RESULTS OBTAINED. THE MOST URGENT IMPROVEMENTS RELATE TO: (1) HYDROLOGICAL PROBLEMS, (2) THE DEVELOPMENT OF RAPID AND CONTINUOUS METHODS FOR GEOLOGICAL AND ESPECIALLY GEOPHYSICAL INVESTIGATION, (3) INVESTIGATIONS ON THE TUNNEL FACE WITHOUT HOLDING UP THE WORK, (4) THE ESTABLISHMENT OF A UNIFIED TERMINOLOGY COMMON TO THE VARIOUS SPECIALISTS, (5) THE DEVELOPMENT OF REGIONAL DOCUMENTATION CENTERS. THE SOIL MECHANICS LABORATORY TESTS LISTED IN THE QUESTIONNAIRE WERE USED QUITE FREQUENTLY, AS ARE THE IN-SITU STRENGTH AND PERMEABILITY TESTS HOVERE, THE NEED IS RECOGNIZED OF THE ESTABLISHMENT OF A RELIABLE CORRELATION BETWEEN PRELIMINARY TESTS AND SITE DATA WHICH WOULD SEEM TO JUSTIFY EXPERIMENTAL INVESTIGATIONS ON TUNNELS AT DIFFERENT SITES. THE EXCAVATION PROCESS IS A MATTER OF GREAT CONCERN TO THE RESPONDENTS. THE TRADITIONAL METHODS OF HEADING-AND-BENCH EXCAVATION AND EXCAVATION IN FULL-FACE HEADING, WHICH ARE DISCONTINUOUS SYSTEMS, ARE STILL WIDELY USED. HOWEYER, A SYSTEMATIC TEND TO INDICATE TOWARDS CONTINUOUS SYSTEMS OF MECHANICAL EXCAVATION, OFTEN USING SHIELDS THE INADEQUACIES WHICH WERE STRESSED WITH RESPECT TO SHIELDS AND MECHANICAL DIGGERS RELATE TO COMPLEXITY, EXCESSIVE WEIGHT AND BULK, AND LACK OF FLEXIBILITY OF EQUIPMENT AVAILABLE. NEW PROCESSES SUCH AS HIGH-VELOCITY JET EROSION, EXTRUSION AND ELECTROCHEMICAL CONSOLIDATION ARE CONSIDERED TO BE OF GREIT INTEREST. GREAT INTEREST IS EXPRESSED IN THE DEVELOPMENT OF CONTINUOUS METHODS OF EXCAVATION. RELATIVELY LITTLE INTEREST WAS SHOWN IN MATERIALS HANDLING, GROUND SUPPORT AND TUNNEL LINING METHODS WIT A GENERAL FEELING OF DISSATISFACTION. THE USUAL PRACTICE OF TUNNEL LINING IS TO USE CONCRETE POURED IN SITU OR PRECAST REINFORCED CONCRETE SEGMENTS. ATTENTION IS DRAWN TO THE NEED FOR SIMPLE METHODS FOR THE RAPID AND EARLY DETECTION OF VARIOUS HAZARDS AT THE TUNNEL FACE; THE IMPORTANCE OF THE FULLEST POSSIBLE AUTOMATION OF OPERATIONS AT THE FACE; AND THE NEED FOR THOROUGH STUDY AND GOOD ORGANIZATION OF THE SITE FROM THE SAFETY STANDPOINT.

Deschamps, MI
Oecd. Paris /France/ June 1970

CFSTI PB 193286, HBIS 33 213478, HRIS 33 213477, IP33213479, HRIS 33 213476, HRIS 33 213475, HRIS 33 213480

2A 215342
RESEARCH AND DEVELOPMENT IN THE FIELD OF TUNNELLING

AN ESTIMATED TOTAL OF $86 MILLION AND 5,800 MAN-YEARS OF EFFORT WERE DEVOTED BY THE 17 REPORTING OECD COUNTRIES TO RESEARCH AND DEVELOPMENT (R & D) IN THE FIELD OF TUNNELLING DURING THE PERIOD 1960-69. THE LARGEST SHARE OF EFFORT WAS DEVOTED TO RESEARCH ON GROUND SUPPORT. ROCK MECHANICS, ENVIRONMENTAL CONTROL AND SAFETY, AND EXCAVATION. WHILE ONLY AN INSIGNIFICANT AMOUNT OF EFFORT WAS DEVOTED TO MATERIALS HANDLING. A DETAILED BREAKDOWN IS PRESENTED OF R&D EXPENDITURES FURNISHED BY EACH COUNTRY AND ALL THE R&D PROJECTS undertaken DURING THE LAST DECADE IN THE UNITED STATES LEADS IN THE LEVEL OF EFFORT DEVOTED TO RESEARCH AND DEVELOPMENT IN THE FIELD OF TUNNELLING. THE REPLIES INDICATE THAT DIRECT GOVERNMENT SUPPORT OF RESEARCH IN OECD COUNTRIES VARIES BETWEEN 20 AND 100 PERCENT. THERE APPEARS TO BE NO SERIOUS DUPLICATION IN R & D ACTIVITIES WITHIN OR AMONG NATIONS. SUBJECTS OF SOME OVERLAP WERE IDENTIFIED: THE MOST SERIOUS RESEARCH GAP APPEARS TO BE THE ABSENCE OF ADEQUATE METHODS OF ANALYSIS, PLANNING AND PROGRAMMING OF RESEARCH AND DEVELOPMENT ACTIVITIES. THE MOST RESEARCH AND DEVELOPMENT IS CONDUCTED IN THE FIELDS OF ROCK MECHANICS, SOIL MECHANICS AND GEOLOGY. INDICATED AREAS OF RESEARCH EMPHASIS NEEDED APPEAR TO BE IN EXCAVATION, GROUND SUPPORT OF RESEARCH IN OECD COUNTRIES IS SUMMARIZED IN THE 14 OECD COUNTRIES BY PRINCIPLE FIELDS OF RESEARCH.

Oecd. Paris /France/ June 1970

CFSTI PB 193286, HRIS 33 213477, HRIS 33 213478. IP33213480, HRIS 33 213477, HRIS 33 213475, HRIS 33 213476

2A 215344
DETERMINATION OF THE EFFECT OF ENVIRONMENTAL TEMPERATURES ON COMPACTION OF ASPHALTIC PAVEMENTS

A FIELD STUDY WAS CONDUCTED TO LEARN THE EFFECT OF AMBIENT TEMPERATURES AND CONDITIONS ON THE COOLING RATE FOR 0.2 FT. AND 0.4 FT. PLANT-MIX COURSES DURING THE LAYDOWN AND ROLLING PHASES OF ASPHALTIC CONCRETE PAVEMENT CONSTRUCTION. THERMOCOUPLES WERE PLACED IN THE TOP, MIDDLE AND BOTTOM OF THE PAVERM COURSE. TEMPERATURES WERE RECORDED AT FREQUENT INTERVALS BEGINNING WITH LAYDOWN AND CONTINUED UNTIL THE LAYDOWN WAS COMPLETED. AIR AND BASE TEMPERATURES, CLOUD COVER AND WIND CONDITIONS WERE RECORDED. DENSITIES OF THE FINISHED PAVEMENT AFTER FINAL ROLLING WERE DETERMINED BY BOTH NUCLEAR METHODS AND BY CORES TAKEN AT TWO FOOT INTERVALS ALONG THE LANE. AIR VOID MEASUREMENTS WERE MADE ON EACH CORE. A CORRELATION BETWEEN THE ROLLER COVERAGES, TEMPERATURES DURING ROLLING AND THE DENSITIES AND AIR Voids OBTAINED FROM TESTS ON THE CORES WAS MADE OF THE FINISHED PAVEMENT. RESULTS SHOWED THAT THE TEMPERATURE DROP WITHIN THE MIDDLE OF THE 0.2 FT. COURSE OF PLANT-MIX IS MORE RAPID THAN IN THE 0.4 FT. COURSE AND THE TEMPERATURES AT THE MIDDLE OF THE COURSE WERE CONSIDERABLY LOWER THAN 0.15 DEGREES HOURS AT THE TOP. BREAKDOWN AND INTERMEDIATE ROLLING WAS COMPLETED ABOVE THE SPECIFIED TEMPERATURE OF 140°F AND IN SOME INSTANCES MUCH HIGHER. THE 0.4 FT. COURSE PAVEMENT AVERAGED HIGHER DENSITIES AND LOWER AIR Voids THAN THE 0.2 FT. COURSE. THE DENSITY OF THE TOP, MIDDLE AND BOTTOM PORTION OF 0.4 FT. COURSE CORES CORRELATES WITH THE TEMPERATURES ACTUALLY MEASURED AT THESE LEVELS. THE RESEARCH CONFIRMS THAT AIR Voids, DENSITY AND ASPHALT FILM THICKNESS ARE
CONSTRUCTION MATERIALS

IMPORTANT FACTORS IN DETERMINING THE DURABILITY OF ASPHALT PAVEMENT. THE TEMPERATURE OF THE MIXTURE, AIR AND BASE TEMPERATURE, WIND VELOCITY AND SOLAR RADIATION INFLUENCE THE RATE OF COOLING OF A MIXTURE PLACED ON A BASE. REDUCTION OF AIR VOID TO A MINIMUM (3-5%) IS ESSENTIAL TO SATISFACTORY PERFORMANCE.

Wortham, GR Erickson, LF Idaho Department of Highways July 1970

2A 215357
RAPID TEST METHODS FOR FIELD CONTROL OF HIGHWAY CONSTRUCTION
RESEARCH WAS CONDUCTED TO DETERMINE THE STATE OF THE ART IN THE DEVELOPMENT, NEED, AND USE OF RAPID TEST METHODS. THE FIRST PHASE COMPRIS A LITERATURE SURVEY OF CURRENT PRACTICES IN QUALITY CONTROL AND ACCEPTANCE TESTING, ALONG WITH A STUDY USING STATISTICAL METHODS TO ASSESS THE TIME LIMITS FOR RAPID TESTS. THE SECOND PHASE IS CONCERNED WITH THE DEVELOPMENT AND EVALUATION OF NEW RAPID TEST METHODS OR PRINCIPLES TO SELECT THOSE WORTHY OF FURTHER INVESTIGATION. THIRTY-EIGHT STATE HIGHWAY DEPARTMENTS PARTICIPATED IN THE STUDY, AND INTERVIEWS WERE CONDUCTED OR THE DEPARTMENTS ANDxing a phase of the study applied to rapid test methods for asphalt content determination, compaction control, gradation of several types of aggregate, density of base course materials and soils, and moisture content. The results of all tests are appended. In addition to 226 textual references, the report contains an annotated bibliography of 105 reports and articles on rapid test methods. /Author/


2A 215360
CRITERIA FOR USE OF SAND DRAINS IN HIGHWAY CONSTRUCTION

Elias, V Scitch, H Highway Research Record, Hwy Res Board 1970

2A 215371
STATISTICAL QUALITY CONTROL OF HIGHWAY CONSTRUCTION AND MATERIALS
EXISTING LOCAL PRACTICES USED IN ESTABLISHING AND ENFORCING HIGHWAY SPECIFICATIONS AND CONSTRUCTION PROCESSES ARE REVIEWED AND COMPARED WITH PROCEDURES BASED ON STATISTICAL QUALITY CONTROL CONCEPTS. IN ORDER THAT STATISTICAL QUALITY CONTROL CONCEPTS MAY BE PROPERLY USED WHERE APPLICABLE, THE DEVELOPMENT OF THE PRINCIPLES UNDERLYING THE USE OF STATISTICAL CONTROL METHODS AND THE DEVELOPMENT OF DIFFERENT TYPES OF ACCEPTANCE PLANS WHICH MAY BE USED IN THE HIGHWAY CONSTRUCTION INDUSTRY. THE SECOND PORTION OF THE REPORT IS CONCERNED WITH ANALYZING AND COMPARING KENTUCKY S CURRENT SPECIFICATION REQUIREMENTS
WITH TYPICAL QUALITY CONTROL REQUIREMENTS ESTABLISHED USING BASIC STATISTICAL THEORY. SPECIFICATIONS USED BY SOME OTHER AGENCIES WHICH ARE BASED ON STATISTICAL PRINCIPLES ARE PRESENTED TO ILLUSTRATE THE USE BEING MADE OF THIS TYPE OF ACCEPTANCE PLAN. /AUTHOR/

Venable, JB
Kentucky Department Highways Dec. 1970

2A 215409
STRUCTURAL TIMBER FOR BRIDGE CONSTRUCTION IN CENTRAL AMERICA
THE LATIN AMERICAN RESOURCES PROJECT WAS FORMED TO DETERMINE THE SUITABILITY OF THE TREES IN LOCAL FORESTS FOR SPECIFIC WAR USES. TIMBERS USED IN BRIDGE CONSTRUCTION MUST MEET STRENGTH AND DECAY-RESISTANCE STANDARDS. PRESERVATIVE TREATMENT CAN BE APPLIED TO NONDURABLE WOODS AND DESIGN CAN PROVIDE INCREASED SIZE TO COMPENSATE FOR LOW STRENGTH. MORE INFORMATION MUST BE OBTAINED ABOUT THE PROPERTIES AND CHARACTERISTICS OF CENTRAL AMERICAN WOODS BEFORE THEY CAN BE WIDELY USED.

Scholten, JA
Highway Research Board Proceedings 1944

2A 215410
AN EXAMPLE OF GRAVEL BASE CONSTRUCTION IN MARYLAND UNDER HEAVY TRAFFIC CONDITIONS
LOCAL BANK RUN GRAVEL IS USED WITH CALCIUM CHLORIDE TO PROVIDE A SURFACE FOR UNUSUALLY HEAVY WARTIME TRAFFIC. /AUTHOR/

Wood, JE
Highway Research Board Proceedings 1944

2A 215457
DEVELOPMENT AND TRIAL USE OF ACCEPTANCE SAMPLING PLANS FOR ASPHALT CONSTRUCTION
THE RESEARCH ON VARIABILITY IN ASPHALT CONSTRUCTION IN NORTH DAKOTA BROUGHT TO LIGHT MANY CHARACTERISTICS OF CURRENT ACCEPTABLE ASPHALT CONSTRUCTION. THEY ARE (1) SINGLE TEST RESULTS EXHIBIT A LARGE VARIABILITY CAUSING MANY OF THE MATERIALS TO FAIL THE SPECIFICATIONS; (AVARAGE TEST RESULTS ARE RECOMMENDED); (2) THE CURRENT GRADATION BAND WAS ONLY PARTIALLY EFFECTIVE IN CONTROLLING AGGREGATE GRADATION; (TARGET VALUES SHOULD BE CHOSEN EITHER AT THE CENTER OF THE BAND OR IN 2 OR 3 STANDARD DEVIATIONS FROM THE CURRENT SPECIFICATION LIMITS; AND (3) PAYMENTS TO THE CONTRACTOR WERE MADE BASED ON THE RESULTS OF HIS WORK; (SPECIFICATIONS SHOULD REQUIRE THE CONTRACTOR TO BEAR A GREATER RESPONSIBILITY FOR THE QUALITY OF HIS WORK, SUBSTANDARD WORK WOULD NOT BE PERMITTED OR THE PRICE COULD BE ADJUSTED).

Jorgenson, JL
Highway Research Record, Hwy Res Board 1971

2A 215466
EVALUATION OF BITUMINOUS COMPACTATION PROCEDURES USING NUCLEAR GAGES
THE COMPACTING PROCEDURES USED IN BITUMINOUS CONSTRUCTION ARE EVALUATED USING NUCLEAR GAGES. NUCLEAR DENSITY TESTS WERE TAKEN BOTH DURING ROLLER OPERATIONS AND AFTER COMPACTION HAD BEEN COMPLETED. THE DENSITY DATA WERE ANALYZED TO STUDY THE FEASIBILITY OF USING NUCLEAR GAGES TO ESTABLISH OPTIMUM ROLLING PATTERNS FOR SEVERAL DIFFERENT TYPES OF BITUMINOUS PAVEMENT MATERIALS FOR THE ROLLERS ENCOUNTERED. AFTER FINAL COMPACTION, CONTINUED NUCLEAR TESTS WERE TAKEN IN A STUDY OF ANY DENSITY VARIATIONS IN THE COMPACTED PAVEMENT. DENSITY TESTS WERE TAKEN TRANSVERSELY, ON JOINTS, ALONG THE PAVEMENT EDGES, ALONG THE LONGITUDINAL WHEELPATH AREAS, AND IN RANDOM LOCATIONS ALONG THE PAVEMENT. THE PREVIOUS VIEW, THAT AREAS OF LOW DENSITY ARE PREDOMINANTLY THE JOINTS AND PAVEMENT EDGES, WAS CONFIRMED. A SEPARATE STUDY WAS CONDUCTED WITH TWO COMMERCIALLY AVAILABLE NUCLEAR DENSITY GAGES TO EVALUATE THE EFFECTIVE DEPTH OF MEASUREMENT. BOTH BACKSCATTER AND AIR-GAP TECHNIQUES WERE ANALYZED. THE AIR-GAP DENSITY TEST WAS SHOWN TO BE DEPENDENT ON ONLY THE TOP 1/4 IN. OF MATERIAL TESTED USING THE TEST METHOD DESCRIBED. /AUTHOR/

Grey, RL
Highway Research Record, Hwy Res Board 1971

2A 215472
CONTROL OF SEDIMENTS RESULTING FROM HIGHWAY CONSTRUCTION AND LAND DEVELOPMENT
THE TECHNICAL CAPABILITY OF CONTROLLING EROSION AND SEDIMENT DEPOSITION IS AVAILABLE. IT INVOLVES PROTECTION OF DISTURBED SOIL FROM THE ENERGY OF FALLING RAIN AND FLOWING RUNOFF WATER BY INSTALLING PROTECTIVE COVERS, CONTROLLING RUNOFF, AND TRAPPING SEDIMENTS IN TRANSPORT. THE COST OF EFFECTIVE EROSION AND SEDIMENT CONTROL PROBABLY IS MINIMAL. THE PRINCIPAL PROBLEM LIES IN ACHIEVING EFFECTIVE ADMINISTRATIVE CONTROL AND ENFORCEMENT BY CONCERNED AGENCIES OF EROSION AND SEDIMENT CONTROL PROGRAMS. /AUTHOR/

Thronson, RE
Environmental Protection Agency 50 pp. Sept. 1971

AVAILABLE: U.S. GOVT., PRINTING OFFICE $ .60, DP3321303

2A 215473
ROCKFILL
THIS PAPER REVIEWS THE DEVELOPMENT OF COMPACTED ROCKFILL AS A CONSTRUCTION MATERIAL FOR EMBANKMENTS. ILLUSTRATES POST-CONSTRUCTION SETTLEMENTS OF ROCKFILL EMBANKMENTS, AND DISCUSSES THE VALUE OF ROCKFILL AS A CONSTRUCTION MATERIAL FOR ROAD EMBANKMENTS. THE ERA OF FREEWAY CONSTRUCTION HAS BROUGHT A REQUIREMENT FOR EMBANKMENT HEIGHTS NOT PREVIOUSLY USED FOR ROAD CONSTRUCTION. ROCKFILL HAS MARKED ADVANTAGES OVER EARTHFILL FOR HIGH EMBANKMENTS. BECAUSE, BEING SUBSTANTIALLY DURABLE, IT WILL NOT SUBSIDENCE UNDER HEAVY TRAFFIC CONDITIONS. THE LININGS ARE 16-FT. ID AND ARE USED WITH CAST IRON LININGS WHICH ARE ALSO USED ON ROCKFILL AS A CONSTRUCTION MATERIAL. SIDE SLOPES CAN BE USED AS COMPARED WITH EARTHFILL, SO THAT THE EMBANKMENT REQUIRE A SMALLER VOLUME OF FILL. /AUTHOR/

Penman, AD
Building Research Station /UK/ Apr. 1971

2A 215477
PRECAST CONCRETE TUNNEL LININGS FOR TORONTO SUBWAY
PRECAST CONCRETE TUNNEL LININGS HAVE BEEN USED IN THE TORONTO SUBWAY SYSTEM IN A WIDE RANGE OF SOIL CONDITIONS. THE LININGS ARE 16-FT. ID AND ARE USED WITHOUT SECONDARY LINING THEY ARE INTERCHANGEABLE WITH CAST IRON LININGS WHICH ARE ALSO USED ON THE PROJECT. EIGHT SEGMENTS PLUS A KEY ARE BOLTED WITH 3/4 IN. BOLTS TO MAKE A COMPLETE RING. SEGMENTS WERE PRODUCED AT THE RATE OF 300 PER DAY IN A PRECAST CONCRETE PLANT USING STEEL FORMS. SPECIFIED CONCRETE STRENGTH WAS 6,500 PSI AND OVER 7,000 PSI WAS ACHIEVED. ERECTION WAS ACHIEVED WITH THE AID OF SHIELDS OF TYPICAL DESIGN SOME SPALLING AND CRACKING OCCURRED DURING SHIELD MOVING, BUT THIS TYPE OF DAMAGE WAS MOSTLY SUPERFICIAL. REPLACEMENT OF DAMAGED SEGMENTS WAS RARE, GROUTING OUTSIDE THE LINING WAS CARRIED OUT IMMEDIATELY AFTER SHIELD MOVING. THE COST SAVING COMPARED WITH CAST IRON LINING IS OVER $300 PER RING. /ASC/
2A CONSTRUCTION MATERIALS

2A 215478
CHANGED SOIL AND ROCK CONDITIONS IN CONSTRUCTION
THE OBJECT OF THE CHANGED CONDITIONS CLAUSE IN
CONSTRUCTION CONTRACTS IS TO MINIMIZE THE GAMBLE IN
BIDDING ON SOIL AND ROCK WORK BY PAYING THE CON­
TRACTOR FOR UNEXPECTED SOIL AND ROCK CONDITIONS.
FOUR CATEGORIES OF CLAIMS APPEAR: (1) REAL DIFFER­
ENCES, WHICH COULD NOT HAVE BEEN ANTICIPATED; (2) FOR­
SEEABLE CHANGES CAUSED BY THE SPECIFIED CON­
STRUCTION; (3) PSEUDO OR PREVENTABLE CHANGES CAUSED
BY FAULTY CONSTRUCTION METHODS AND; (4) MISTAKEN
CHANGES, WHICH ARE COSTS BLAMED ON THE SOIL BUT
WHICH ARE THE RESULT OF OTHER JOB CONDITIONS. ONLY
THE FIRST CATEGORY DESERVES COMPENSATION. THE DIAG­
NOSIS OF CHANGED CONDITIONS REQUIRE IMMEDIATE EX­
PERT EVALUATION TO DETERMINE THE TRUE CONDITIONS AS
WELL AS TO PREVENT THE CHANGE FROM GENERATING A
CATASTROPHE. QUICK ACTION NOT ONLY PROVIDES THE
BASIS FOR A VALID CLAIM BUT ALSO MINIMIZES THE ULTI­
MATE COST TO BOTH THE CONTRACTOR AND THE OWNER.
/C/ASCE/

Sowers, GF Am Soc Civil Engr J Construction Div Nov. 1971

2A 215480
MORAINIC SOIL DEPOSITS AND THEIR USE IN LOWER
COST ROADS
THE TYPE OF CONSTRUCTION NORMALLY ADOPTED IN FOR­
EST ROADS CONSISTS OF A MECHANICALLY STABLE BASE, AS
THE RUNNING SURFACE, OVER THE SUBGRADE MATERIALS.
WHEN SOILS FROM MORAINE MOUNDS ARE TO BE USED.
THEIR GEOLOGICAL NATURE SHOULD BE DETERMINED, AND
THEIR ENGINEERING BEHAVIOR CHARACTERIZED. THEY
APPEAR TO FALL SHORT OF THE IDEAL ROAD CONSTRUC­
TION MATERIAL ON THREE MAIN POINTS: LACK OF BINDING,
THE NEED OF HIGH COMPACTIVE EFFORT TO OBTAIN AC­
CEPTABLE C. B. R. VALUES, AND THEIR SUSCEPTIBILITY TO
FROST HEAVE. THESE MAY BE CORRECTED BY THE ADDITION
OF CEMENT OR BITUMINOUS EMULSION BUT THE COST OF
SUCH MEASURES IS PERHAPS BEYOND WHAT IS ECONOMI­
CALLY VIABLE FOR THE CONSTRUCTION OF THE ROAD.
MECHANICAL STABILIZATION BY CRUDELY MIXING IN
COARSE AGGREGATE MAY, HOWEVER, BE FEASIBLE AL­
THOUGH LESS EFFECTIVE. LABORATORY INVESTIGATIONS
HAVE INDICATED THAT THE optimum COMBINATION OF
THE COARSE AND FINE FRACTIONS OF THESE SOILS LIES
BETWEEN 45 TO 25 PER CENT FINES FOR THE MATERIAL LESS
THAN 3/4 IN. SIEVE SIZE. /AUT­ROR/

Megown, A McArthur, AA Roads & Road Construction, London /UK/
Nov. 1971

2A 215483
INDUSTRIALIZED BUILDERS HANDBOOK
SUBTITLED "TECHNIQUES OF COMPONENT AND MODULAR
MANUFACTURING". THIS HANDBOOK IS DIRECTED TO THOSE
INVOLVED IN DESIGN, MANUFACTURE, CONSTRUCTION,
AND FINANCING OF INDUSTRIALIZED BUILDINGS. THE AP­
PENDIX INCLUDES TABLES AND DISCUSSION OF TOOLS AND
EQUIPMENT. A SPECIFIC SEGMENT OF THE MANUFACTURING
PROCESS IS COVERED IN DETAIL. /CA/

Lytle, RJ Structures Pub Co

ACKNOWLEDGMENT Concrete Abstracts

2A 215510
DEEP LIFT ASPHALTIC CONCRETE, WITH DISCUSSIONS AND
CLOSURE
DEEP LIFT ASPHALTIC PAVEMENTS, BY ELIMINATING THE
NEED FOR BASES OF CRUSHED ROCK OR UNTREATED
GRAVEL, ALLOW TRENCHING FOR UTILITIES AND SUBSE­
QUENT REINSTATEMENT TO BE UNDERTAKEN WITH LESS
TRAFFIC DISRUPTION AND LESS DISTURBANCE TO THE ROAD
ITSELF. RECOMMENDATIONS ON MIX CHARACTERISTICS
AND DESIGN, PAVEMENT LAYING AND COMPACTION METH­
ODS ARE MADE, BASED ON EXPERIENCE GAINED WITH DEEP
LIFT ASPHALT PAVEMENTS IN NEW SOUTH WALES. THE
METHOD WAS FOUND TO GIVE STRONG PAVEMENTS POSSESS­
ING GOOD RIDING QUALITIES, WITHOUT THE PROBLEM OF
REFLECTIVE CRACKING ASSOCIATED WITH CONCRETE PAV­
MENTS.

Giffen, JC Divnick, G Bone, EJ DISCUSSER Bla, JA
DISCUSSER Larcombe, LA DISCUSSER Australian Road Research
Board Proc Vol. 5 1970, pp 231-47, 5 Fig, 5 Tab, 7 Ref

2A 215512
THE COMPACTION CHARACTERISTICS OF BITUMINOUS
CONCRETE WITH PARTICULAR REFERENCE TO DESIGN
METHODS, WITH DISCUSSION AND CLOSURE
RESEARCH WAS UNDERTAKEN TO DETERMINE WHETHER A
FUNCTIONAL RELATIONSHIP EXISTS BETWEEN COMPACTIVE
EFFORT AND DEGREE OF COMPACTION. THE PARAMETER
OBTAINED FROM SUCH A RELATIONSHIP WOULD BE USEFUL
IN CORRELATING THE DEGREE OF COMPATION GIVEN BY
THE VARIABLE COMPACTION METHODS THAT HAVE BEEN
DEVISED. THE THREE METHODS WERE: STATIC COMPRESSION
(HUBBARD-FIELD METHOD), MECHANIZED IMPACT COMPAC­
TION (MARSHALL HAMMER METHOD), MECHANICAL
KNEADING (HVEEM METHOD). IT WAS FOUND THAT THE
DEGREE OF COMPATION WAS LINEARLY RELATED TO THE
LOGARITHM OF COMPACTIVE EFFORT. A PARAMETER DE­
RIVED FROM THIS FUNCTION, THE 'COMPACTIVE EFFI­
CIENCY', IS SUGGESTED AS A BASIS FOR A RATIONAL DESIGN
PROCEDURE FOR BITUMINOUS CONCRETE MIXTURES TO DO
THIS, A CURVE RELATING COMPACTIVE EFFORT TO STAIN IS
ESTABLISHED.

Fug, KY Dickinson, EJ DISCUSSER Australian Road Research Board
Proc Vol. 5 1970, pp 268-88, 21 Fig, 8 Tab, 3 Phot, 2 Ref

2A 215514
POLUTION CONTROL-ANTI-POLLUTION CONSTRUCTION
PROGRESS IN DEVELOPING NEW PROGRAMS AND
METHOBS TO KEEP AIR AND WATER POLLUTION TO A
MINIMUM DURING HIGHWAY CONSTRUCTION. PREVENTIVE
MEASURES THAT SHOULD BE ADHERED TOO RELATE TO (1)
CONTROLLING DUST, (2) LIMITING BURNING, (3) CONTROL­
LING WATER POLLUTION AND, (4) MINIMIZING SOIL ERO­
SION.

Sigler, CW Kentucky Highway Conference Proceedings July 1971, p 74

2A 215522
EVALUATION OF CONCRETE CURBING
OWING TO THE CLOSING OF MOST OF MAINE'S GRANITE
QUARRIES, WHICH HAD BEEN THE PRINCIPAL SOURCE OF CURBING.
RESEARCH WAS UNDERTAKEN INTO THE USE OF
TWO TYPES OF PCC--CAST-IN-PLACE AND PRECAST--WITH
AND WITHOUT COATINGS (PG-1024 AND THIOXY 61) AS A
SUBSTITUTE. THE THREE MAJOR CRITERIA FOR EVALUATION
WERE APPEARANCE, DAMAGE, AND SAFETY. QUARTERLY
RATINGS WERE MADE FROM SUMMER 1964 THROUGH LATE
SPRING 1971. THE TWO CONCRETES EXHIBITED NO SIGNIFI­
CANT DIFFERENCES IN DURABILITY, NOR DID COATINGS
HAVE AN EFFECT; HOWEVER, AFTER BEING DAMAGED THE
COATINGS LENT A MUCH WORSE APPEARANCE TO THE
CURBINGS. IN ALL RESPECTS CONCRETE WAS FOUND INFE­
RIOR TO GRANITE AND IT IS RECOMMENDED THAT PCC NOT
BE USED IN SUBSTITUTION OF GRANITE IN MAINE.

Merrow, FC Maine Dept of Transportation Oct. 1971, 30 pp, 2 Fig, 1 Tab, 25 Phot
CONSTRUCTION MATERIALS

2A 215558
KEEP ROAD BUILDING QUALITY UP TO SPECIFICATIONS
STATISTICAL QUALITY CONTROL SUPPOSES THE AVAILABILITY OF PRIOR ESTIMATES OF THE VARIABILITY LIKELY TO OCCUR IN THE MOST IMPORTANT PROPERTIES: GRADING, BINDER CONTENT, STABILITY, FLOW, VOID CONTENT, THICKNESS, DENSITY, COMPRESSIBILITY INDEX, AND CBR—OF THE MATERIALS USED. TENTATIVE ESTIMATES ARE MADE OF THE COEFFICIENTS OF VARIATION IN THESE PROPERTIES. THE ESTIMATES ARE BASED ON ANALYSIS OF DATA FROM COMPLETED ROAD AND AIRFIELD PROJECTS IN SOUTH AFRICA AND ELSEWHERE.

Kuhn, SH; Slavik, MM
Nat Inst Road Research /S Africa/ 6 pp 3 Fig 4 Tab 18 Ref

2A 215564
RECOMMENDED PRACTICE FOR HOT WEATHER CONCRETING
SUCH ENVIRONMENTAL FACTORS AS HIGH TEMPERATURE, LOW HUMIDITY, AND WIND CAN HAVE UNDESIRABLE EFFECTS ON CONCRETE PROPERTIES AND CONSTRUCTION OPERATIONS. POSSIBLE UNDESIRABLE EFFECTS ARE LISTED, AND RECOMMENDATIONS FOR MINIMIZING THEM ARE SUGGESTED. AMONG THESE RECOMMENDATIONS ARE SUCH MEASURES AS PRECOOLING INGREDIENTS, LIMITATION OF CONCRETE TEMPERATURE AS PLACED, LENGTH OF HAUL, FACILITIES FOR HANDLING CONCRETE AT THE SITE, AND SPECIAL PLACING AND CURING TECHNIQUES.

Am Concrete Inst Journal & Proceedings Vol. 69 No. 5, May 1972, p 261

2A 215566
RESPONSIBILITY FOR INSPECTION-SYMPOSIUM WITH FIVE PAPERS

O'Brien, D; Weinberg, BE; Santanie, DP; Flang, RS; Lombard, MA; Artuso, JF Am Concrete Inst Journal & Proceedings Vol. 69 No. 6, June 1972, pp 320-33

2A 215590
CONSTRUCTION ECONOMY THROUGH SYSTEMS BUILDING
ALTHOUGH THE SYSTEMS BUILDING CONCEPT IS 20 YEARS OLD, AND ALTHOUGH SYSTEMS COMPONENTS ARE BEING UTILIZED IN ACTUAL CONSTRUCTION, CURRENT APPLICATIONS OF THE CONCEPT BEAR ABOUT THE SAME RELATION TO OUR UNDERSTANDING OF IT AS DOES COL- LINDBERGH'S AIRPLANE TO SUPersonic jets. THE PRESENT AND ANTICIPATED ECONOMIC CLIMATE DICTATES OPTIMIZATION IN THE ECONOMY OF CONSTRUCTION, BUT ENGINEERS ARE OFTEN REQUIRED TO INNOVATE BY USING TRADITIONAL TOOLS UNDER TIGHT DEADLINES. WHAT IS NEEDED ARE PROGRAMS THAT PERMIT ADVANCED ENGINEERING STUDIES AT THE VERY PRELIMINARY CONCEPTION OF A PROJECT IDEA TO ENSURE THAT DURING THE FINAL DESIGN PHASE ALL POSSIBLE COST-SAVING INNOVATIONS CAN BE INCLUDED. PRINCIPLES OF INNOVATION IN PROCEDURE, DESIGN, AND CONSTRUCTION ARE LISTED. THESE, THE MOST IMPORTANT ARE SIMPLICITY AND MODULARITY. THE FIGURES, KEPT TO TEXTUAL DESCRIPTIONS, PRESENT EXAMPLES OF INNOVATION IN A PROGRESSION FROM ELEMENTARY COMPONENTS TO VERY LARGE, COMPLEX STRUCTURES. FOUR OF THE FIGURES ARE DEVOTED TO THE GEOMETRIC DESIGN, SUPPORT, AND INSTALLATION OF A 25-FOOT-LONG BRIDGE MADE OF PAPER.

Zeltin, L Highway Research Board Special Reports No. 132, 1972, pp 22-30, 28 Fig

2A 215591
CURRENT PRACTICES IN STEEL CONSTRUCTION
SYSTEMS CONCEPTS HAVE BEEN APPLIED TO STEELS CHIEFLY IN TWO AREAS: MODULAR COMPONENTS FOR SUBASSEMBLIES, AND TECHNIQUES TO REDUCE ON-SITE TIME. HOWEVER, THE SUBASSEMBLIES THEMSELVES ARE NEITHER STANDARDIZED NOR STOCK BECAUSE THE LIKELIHOOD OF USING A PARTICULAR PREFABRICATED ELEMENT IN TWO DIFFERENT JOBS IS TOO REMOTE TO JUSTIFY STOCKING. TO THIS IS ADDED THE COST OF HAVING PIECES IN INVENTORY. AS TO CONSTRUCTION, ONE OF THE MAIN DETERRENTS TO SYSTEMIZATION IS THE SOVEREIGNTY EXERCISED BY INDIVIDUAL OWNERS AND DESIGNERS, EVEN IN SUCH AREAS AS SPECIFICATIONS AND INSPECTION.

Elssasser, HB Highway Research Board Special Reports No. 132, 1972, pp 31-3

2A 215603
UNDERWATER TRANSPORTING OF CONCRETE WITH THE HYDRO-VALVE
A NEW METHOD DEVELOPED IN THE NETHERLANDS FOR PLACING CONCRETE UNDER WATER IS DESCRIBED. THE DEVICE ALLOWS PLACING CONCRETE OF HIGHER QUALITY THAN PREVIOUSLY POSSIBLE AND PROVIDES A MEANS OF PLACING REINFORCED CONCRETE UNDERWATER.

Schoewert, LC; Hillen, HF Am Concrete Inst Journal & Proceedings Vol. 69 No. 9, Sept. 1972, pp 584-8, 5 Fig 1 Tab

2A 215604
RECOMMENDED PRACTICE FOR CONSOLIDATION OF CONCRETE
CONSOLIDATION IS THE PROCESS OF REMOVING ENTRAPPED AIR FROM FRESH CONCRETE IN THE FORM. SEVERAL METHODS AND TECHNIQUES ARE AVAILABLE—THE CHOICE DEPENDING MAINLY ON THE WORKABILITY OF THE MIX, PLACING CONDITIONS, AND DEGREE OF DETERIORATION DEEMED SOME FORM OF VIBRATION IS USUALLY EMPLOYED. THIS RECOMMENDED PRACTICE INCLUDES UP-TO-DATE INFORMATION ON THE MECHANISM OF CONSOLIDATION, AND GIVES RECOMMENDATIONS ON EQUIPMENT CHARACTERISTICS AND PROCEDURES FOR VARIOUS CLASSES OF CONSTRUCTION.


2A 215605
TERMINAL ROAD BRIDGES FOR SAN FRANCISCO INTERNATIONAL AIRPORT
THE PLANNING, DESIGN, AND CONSTRUCTION OF TWO PARALLEL ELEVATED ROAD BRIDGES FOR THE SAN FRANCISCO INTERNATIONAL AIRPORT EXPANSION IS DESCRIBED. IT UTILIZES PRECAST, PRESTRESSED INVERTED DOUBLE-T PANELS, CANTILEVERING 22 FT EACH SIDE FROM A CENTRAL SPINAL BEAM WHICH CONTAINS POST-TENSIONED CABLE TO THE TOGETHER THE PRECAST SEGMENTS. LIMITATIONS IMPOSED BY TRAFFIC AND UNDERGROUND UTILITIES TOGETHER WITH HIGH STANDARDS FOR AESTHETIC AND SEISMIC REQUIREMENTS DICTATED THE PLANNING AND DESIGN OF THE SUPERSTRUCTURE AND THE PIER. OPTIMUM USE OF BOTH PRETENSIONING AND POST-TENSIONING, COMBINATION OF PRECASTING AND CAST-IN-PLACE CONCRETE, TOGETHER WITH INTENSIVE COOPERATION BETWEEN ENGINEERS AND ARCHITECTS HAVE MADE THIS UNIQUE DESIGN A SUCCESS.

Yang, YC Am Concrete Inst Journal & Proceedings Vol. 69 No. 10, Oct. 1972, pp 614-8, 7 Fig
2A CONSTRUCTION MATERIALS

2A 215621
SAFE SHORE LOADS FOR NEW LUMBER SIZES

Design tables show carrying capacity of single post wood shores, based on new standard lumber sizes and working stresses recommended by the National Forest Products Association. A check of compression perpendicular to the grain of supported wood members is recommended, and bracing requirements are noted. /AUTHOR/

Hurd, MK. An Concrete Instr Journal & Proceedings Vol. 70 No. 5, May 1973, pp 362-7. 8 Tab, 5 Ref

2A 215622
CONSTRUCTION OF FULL-DEPTH ASPHALTIC CONCRETE PAVEMENTS

Considerable attention has been devoted to the design and use of full-depth asphaltic concrete pavements. An experimental full-depth pavement was constructed on the Cannonsburg-Ashland road (US 60), and the mechanical response of each asphaltic concrete layer to static and dynamic loading has been tested during construction. This report is a documentation of section designs and construction procedures and summarily presents construction test results to be used in future analyses. /AUTHOR/

Ross, JD Southgate, HF Kentucky Department Highways Res Rept No. 340, Sept. 1972, 62 pp, 51 Fig, Tabs

2A 215625
TWO-LAYER PLASTIC LINER SYSTEM WILL KEEP AUSTRIAN ALPINE TUNNEL DRY

Twin layers of polyvinyl chloride (PVC) outside the concrete lining will keep dry 2 parallel bores along a new section of expressway south of Salzburg. The two-lane vehicular tunnels through sound limestone formations are connected by a post-tensioned concrete box girders bridge spanning the Salzach Valley. After bores are mucked out, rock anchors are placed to hold a wire mesh mat against the rock facing before spraying a concrete layer which smooths the tunnel walls. A 0.047-in. thick PVC layer will be stretched across the tunnel walls and secured to the rock by pneumatically driven bolts that fasten the layer to steel disks. The disks (3.5-in.-dia), spaced 3.5 ft apart, provide a solid base for the outer 0.055-in thick PVC layer, which is processed against the base layer by a specially designed truck-mounted rock. The two layers are welded by high frequency heating at disk points. Three steel form work sections are then positioned to cast the inner concrete lining. This method requires a complete watertight lining that keeps the 10-in. thick inner concrete shell completely dry. The PVC is shrinkproof and can stretch threefold without rupturing. The construction of the 3.7-mile expressway section which includes the two tunnels (5.44-mile-long northern tunnel and 7.925-ft-long southern tunnel) will cost $95 million excluding the bridge. /AUTHOR/


2A 215629
RECLAMATION PROCESS CUTS STREET CONSTRUCTION COSTS BY 35%

Reclamation of existing paving materials is proving to be a satisfactory method of rebuilding bituminous streets. The operation involves breaking up the old pavement, gathering the material in windows, pulverizing and mixing the broken pieces with a portable hammer mill. Then blending the mixture to grade and compacting it with a pneumatic roller. The only new material added is the wearing surface of plant-mix asphalt. At no time during the work cited were residents of the street unable to reach their homes by car.


2A 215638
CONCRETE CANTILEVERED BOXES ARE U.S. FIRST

Post-tensioned box girder segments make up only the main spans of the bridge across the Gulf inter-coastal waterway, a 200-ft span flanked by a 100-ft span on each side. A lifting rig and mating method are being used in place of a launching truss. The erection of the 10-ft-long units proceeds In balanced cantilevers from sections bolted atop the piers with 5-ft units completing the ends of each girder. The 27-ft. wide winged sections weigh up to 52 tons each. A 2-ft wide, cast-in-place strip between the girders will complete the deck, to be topped by asphaltic concrete. The process of erection of the 84 box sections is described in detail. Assure perfect mating when segments were erected on a 5-day curve, they were cast against each other on a 90-ft-long bed that was built on steel beams with screw jacks at each end for adjustments. Constructional experiences are described and problems are discussed. It is hoped that the project (which will cost $2.82 million) will lead to standardization of elements that will relieve some of the problems of building bridges and viaducts and double decking expressways in congested areas by eliminating falsework. It is expected that standardization will lead to a drop in time and cost. /AUTHOR/


2A 215640
POLLOLLON: SOURCES AND SOLUTIONS IN BITUMINOUS CONSTRUCTION

The paper briefly summarizes possible sources of pollution in bituminous construction and discusses methods to solve some problems. Hot-mix operations in central-plant mixing is discussed. Aggregate dust, fly ash, soot and unburned droplets of fuel are considered. Incomplete combustion of fuel is a major cause of pollution. Dust control techniques used in plant operations. Fused to ten tons of dust per hour leave the drying chamber of an average sized dryer without a dust collecting system. Fly ash results from impurities in fuel oil or incomplete combustion. Poor combustion can result in unburned oil droplets being emitted from the stack or deposited on the dryer. The dust-water mixture (from wet washes used to control dust) is sometimes drained into rivers or lakes, and thus causes pollution problem. Noise at an asphalt plant can be caused by many factors but maximum levels occur at or near the hot-bin screens. The pub mill, the exhaust fans and the burners, offensive odors and noxious gases produced vary with the type of fuel used. The burning temperature and the efficiency of the combustion process. The various operations constituting the road-mix construction procedure, requires diesel or gasoline powered internal combustion engines which are sources of pollution. Dust is created during the operations and noxious volatiles may escape into the air. Pollution control methods may be categorized in 3 classes: auxiliary equipment used in mixing and handling operations are summarized. These include dust control, water control, noise control, and odor and noxious gas control systems. Equipment manufacturers are making improved products. A new mixing
CONSTRUCTION MATERIALS

2A 215644
NEW AUSTRIAN TUNNELING METHOD

2A 215649
CONSTRUCTION MATERIALS INPUT INTO HIGHWAY CONSTRUCTION

2A 215689
VIBRATORY COMPACTION OF ASPHALT CONCRETE PAVEMENTS

2A 215702
AN ALL-CONCRETE LOOK FOR RAILWAY TRACK

2A 215704
QUALITY CONTROL IN ASPHALTIC CONCRETE ROAD CONSTRUCTION

CONCEPT THAT COMBINES THE AGGREGATE HEATING AND MIXING PROCESS IS A SINGLE OPERATION IN THE LOCATING DRUM. AND WHICH OFFERS PROMISE OF A RELATIVELY POLLUTION FREE PLANT IS DESCRIBED. SPECIAL MIXES THAT MAY BE DEVELOPED TO CONTROL POLLUTION ARE REVIEWED.

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/IRRD 502 410, 3C 3325463

THE USER TO DETERMINE THE DEGREE OF PROTECTION HE DESIRES BY SPECIFYING A SERVICE OVERLOAD FACTOR IN THE INPUT DATA.
CONSTRUCTION MATERIALS

ASPHALT PLANT AND (2) PAVING OPERATIONS. THE BATCH TYPE OF HOT-MIX PLANT IS CONSIDERED TO GIVE CLOSER CONTROL OF QUALITY THAN THE CONTINUOUS TYPE, AND OTHER FACTORS AFFECTING THE PRODUCTION OF A UNIFORM HIGH QUALITY ASPHALTIC CONCRETE ARE DISCUSSED. THESE INCLUDE: (1) SELECTION AND CONTROL OF OPTIMUM ASPHALT CONTENT; (2) TESTING AND INSPECTION OF AGGREGATES; (3) COLD FEEDING PROPORTIONING; (4) DRYER OPERATION (5) HOT BIN GRADATION; (6) HOT AGGREGATE PROPORTIONING; (7) TEMPERATURE CONTROL; (8) MIXING TIME; (9) MIXING TEMPERATURE AND (10) MIXTURE SAMPLING AND TESTING. PAVING OPERATIONS ARE ALSO DESCRIBED UNDER THE MAIN HEADINGS OF (1) GENERAL (2) HAULING EQUIPMENT (3) CONTROL OF SPREADER OPERATOR: (4) TEMPERATURE CONTROL; (5) CONTROL OF ROLLING OPERATIONS; (6) CONTROL OF FIELD DENSITY; (7) CONTROL OF JOINTS; (8) CONTROL OF TRAFFIC AND (9) CONTROL OF FINISHED SURFACE.


Acknowledgment: Transport & Road Research Lab /UK/

2A 215752
GUSSASPHALT: MACHINE-LAID MASTIC IN ROAD CONSTRUCTION

THE DEVELOPMENTS IN MANUFACTURING PROCESSES FOR THE MATERIALS, ASPHALT OR GUSSASPHALT, ARE DISCUSSED UNDER THE FOLLOWING HEADINGS, PRINCIPLES OF THE COMPOSITION OF GUSSASPHALT; SPECIFICATION OF GUSSASPHALT; MANUFACTURE OF GUSSASPHALT; LAVING GUSSASPHALT; AND ASSOCIATED BINDER COURSE. AN EXTRACT FROM GERMAN SPECIFICATION TV BIT 6/60 AND DETAILS OF INDENTATION TEST (DIN 1996 SHEET 13) ARE APPENDED. /TRL/

Shell Refining Limited /UK/ R&d Rept 1971, 16 pp, 2 Fig, 4 Tab, 19 Phot

Acknowledgment: Transport & Road Research Lab /UK/IRRD 201 447, 3C33301447

2A 215758
ANALYSIS OF DEFECTS IN CONCRETE AND BRICK STRUCTURES DURING CONSTRUCTION AND IN SERVICE

THIS STUDY CONCERNS THE CAUSES OF DISTRESS OR FAILURE OF PERMANENT AND TEMPORARY STRUCTURES DURING CONSTRUCTION AND IN SERVICE. THE MAIN OBJECTIVES ARE TO ANALYZE THE CAUSES OF THE MOST FREQUENTLY OCCURRING FAILURES AND ADVERSE PERFORMANCE OF STRUCTURES, AND TO INVESTIGATE THE PATHOLOGY OF MATERIALS, ERRORS IN DESIGN AND CONSTRUCTION, ETC. THE TYPES OF STRUCTURES CONSIDERED ARE: BUILDINGS, FACTORIES, SCHOOLS, TANKS AND, TO A LESSER EXTENT, BRIDGES AND EARTHWORKS. THE MATERIALS DISCUSSED ARE MAINLY CONCRETE, BRICKWORK AND SOILS. THE PRINCIPAL EFFECTS DISCUSSED ARE: GRAVITY AND LATERAL FORCES, TEMPERATURE AND MOISTURE CHANGES, CREEP AND SHRINKAGE, SETTLEMENT, DEFECTS AND DEGRADATION OF MATERIALS WITH TIME, INADEQUATE WORKMANSHIP, FAULTY CONSTRUCTION, ERRORS AT THE DESIGN STAGE AND DURING CONSTRUCTION, AND LACK OF STABILITY. /TRL/

Smolira, M
Dept of Environment Dir Gen /UK/ R & D Rpt Oct. 1972, 142 pp, 105 Fig, 2 Tab, 184 Ref

Acknowledgment: Transport & Road Research Lab /UK/

2A 215796
EFFECTS OF TYPE OF MATERIAL ON NUCLEAR DENSITY MEASUREMENTS

THE PAPER DESCRIBES LABORATORY AND FIELD INVESTIGATIONS CARRIED OUT TO IMPROVE THE PRACTICAL APPLICATION OF THE NUCLEAR METHOD IN HIGHWAY CONSTRUCTION. VARIOUS FACTORS HAVE BEEN STUDIED, INCLUDING THE EFFECTS OF DENSITY GRADIENT, SOURCE ENERGY, AND PARTICULARLY SOIL TYPE ON DENSITY MEASUREMENTS. TWO METHODS ARE DESCRIBED FOR THE POSSIBLE ELIMINATION OF THE EFFECT OF SOIL TYPE IN PRACTICAL DENSITY MEASUREMENTS. IN THE FIRST, DIRECT TRANSMISSION IS USED AS AN AUXILIARY TEST WITH BACKSCATTER MEASUREMENTS. RESULTS ARE GIVEN TO ILLUSTRATE THE ADVANTAGES OF THIS METHOD FOR DETERMINING THE CORRECT CALIBRATION CURVE FOR THE BACKSCATTER METHOD. IN THE SECOND METHOD, THE EFFECTS OF DENSITY GRADIENT IN THE SOIL LAYER. IN THE SECOND METHOD, INTRODUCTION OF A CERTAIN AIR GAP BETWEEN THE SURFACE PROBE AND THE SOIL SURFACE IS USED TO OBTAIN A COUNT RATIO WHICH, WHEN PLOTTED AGAINST DENSITY, GIVES A POSITIVE SLOPE RELATIONSHIP INDEPENDENT OF SOIL TYPE FOR DENSITIES UP TO 400 PCF. THIS METHOD ONLY EMPLOY THE BACKSCATTER TECHNIQUE AND IS THEREFORE COMPLETELY NONDESTRUCTIVE. IT IS SHOWN FURTHER HOW THE AIR-GAP METHOD CAN BE USED FOR EFFECTIVE DENSITY MEASUREMENTS ON SOIL LAYERS. MEASUREMENTS AT PREDETERMINED AIR GAPS FURTHER PERMIT CONTINUOUS RECORDS OF DENSITY TO BE OBTAINED BY USING A SUITABLE RATERMETER. /AUTHOR/

Kuhn, SH Highway Research Record, Hwy Res Board 1965

2A 215825
STUDY IN THE GENERAL FIELD OF QUALITY CONTROL ENGINEERING

THIS REPORT DESCRIBES CURRENT METHODS OF CONTROL FOR VARIOUS CONSTRUCTION MATERIALS AND APPLICATIONS OF RANDOM SAMPLING TECHNIQUES FOR THE USE OF THESE MATERIALS. RESEARCH AREAS FOR ADDITIONAL DEVELOPMENT WERE DEFINED FROM LIMITED STUDIES IN MANY AREAS RATHER THAN EXPLORING A FEW AREAS TO THEIR FULLEST EXTENT AND THOSE STUDIES INCLUDED WERE A/ INSTRUCTION OF STATE ROAD DEPARTMENT PERSONNEL IN METHODS AND APPLICATIONS OF STATISTICAL ANALYSIS; B/ ASPHALT PENETRATION AND VISCOSITY CONTROL TESTS; C/ BITUMINOUS MIX MATERIALS CONTROL TESTS; D/ EVALUATION OF RECORD TEST DATA; E/ RANDOM SAMPLING TECHNIQUES. F/ RESEARCH PROBLEM TESTING AREAS RECOMMENDED FOR ADDITIONAL STUDY WERE/ 1/ ASPHALT EXTRACTION TESTING, /2/ MARSHALL STABILITY TESTING, /3/ COMPARATIVE MOISTURE DETERMINATION METHODS, /4/ MULTIPLE DENSITY TEST REPEATABILITY, /5/ FLORIDA BEARING VALUE TEST, /6/ NUCLEAR DENSITY CALIBRATION CURVE DEVELOPMENT. /BPR/

Warden Engineers, Incorporated Mar. 1965

Acknowledgment:

2A 215893
APPLICATION OF INSTRUMENTAL METHODS FOR EVALUATING HIGHWAY MATERIALS, THIRD PROGRESS REPORT: PYROLYSIS GAS CHROMATOGRAPHY

A RELATIVELY NEW TECHNIQUE OF COMBINING PYROLYSIS (THERMAL DECOMPOSITION) AND GAS CHROMATOGRAPHY HAS BEEN USED TO PRODUCE CHARACTERIZING AND IDENTIFYING FRAGMENTATION PATTERNS OF MANY PLASTIC AND RUBBER MATERIALS WHICH ARE USED IN HIGHWAY CONSTRUCTION AND MAINTENANCE. PYROLYSIS GAS CHROMATOGRAPHY HAS SPECIFICALLY BEEN USED TO DETECT COMPOSITIONAL OR PROCESSING DIFFERENCES, OR BOTH, IN PREFORMED NEOPRENE JOINT SEALS SUPPLIED BY DIFFERENT MANUFACTURERS AND BETWEEN DIFFERENT WIDTH JOINT SEALS FROM THE SAME MANUFACTURER. SUCH DIFFERENCES ARE PERTINENT SINCE JOINT SEALS WHOSE PYROLYSIS COMPONENTS HAVE LONG RETENTION TIMES GENERALLY HAVE HIGH TENSILE STRENGTH AND HIGHER RECOVERY FROM COMPRESSION TESTS THAN THOSE HAVING
CONSTRUCTION MATERIALS

SHORT RETENTION TIMES, PROCEDURAL DETAILS OF THE METHODS AND EQUIPMENT DESCRIPTIONS ARE INCLUDED.

THE INVESTIGATION OF NEOPRENE JOINT SEALS BE CHARACTERIZED BY PYROLYSIS GAS CHROMATOGRAPHY, (2) THE INVESTIGATION OF NEUTRON ACTIVATION ANALYSIS TECHNIQUES TO THE QUANTITATIVE LABORATORY ANALYSIS OF SUCH HIGHWAY MATERIALS AS ALUMINUM, FERROUS METALS, ZINC, PAINT PIGMENTS, LIMESTONE AND CEMENT. THE REALISTIC POTENTIAL OF ACTIVATION ANALYSIS WAS COMPARED WITH CONVENTIONAL WET METHODS OF ANALYSIS AS WELL AS WITH X-RAY FLUORESCENCE AND ATOMIC ABSORPTION SPECTROSCOPY. OF THESE METHODS, IT WAS CONCLUDED THAT ATOMIC ABSORPTION-FLAME EMISSION METHODS HAVE THE GREATEST POTENTIAL FOR REPLACING AND IMPROVING UPON CURRENT HIGHWAY MATERIALS ANALYSIS PROCEDURES. /BFR/

Backshaw, GL
West Virginia University, Bureau of Public Roads /US/, West Virginia State Road Commission Nov. 1969

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4674083 70) REPORT PENDING, I C34021797

2A 215930
EVALUATION OF BITUMINOUS COMPACTION PROCEDURES USING NUCLEAR GAUGES

A STUDY WAS CONDUCTED USING NUCLEAR GAUGES TO EVALUATE PRESENT BITUMINOUS CONSTRUCTION PROCEDURES SPECIFICALLY, NUCLEAR DENSITY TESTS WERE TAKEN BOTH DURING ROLLER OPERATIONS AND AFTER COMPACTION HAD BEEN COMPLETED. THE DENSITY DATA WERE ANALYZED TO STUDY THE FEASIBILITY OF USING NUCLEAR GAUGES TO ESTABLISH OPTIMUM ROLLING PATTERNS FOR SEVERAL DIFFERENT TYPES OF BITUMINOUS PAVEMENT MATERIALS FOR THE ROLLERS ENCOUNTERED. AFTER FINAL COMPACTION, CONTINUED NUCLEAR TESTS WERE TAKEN IN A STUDY OF ANY DENSITY VARIATIONS IN THE COMPACTED PAVEMENT. DENSITY TESTS WERE TAKEN TRANSVERSELY, ON JOINTS, ALONG THE PAVEMENT EDGES, ALONG THE LONGITUDINAL WHEELPATH AREAS, AND FINALLY, AT RANDOM LOCATIONS ALONG THE PAVEMENT. AREAS OF LOW DENSITY APPEARED TO BE PREDOMINANTLY THE JOINTS AND PAVEMENT EDGES. A SEPARATE STUDY WAS CONDUCTED WITH TWO COMMERCIALY AVAILABLE NUCLEAR DENSITY GAUGES TO EVALUATE THE EFFECTIVE DEPTH OF MEASUREMENT. BOTH BACKSCATTER AND AIR-GAP TECHNIQUES WERE ANALYZED. THE AIR-GAP DENSITY TEST WAS SHOWN TO BE DEPENDENT ON ONLY THE TOP 1 3/4 INCHES OF MATERIAL TESTED. /AUTHOR/

Greys, RL
Pennsylvania Department Transp, Bureau of Public Roads /US/ 64-15

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4723152 70) NTIS PB 194333, 1C3402208

2A 215995
FINAL REPORT ON THE FEASIBILITY OF USING HIGHWAY LITTER IN HIGHWAY CONSTRUCTION AND MAINTENANCE

THE TECHNICAL AND ECONOMIC FEASIBILITY OF UTILIZING HIGHWAY LITTER IN HIGHWAY CONSTRUCTION AND MAINTENANCE WAS INVESTIGATED. A RESEARCH TEAM GATHERED INFORMATION AND MADE TECHNICAL AND ECONOMIC ASSESSMENTS OF SIXTEEN POTENTIAL USES OF HIGHWAY LITTER. A MAJOR FINDING WAS THAT IF HIGHWAY LITTER IS CONSIDERED BY ITSELF NOT ONE OF POTENTIAL USES INVESTIGATED WOULD BE ECONOMICALLY FEASIBLE AT THE PRESENT TIME. IN ORDER TO BE ECONOMICALLY FEASIBLE, HIGHWAY LITTER SHOULD BE COMBINED WITH OTHER SOLID WASTES IN ORDER TO PROVIDE EITHER SUFFICIENT QUANTITIES OR LOWER THE UNIT COST OF PROCESSING. OTHER MAJOR FINDINGS WERE THAT SIX POTENTIAL USES WERE ASSIGNED TO BE BOTH TECHNICALLY AND ECONOMICALLY FEASIBLE, PROVIDING THE LITTER IS COMBINED WITH OTHER SOLID WASTES. THESE SIX USES ARE (1) LANDFILL OPERATIONS, (2) AGGREGATE REPLACEMENT FOR BASE AND SUBBASE, (3) AGGREGATE REPLACEMENT FOR STABILIZED MATERIALS, (6) INDUCED TRENCH, (5) VEHICLE IMPACT ATTENUATORS, AND (6) MAINTENANCE MATERIALS. /FHWA/

Gallaway, BM

Contract FH-11-7692

ACKNOWLEDGMENT: Federal Highway Administration (M-0082) PB-224332/AS

2A 216010
TECHNICAL CONTROL OF SULFATE WASTE MATERIALS AT THE TRANSPO '72 SITE


Minnick, Li Webster, WC Hilton, RG
Corson, G. & W.H., Inc Final Rpt 1972, 73 pp

ACKNOWLEDGMENT: Federal Highway Administration/FHWA M-0044, NTIS PB 228 975/AS, 1C34025611

2A 216011
ARKANSAS WASTE IN MUNICIPAL AREAS SUITABLE FOR HIGHWAY CONSTRUCTION OR MAINTENANCE

THE CATEGORIES AND QUANTITIES OF MUNICIPAL WASTE PRODUCTS ARE AGGREGATES (2 MILLION TONS/YR), GLASS (2200 TONS/YR), CHEMICAL WASTES (3 MILLION TONS/YR), WOOD PRODUCTS AND PAPER (50,000 TONS/YR), RUBBER (2000 TONS/YR), AND TEXTILES AND MISCELLANEOUS (VARIABLE QUANTITIES). AGGREGATES, WOODCHIP MULCHES, BROWN MUD, DRIED SEWAGE SLUDGE, INCINERATOR RESIDUES CAN BE USED IN FILLS AND EMBANKMENTS. WOODCHIP MULCHES ARE EFFECTIVE IN PREVENTING EROSION. DRIED SEWAGE SLUDGE IS AN EFFECTIVE SOIL CONDITIONER AND FERTILIZER. BROWN MUD AND HYDRATED LIME CAN STABILIZE PLASTIC CLAYS. RUBBER, BRINE, AND ACID HOLD PROMISE FOR FUTURE USE. RUBBER HOLD PROMISE AS A VISCOSO-ELAS.

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CONSTRUCTION MATERIALS

TIC LAYER TO ELIMINATE PAVEMENT CRACKING AND AS A PLASTICIZER IN WEARING COURES BUT THE TECHNOLOGY FOR THIS IS NOT SUFFICIENTLY DEVELOPED. BRINE, GYPSUM, AND SPENT SULFURIC ACID APPEAR TO BE GOOD SOIL STABILIZERS AND CONDITIONS. STUDIES ON THE EFFECT OF BRINE AND ACID ON THE ENVIRONMENT SHOULD BE MADE BEFORE USE. /NTIS/

Thomton, SI Welch, RC
Arkansas University Final Rpt June 1973, 90 pp

ACKNOWLEDGMENT: Arkansas State Highway Department, Federal Highway AdministrationFHWA M-0120, NTIS PB 230 951/AS, IC34023630

2A 216102
THE LOCATION AND POTENTIAL HIGHWAY USE OF BY-PRODUCTS IN ARKANSAS
EIGHT HUNDRED NINETY-NINE COMPANIES WERE SURVEYED IN RURAL ARKANSAS AND 287 COMPANIES REPORTED 309 WASTES WITH TOTAL MONTHLY AMOUNTS OF 22,752 TONS OF WOOD; 762 TONS OF PAPER 4,352 TONS OF LIQUID; 1,355 TONS OF METAL; 12,804 TONS OF AGRICULTURAL WASTES; 52 TONS OF LEATHER AND CLOTH; 15 TONS OF GLASS, 31,745 TONS OF MINERALS; AND 71 TONS OF POLYMERS. THESE MATERIALS AND THEIR SOURCES ARE TABULATED BY TYPE AND BY HIGHWAY DISTRICT IN THE REPORT SUPPLEMENT. A COMPREHENSIVE LIST OF THE USES OF WASTE BY OTHER STATE HIGHWAY DEPARTMENTS IS INCLUDED. SOME LABORATORY TESTING WAS DONE AND THE RESULTS ARE INCLUDED IN DETAIL. BY-PRODUCTS RECOMMENDED FOR DIRECT USE BY THE ARKANSAS HIGHWAY DEPARTMENT ARE PINE BARK, RICE HULLS, BRINE, AL(OH)3, CA(OH)2 CEMENT KILN STACK DUST, LIME CORE, GLASS USED FIRE BRICK, USED CONCRETE, SLAG, BARI TAILINGS, OILY FILTER CLAY, AND CLASSIFIER SAND. OTHER MATERIALS WHICH REQUIRE PROCESSING OR STUDY BEFORE USE ARE RECOMMENDED FOR POSSIBLE APPLICATIONS AS MULCH, DUST PALLIATIVES, EROSION CONTROLS, SEED BED PREPARATIONS, SOIL STABILIZERS, SHOULDER SANDING, WINTER SANDING, FINE AGGREGATES, GROUT, INSULATION LAYERS, CUSHION COATS, TACK COATS, JOINT FILLERS, PAINT THINNERS, AND BINDER.

Jimerson, GD Wyatt, WV
Arkansas State University, Jonesboro Final Rep Aug. 1973, 114 pp

ACKNOWLEDGMENT: Arkansas State Highway Department, Federal Highway AdministrationFHWA M-0125, NTIS PB 230 953/AS, IC34023631

2A 216103
USE OF LIME IN THE CONSTRUCTION AND MAINTENANCE OF SASKATCHEWAN HIGHWAYS, 1962-1968
VARIOUS USES OF LIME BY THE SASKATCHEWAN DEPARTMENT OF HIGHWAYS FOR HIGHWAY CONSTRUCTION AND MAINTENANCE ARE OUTLINED. PROJECTS INCLUDE LIME STABILIZATION AND MODIFICATION OF HIGHLY PLASTIC LACUSTRINE CLAY SOILS, LIME DRYING OF EXCESSIVELY WET SUBGRADES, FILLING AND INJECTING LIME SLURRY INTO PAVEMENT CRACKS TO CONTROL FORMATION AND DEVELOPMENT OF TRANSVERSE RIDGES, AND LIME MODIFICATION OF DIRTY AGGREGATE FOR ASPHALTIC CONCRETE.

/RATAOC/

Colley, RW
Saskatchewan Dept Hwy, Regina /Canada/ Apr. 1970

ACKNOWLEDGMENT: Roads & Transportation Assoc /Canada/

2A 216106
THE USE OF THERMISTORS FOR TEMPERATURE MEASUREMENT IN CONCRETE
THE USE OF THERMISTORS FOR TEMPERATURE MEASUREMENT OF THE INTERIOR OF CONCRETE CONSTRUCTION IS BEING INVESTIGATED. AN INVESTIGATION WAS CARRIED OUT ON THE DISTRIBUTION OF TEMPERATURES WITH TIME IN A REINFORCED CONCRETE MINESHAFT LINING CONSTRUCTED AGAINST GROUND WHICH HAD BEEN FROZEN TO A DEPTH OF 10 FEET. WATER INTRATHEMATICALLY WAS USED IN LABORATORY STUDIES OF THE FROST-RESISTANCE OF CEMENT GROUTS AND IN A STUDY OF THE TEMPERATURE-LAG EFFECT FOR CONCRETE SPECIMENS PLACED IN COLD ROOMS.

Geddes, JD
Civil Eng & Public Works Review /UK/ Sept. 1965

2A 216131
SPICES IN TENSILE REINFORCING BARS
INFORMATION IS TO BE PROVIDED ON THE RELATIVE MERITS OF THE VARIOUS METHODS OF CONNECTING TENSILE REINFORCING BARS IN REINFORCED CONCRETE CONSTRUCTION. IN PART I, A SERIES OF 122 DIFFERENT BAR SAMPLES WERE PREPARED AND TESTED TO FAILURE. EIGHT DIFFERENT SPlicing SYSTEMS WERE STUDIED PLUS A SERIES OF CONTROL BARS /CONTINUOUS BARS WITHOUT ANY SPlices/. STRESS-STRAIN DIAGRAMS ARE INCLUDED FOR ALL SAMPLES THAT YELLED SUFFICIENT DATA. ON THE BASIS OF THIS STUDY, THE MOST PROMISING TYPES OF SPlicing DEVICES WERE SELECTED FOR FLEXURAL TESTS. IN PART II, EIGHT REINFORCED CONCRETE BEAMS WERE FORMED. EACH BEAM WAS TWELVE FEET IN LENGTH AND HAD A CROSS-SECTION OF 8 IN. WIDE BY 12 IN. DEEP. FOUR DIFFERENT SPlicing DEVICES WERE STUDIED IN THIS SERIES PLUS ONE BEAM WHICH CONTAINED A SIMILAR, CONTINUOUS REINFORCING BAR /WITHOUT A SPlice/ FOR CONTROL PURPOSES.

Segner, EP
Oklahoma University 59 pp Aug. 1965

ACKNOWLEDGMENT: Highway Res Abstracts Hwy Res Board

2A 216205
SYMPOSIUM ON VIBRATION TESTING OF ROADS AND RUNWAYS
CONTENTS: MECHANICAL PROPERTIES OF BITUMEN, W. J. SAAL. MECHANICAL PROPERTIES OF BITUMINOUS ROAD MIXTURES, L. W. NIIBOER. VIBRATION TESTING OF SOILS, H. LORENZ. VIBRATION TESTING OF ROADS, L. W. NIIBOER. INTERPRETATION OF SURFACE VIBRATION MEASUREMENTS, R. JONES. DYNAMIC STIFFNESS OF SOILS AND PAVEMENTS, W. HEUKELOM. DYNAMIC INVESTIGATIONS OF ROADS IN GERMANY, O. BAUM. MEASUREMENT OF EFFECTS OF TRAFFIC

THE INITIAL COST OF THE DATA AND THE ADDITIONAL POINT WHERE IT IS A PRACTICAL PROCEDURE. THE PRACTICES COMPATIBLE WITH EXISTING TECHNOLOGY. ATTAINED AMONG THE NUMEROUS REPUTABLE CONTRIBUTIONS EXTENSIVELY FROM PUBLISHED LITERATURE, AND EXPERIENCE BY ENGINEERS, PUBLIC OFFICIALS, CONSTRUCTION PRODUCTS.

CONSTRUCTION PRODUCTS INCLUDING SOILS SELECTION, TO COMPACTION PROCESSES, INCLUDING SOILS SELECTION, TO CONSTRUCTION PRODUCTS IS INTENDED TO SERVE A LONG COURSE, AND ASPHALTIC CONCRETE SURFACE COURSE ON THE HANDBOOK OF STEEL DRAINAGE AND HIGHWAY CONSTRUCTION STRUCTURES AND RELATED STEEL PRODUCTS. THE TEXT PRESENTS DOCUMENTED INFORMATION ON THE CORROSION PREVENTION FOR THE CONCRETE AND METAL REINFORCING IN THE CONSTRUCTION INDUSTRY. IMPROVED PRACTICES AND TECHNIQUES OF FORMULATING CONCRETE HAVE INCREASED ITS ABILITY TO RESIST DETERIORATION AND CORROSION. IN MANY ENVIRONMENTS, HOWEVER, CONCRETE MAY BE SUSCEPTIBLE TO CHEMICAL ATTACK. THIS ARTICLE BRIEFLY DISCUSSES THE MAKE-UP OF CONCRETE, INCLUDING AIR-ENTRAINED CONCRETE, AND PRESENTS DOCUMENTED INFORMATION ON THE CORROSION OF REINFORCING METALS. METHODS OF PROTECTING AND REINFORCING CONCRETE ALSO ARE PRESENTED. THE INFORMATION IS INTENDED TO BE ONLY AN INTRODUCTION AND SHOULD NOT BE USED AS A GUIDE FOR PROTECTING CONCRETE STRUCTURES. THIS ARTICLE IS A CONTINUATION OF A SERIES ON THE PROTECTION OF MATERIALS IN THE CONSTRUCTION INDUSTRY. (AUTHOR) REFERENCES: MATERIALS PROTECTION, JANUARY, 1968, VOL. 7, PAGES 19-23.

Castlesberry, JR. Materials Protection Mar. 1968

CAUSES OF DETERIORATION OF BUILDING MATERIALS II ROLE OF MICROBIOLOGICAL AGENCIES IN DETERIORATION OF STONE THE WAY IN WHICH MICROBIOLOGICAL AGENCIES CAN AGGRAVATE OR EVEN CAUSE THE DECAY OF LIMESTONE AND STONE MAASSIVE IN ILLUSTRATION TO THE POWDERY GYPSEOUS LAYER BELOW THE SURFACE SCALE AT CERTAIN LOCALITIES. THIS LAYER GIVES HEAVY COUNTS OF THIOBACILLUS THIO-OXIDANS, WHICH NEEDS REDUCED SULFUR TO PRODUCE SULFATE IONS BY OXIDATIVE METABOLISM. IT IS PROBABLE THAT SOIL SULFATES ARE ANAEROBICALLY REDUCED TO SULFIDE BY DESULPHOVIBRIO DESULPHURICANS (OFTEN FOUND AT BASE OF DAMP WALLS) AND THAT AN AQUEOUS SOLUTION OF THE SULPHIDES RISES UPWARDS FOR USE BY T. THIO-OXIDANS. THE PARTLY MICROBIOLOGICAL ORIGIN OF 'MOND-MILCH' (CRYST. CALCIUM OR ARAGONITE) AS SOFT OR HARD INCRUSTATIONS, OR MILKY AQUEOUS SUSPENSIONS, IN SOME LIME CARBONATES IN SOLUTION ARE HELD RESPONSIBLE. (BSA/)

American Iron & Steel Institute 1967
CONSTRUCTION MATERIALS

2A 216392
EPOXY MORTARS IN CONSTRUCTION
EPOXY RESINS ARE BEING INCREASINGLY APPLIED IN CONSTRUCTION AND HABITATION DUE TO THEIR EXCELLENT PROPERTIES AND AN IMPROVING TECHNOLOGY, WHICH ENABLES THESE RESINS TO BE APPLIED TO MORE DELICATE AND DIFFICULT USES. THIS ARTICLE DESCRIBES THE WORK DONE BY THE AUTHOR AS PART OF AN EXTENSIVE PROGRAM OF EXPERIMENTAL WORK AT THE INSTITUTO EDUARDO TORROJA LABORATORY. THIS PROGRAM OF WORK REFERS PARTICULARLY TO MORTARS WITH A LOW CONTENT OF EPOXY RESINS BY THIS IS MEANT A MIXTURE OF COARSE AGGREGATE WITH THE LEAST QUANTITY OF RESIN NECESSARY TO OBTAIN A SUITABLE BOND. THE INVESTIGATION INVOLVED A STUDY OF THE PROPORTIONING OF SAND AND RESIN, THE RELATION BETWEEN PROPORTIONING, THE AGE AND THE MECHANICAL STRENGTH AND ALSO THE PHYSICAL PROPERTIES OF THE RESULTING MORTARS.

2A 2165460
WELDED STRUCTURES-A SYMPOSIUM
PAPERS PRESENTED DISCUSS THE FOLLOWING: (1) STEEL REQUIREMENTS, (2) DESIGN AND RESEARCH, AND (3) THE APPLICATION AND CONSTRUCTION. THE PROPERTIES OF STEEL THAT IS TO BE WELDED MUST BE MORE CAREFULLY SPECIFIED THAN THOSE FOR STEEL THAT IS TO BE FABRICATED BY OTHER JOINING METHODS. THE TYPE OF CONSTRUCTION ALSO AFFECTS THESE REQUIREMENTS. IT IS PRESUMED THAT WELDED STRUCTURES WILL BE USED WIDELY. OF THE MORE THAN 35 DIFFERENT WELDING PROCESSES CURRENTLY USED, MANUAL SHIELDED METAL-ARC WELDING IS THE MOST COMMON FOR STRUCTURAL FABRICATION. MECHANICAL PROPERTIES OF THE STEEL MUST BE KNOWN AS WELL AS THE FOLLOWING: (1) THE CHEMISTRY OF STEEL, (2) HOW THE STEEL IS MADE, AND (3) THE THICKNESS OF THE PLATES AND SHAPES TO BE USED. RECOMMENDATION IS MADE FOR THE USE OF ASTM A7 STEEL. THE ADEQUACY OF WELDED JOINTS, SPECIAL REQUIREMENTS IN SPECIFICATIONS TO ASSURE WELDABILITY, THE BEHAVIOR OF WELDED JOINTS UNDER REPEATED STRESSES, IMPACT AND VIBRATION, AND RESIDUAL STRESS PROBLEMS ARE EVALUATED AND DISCUSSED. THE FABRICATING AND CONSTRUCTING OF WELDED STRUCTURES ARE ANALYZED. A BRIEF HISTORY IS GIVEN OF THE DEVELOPMENT OF THE USE OF STEEL STRUCTURES.

2A 2165463
LEAD AND CORROSION RESISTANCE
THE REFERENCES ON LEAD AND CORROSION RESISTANCE INCLUDE: MEANS OF COMBATING CORROSION; CATHODIC PROTECTION; PROTECTIVE COATINGS, DETERIORATION OF LEAD CABLE SHEATHING, CORROSION RATES AND INFLUENCE OF IMPURITIES; CORROSION TESTS; RELATIVE CORRODIBILITIES OF FERROUS AND NON-FERROUS METALS AND ALLOYS; ELECTROLYTIC DESTRUCTION OF METALS IN SOIL, ATMOSPHERE, AND WATER; ACID ACTION; ACTION OF ACIDS, ALKALI, AND SALTS; HIGH TEMPERATURE OXIDATION; INTERCRYSTAL LINE BRITTELINESS, FATIGUE STUDIES, AND AS CONSTRUCTION MATERIAL FOR CHEMICAL APPARATUS.

ACKNOWLEDGMENT: Highway Research Board

2A 2165467
ELECTRONICS AND ACCOUSTICAL METHODS FOR TESTING CONSTRUCTION MATERIALS /IN RUSSIAN/
THIS BOOK CONTAINS THE FOLLOWING CHAPTERS: (1) PHYSICAL PRINCIPLES OF ACCOUSTICAL METHODS AND WORKING PRINCIPLES OF ELECTRONIC EQUIPMENT FOR THE QUALITY CONTROL OF CONSTRUCTION MATERIALS. (2) ELECTRONIC EQUIPMENT FOR TESTING CONSTRUCTION MATERIALS BY ACCOUSTICAL METHODS, AND (3) SOME RESULTS AND POSSIBLE APPLICATIONS OF ACCOUSTICAL METHODS AND ELECTRONIC ENGINEERING STRUCTURES.

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 2165509
JOINTS AND JOINT CONSTRUCTION IN CONCRETE AND REINFORCED CONCRETE CONSTRUCTION /GERMAN/
THIS IS THE FIRST COLLECTION OF APPROVED METHODS OF CONSTRUCTION IN THIS IMPORTANT FIELD. THIS FIRST PART OF THE BOOK DEALS WITH QUESTIONS OF CONSTRUCTION AND MATERIAL IN THE PRODUCTION OF STRUCTURAL JOINTS: THEIR NUMBER AND DESIGN, THE DIFFERENT KINDS OF JOINTS AND JOINT SEALERS. THE USE OF PVC COMPRESSIBLE SEALERS IS ALSO CONSIDERED. THE SECOND PART CONTAINS DETAILED DISCUSSIONS OF JOINTS AND JOINT CONSTRUCTION IN VARIOUS BUILDING PROJECTS, INCLUDING JOINTS IN BRIDGES AND CONCRETE ROADS.

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 2165514
PRACTICAL EXPERIMENTS WITH PLASTIC OVERLAYS IN ROAD CONSTRUCTION /IN GERMAN/
DURING PARALLEL TESTING OF NEW TYPES OF CONSTRUCTION MATERIAL, VESTOPAL MORTAR BEHAVED PARTICULARLY WELL. APPROXIMATELY 15% WEIGHT OF VESTOPAL TYPE A OR LT WITH LOW PROPORTIONS OF HARDENER AND ACCELERATOR IS ADDED AS A BINDER TO THE GRADED AGGREGATE WHICH CONSISTS OF NATURAL SAND AND/OR CRUSHED STONE SAND (UP TO 3MM KG). MORTAR PRISMS ATTAINED 216 KP/CM SQUARE TENSILE STRENGTH, 905 KP/CM SQUARE COMPRESSIVE STRENGTH AND UP TO 35 KP/CM SQUARE SHEARING STRENGTH AFTER 7 DAYS; SIMILARLY OUTSTANDING WAS ITS RESISTANCE TO ABRASION, FROST AND THAWING SALTS. ALL TYPES OF DAMAGE TO CONCRETE ROADS CAN THEREFORE BE SATISFACTORY AND PERMANENTLY REPAIRED. THE ADDITIONAL USE OF GLASS FIBER HAS ALSO PROVED USEFUL.

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 2165515
RUBBER AND POLYTETRAFLUOROETHYLENE AS CONSTRUCTION MATERIALS IN BRIDGE BUILDING
THE USE OF PLASTICS IN BRIDGE BUILDING IS DISCUSSED, WITH PARTICULAR REFERENCE TO POLYTETRAFLUOROETHYLENE, WHICH HAS EXCELLENT CHEMICAL, MECHANICAL, THERMAL AND ELECTRICAL PROPERTIES. THE AUTHOR DESCRIBES TESTS ON THE MATERIAL TO ASCERTAIN DEFORMATION BEHAVIOUR AND SLIDING PROPERTIES. THE MAIN DISADVANTAGE OF ALL THE PLASTIC MATERIALS TESTED WAS THEIR LOW COEFFICIENT OF FRICTION.

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 2165684
FUME INCINERATOR AND CORROSION OF THE HYDRAULIC PUMP AND THE VORTEX STRUCTURE) ARE EXAMINED. PROTECTION OF THE OCEAN OUTFALL LINE IS ALSO DISCUSSED.

ACKNOWLEDGMENT: Highway Research Information Service /UK/

Graham, RE  Materials Protection  May 1968

Canovas, MF  Informes De La Construccion /Spain/  Jan. 1968

Greenberg, SA  Grover, L  Kreidler, CL  Am Soc Civil Engr Transactions  1955

Buchholz, H  Inzenyrske Stavby /Czech/  1967

Spaethe, G  Mahlo, G  Strasse, Berlin /Germany/  Dec. 1966

Von, MENG W  Schweigert, B  Beton-herstellung-verwendung /Germany/  1966

Zaschuk, IV  Vysaja Skola /Ussr/  1968

Am Soc Civil Engr Transactions  Feb. 1970
THE USE OF EPOXY RESINS IN CONSTRUCTION AND CIVIL ENGINEERING (IN FRENCH)

THE HIGH MECHANICAL STRENGTH OF EPOXY RESIN LED TO A REVIEW OF ITS MAIN USES WITH PARTICULAR REFERENCE TO THE GLUEING OF HARDENED CONCRETE TO HARDENED CONCRETE AS IN THE CASE OF BRIDGE SEGMENTS. IT FACILITATES THE RESUMPTION OF CONCRETING, HIGH STRENGTH SEALING, FILLING OF CRACKS AND POTHOLES, GLUEING OF ALL MATERIALS, AND WATERPROOFING OF ENGINEERING STRUCTURES (IN THIS CASE, COAL TAR PITCH IS ADDED TO EPOXY RESIN). /LCPC/RRL/

Winne, G
Revue Caoutchouc Et Plastiques /France/ Mat. 1968

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 216585
MATERIALS CONTROL IN HIGHWAY CONSTRUCTION


ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 216589
QUALITY CONTROL IN CONCRETE ROAD CONSTRUCTION

THE CONDITIONS NECESSARY TO ENSURE THE PRODUCTION OF HIGH-QUALITY CONCRETE ARE PRELIMINARY CONTROL OF INGREDIENTS AND CONTINUOUS CONTROL DURING MANUFACTURE BY RECORDING PRODUCTION PARAMETERS. RECENT TESTS ON CONSTRUCTION SITES SHOW THAT IT IS POSSIBLE TO RECORD THE TEMPERATURE OF CEMENT AND WATER, TO RECORD THE WEIGHT OF AGGREGATES, CEMENT AND WATER IN A BATCH, AND TO EVALUATE THE CONSISTENCY OF CONCRETE AND REGULARITY OF PRODUCTION BY RECORDING THE ENERGY CONSUMPTION OF THE MIXER. RESULTS SHOW THAT IF CARE IS TAKEN IN OPERATING AND MAINTAINING THE EQUIPMENT, IT IS POSSIBLE TO OBTAIN A HIGH DEGREE OF REGULARITY IN PRODUCTION TESTS CARRIED OUT ON SAMPLES SHOW A WIDE DISPERSION IN MEASUREMENTS ON FRESH CONCRETE. THIS DISPERSION DECREASES FOR RESULTS OF MECHANICAL TESTS ON HARDENED CONCRETE. /LCPC(A)/RRL/

Parry, C Bull Liaison Labs Reporters /France/ Dec. 1969

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 216764
EPOXY RESINS


Scales, GM American Concrete Institute 1968

2A 216883
A MODERN BUILDING MATERIAL FROM ASPHALT AND SOIL

A PROCESS IS DESCRIBED FOR THE MANUFACTURE OF A NEW BUILDING MATERIAL FROM ASPHALT AND SOIL, WHICH IS COMPETITIVE WITH CONVENTIONAL MASONRY PRODUCTS IN COMPRESSIVE, TENSILE, AND FLEXURAL STRENGTH, EXCELS IN WATER REPELLENCY AND FREEZE-THAW RESISTANCE, AND HAS LOW COST. THIS PRODUCT, KNOWN AS BMX, CAN BE MANUFACTURED WITHIN SUCH CLOSE TOLERANCES THAT IN SECTIONS, MORTARS CAN BE USED. THESE MORTARS, COMPOSED OF CEMENT, ORGANIC ADHESIVES, AND FILLERS, CAN BE APPLIED WITH PAINT ROLLERS, RESULTING IN SUBSTANTIALLY LOWER LABOR COSTS. THE HIGHER QUALITY PRODUCTS MADE FROM CAREFULLY SELECTED SOILS CAN BE USED BELOW GRADE WITHOUT WATER-PROOFING TREATMENT. THE PRODUCTS ARE COMPATIBLE WITH ALL TYPES OF WATER AND OIL-BASED PAINTS, AND BECAUSE OF LOW POROSITY ABSORB MUCH LESS PAINT THAN OTHER MASONRY PRODUCTS. DURABILITY TESTS, SOME OF WHICH HAVE BEEN IN PROGRESS FOR SEVEN YEARS, INDICATE A HIGH DEGREE OF STABILITY.

Rogers, DT Munday, JC I & Ee Product Res & Dev Sept. 1969
CONSTRUCTION MATERIALS

2A

 THAN THE AGGREGATE USED IN BITUMINOUS MIXTURES OR IN BASE COURSES, BUT THAT STATISTICAL ANALYSIS PROVIDED INFORMATION FOR EARLY DETECTION OF UNDESIRABLE GRADATION OR UNDESIRABLE QUALITY. THE USE OF STATISTICAL CONTROL CHARTS IS HIGHLY RECOMMENDED FOR CONTROL OF THE CHARACTERISTICS OF AGGREGATE BY SOME STATES.


2A 217018

PROPOSED ACI STANDARD: SPECIFICATIONS FOR CAST-IN-PLACE NONREINFORCED CONCRETE PIPE

THESE SPECIFICATIONS ARE A REFERENCE STANDARD WHICH THE ENGINEER OR ARCHITECT MAY MAKE APPLICABLE TO ANY CAST-IN-PLACE PIPE PROJECT BY CITING THEM IN THE PROJECT SPECIFICATIONS. INDIVIDUAL CHAPTERS OR SECTIONS SHOULD NOT BE COPIED INTO PROJECT SPECIFICATIONS SINCE THEIR MEANINGS WILL BE CHANGED BY TAKING THEM OUT OF CONTEXT. THE SPECIFICATIONS NEED TO BE SUPPLEMENTED BY DESIGNATING OR SPECIFYING INDIVIDUAL PROJECT REQUIREMENTS. A LIST IS PROVIDED INDICATING PLACES IN THESE SPECIFICATIONS AND ITEMS THAT WILL REQUIRE SPECIFIC TREATMENT BY THE SPECIFICATION WRITER. /AUTHOR/

Am Concrete Inst Journal & Proceedings Apr. 1969

2A 217019

RECOMMENDATIONS FOR CAST-IN-PLACE NONREINFORCED CONCRETE PIPE

A GENERAL VIEW IS GIVEN OF PRESENT KNOWLEDGE TOGETHER WITH RECOMMENDATIONS FOR DESIGN, CONSTRUCTION, AND TESTING PROCEDURES. CONSTRUCTION SPECIFICATIONS ARE CONTAINED IN "SPECIFICATIONS FOR CAST-IN-PLACE NONREINFORCED CONCRETE PIPE." /AUTHOR/

Am Concrete Inst Journal & Proceedings Apr. 1969

2A 217076

HAVE YOU CONSIDERED WOOD FOR PROCESS SERVICE?

BECAUSE OF NEW ENGINEERING SKILLS, NEW MANUFACTURING TECHNOLOGIES, AND NEW IMPREGNANTS, WOOD HAS BEEN REESTABLISHED AS AN IDEAL MATERIAL FOR MANY EXISTING CHEMICAL INDUSTRY SERVICES. THE DEPENDABILITIES OF STEEL, CONCRETE, AND WOOD USED AS CONSTRUCTION MATERIALS ARE COMPARED, AND IT IS DEMONSTRATED THAT TREATED WOOD HAS ADVANTAGES IN CORROSORIVE ENVIRONMENTS. /MPP/

Hoffman, CH Materials Protection Mar. 1971

2A 217092

GENERAL MATERIALS

LITTLE WORK HAS BEEN DONE ON THE DEVELOPMENT OF QUALITY ASSURANCE AND ACCEPTANCE PLANS FOR GENERAL HIGHWAY CONSTRUCTION MATERIALS, INCLUDING BITUMINOUS MATERIALS, HYDRAULIC CEMENTS, STRUCTURAL STEEL, PAINTS, PIPES, POSTS AND GUARDRAILS. A NEED EXISTS FOR SUITABLE ACCEPTANCE PLANS SUCH AS THE REDUCED SAMPLING PLAN OF ASTM AND AASHO.

Adam V Highway Research Board Special Reports 1971

2A 217143

PLASTICS—RECENT DEVELOPMENTS IN PLASTICS SCIENCE AND TECHNOLOGY ARE REVIEWED

THE ARTICLE IS AN ANNUAL REVIEW OF THE LITERATURE IN PLASTICS, CHIEFLY FROM THE YEAR 1969. ABOUT 500 REFERENCES ARE GIVEN. THE MAJOR SUBHEADINGS ARE AS FOLLOWS: EDUCATION IN POLYMER SCIENCE AND TECHNOLOGY, PLASTIC STRUCTURES, PLASTIC CONTAINERS AND VESSELS, POLYMER COMPOSITES, SHEET AND FILM, CELLULAR PLASTICS, PLASTIC PIPE, POLYMER COATINGS AND ADHESIVES, SYNTHETIC FIBERS, ELASTOMERS, POLYMERS VERSUS WEATHER, POLYMERS VERSUS FLAME, POLYMERS VERSUS HEAT, POLYMERS VERSUS CORROSIVES, CHARACTERIZATION AND TESTING OF POLYMERS, PROGRESS IN POLYMER SCIENCE (THERMOPLASTICS, POLYAMIDES, POLYOLEFINS, POLYSTYRENE, POLYVINYL HALIDES), AND ASPHALT—ELASTOMER BLENDS FOR HIGHWAYS.

Seymour, RB Industrial & Engineering Chemistry Sept. 1970

2A 217149

EXPERIMENTS USING INFRARED PHOTOGRAPHY FOR NON-DESTRUCTIVE TESTING

THE USE OF INFRARED PHOTOGRAPHIC TECHNIQUES FOR NON-DESTRUCTIVE TESTING DURING HIGHWAY CONSTRUCTION AS A SUPPLEMENT TO EXISTING METHODS IS ADVOCATED AND SUPPORTED BY EVIDENCE FROM LABORATORY TESTS WHOSE METHODOLOGY AND CONDUCT ARE DESCRIBED. THE PORTION OF THE IR SPECTRUM TO WHICH COLOR AND B/W FILMS ARE SENSITIVE LIES IN A NARROW BAND JUST OUTSIDE THE VISIBLE RANGE. WITHIN THIS BAND FOUR KINDS OF IR RADIATION CAN BE RECORDED: FROM THE OBJECT ITSELF, FROM AN OBJECT BENEATH OR WITHIN THE FIRST OBJECT (TRANSMITTED RADIATION), SURFACE REFLECTANCE, AND PHOSPHORESCENCE. TWO HYPOTHESES WERE TESTED: (1) FOR A GIVEN MATERIAL, THE AMOUNT OF IR RADIATION IS A FUNCTION OF THE DENSITY OF THE MATERIAL, AND (2) SIMILAR BUT UNLIKE MATERIAL WILL TRANSMIT DIFFERENT AMOUNTS OF IR RADIATION. ("MATERIAL") MEANS A HETEROGENEOUS MIXTURE OF SEVERAL CHEMICALLY DIFFERENT SUBSTANCES, SUCH AS PCC, ASPHALTIC CONCRETE, AND SOILS.) THE FIRST SET OF TESTS WAS MADE WITH SOIL SAMPLES TAKEN FROM NEW MEXICO SITES THAT WERE SUBSEQUENTLY PHOTOGRAPHED IN AERIAL OVERFLIGHTS. A SECOND SET OF SOILS TESTS EMPLOYED MODIFIED "PROCTOR" (T-180) MOLDS. ADDITIONAL SETS OF TESTS WERE RUN WITH ASPHALT AND CONCRETE. RESULTS AND CONCLUSIONS ARE PRESENTED. THE HYPOTHESES SEEM SUFICIENTLY DEMONSTRATED TO JUSTIFY CONTINUED RESEARCH, INCLUDING IMMEDIATE USE OF SUCH EQUIPMENT AS A BOOM TRUCK AND CAMERA ON A CURRENT HIGHWAY PROJECT.

Goodman, AF New Mexico University pp 40-49, 1970

2A 217159

ENGINEERING PROPERTIES OF MINE TAILLINGS

THE ENGINEERING PROPERTIES OF TAILINGS FROM NINE MINES ARE SUMMARIZED TO DEMONSTRATE THAT THESE ARE GOOD ENGINEERING MATERIALS. SUCH PROPERTIES AS GRADATION, SPECIFIC GRAVITY, MINERAL CONTENT, LABORATORY MAXIMUM AND MINIMUM DENSITY, IN-PLACE DENSITY AND MOISTURE, PERMEABILITY, TRIAXIAL SHEAR DATA, AND ONE-DIMENSIONAL COMPRESSION DATA ARE PRESENTED IN GRAPHS AND TABULAR FORM. PRESENTED IS AN EXAMPLE OF TAILINGS USAGE IN CONSTRUCTING A 4-MILE SECTION OF INTERSTATE 90 NEAR KELLOGG, IDAHO, PROVING THAT TAILINGS CAN BE USED TO CONSTRUCT A MODERN HIGH-CAPACITY FREEWAY. THE THEORETICAL DESIGN OF A SMALL EARTH DAM IS ALSO GIVEN AS AN EXAMPLE THAT TAILINGS COULD BE USED TO BUILD A DAM WITH ADEQUATE FACTORS OF SAFETY. IT IS STRONGLY FELT THAT THE MATERIAL PROPERTIES PRESENTED WILL PROMOTE INTEREST IN THE EMPLOYMENT OF MINE TAILINGS IN FUTURE CONSTRUCTION PROJECTS FOR BOTH STRUCTURAL AND ENVIRONMENTAL REASONS. /AUTHOR/


2A 217181

CRITICAL DEGREE OF SATURATION: A TOOL FOR ESTIMATING THE FROST RESISTANCE OF BUILDING MATERIALS

BY USING THE CONCEPT OF DEGREE OF SATURATION THE DEFECTIVE CORRELATION BETWEEN THE RESULTS OF LABO-
CONSTRUCTION MATERIALS

RATORY EXPERIMENTS AND THE BEHAVIOR OF THE TESTED MATERIAL IN PRACTICE AND THE DIFFICULTIES OF THE CHOICE BETWEEN DIFFERENT MATERIAL WITH REGARD TO FROST RESISTANCE CAN BE PREVENTED TO A GREAT EXTENT. IT IS ALSO SHOWN HOW THIS CONCEPT CAN BE USED IN DEALING WITH THE FROST RESISTANCE OF A LAYERED CONSTRUCTION. A LABORATORY TEST FOR DETERMINATION OF FROST RESISTANCE IS DESCRIBED. /AUTHOR/


2A 217204

WASTED SOLIDS (SOLID WASTE) AND PAVEMENT DESIGN FEASIBILITY STUDIES CONCERNING THE POSSIBLE USES OF WASTED SOLIDS FOR THE IMPROVEMENT OF HIGHWAY AND STREETS WERE CONDUCTED DUE TO THE GROWING SHORTAGE OF GOOD NATURAL AGGREGATES PLUS THE PROBLEMS OF DISPOSITION OF SOLID WASTES PARTICULARLY NON-Biodegradable products. Another consideration was that the original costs of these wasted products are considerably high. Of concern was the present flexible pavement design and mixtures which have only led to pavement cracking-a stress relieving interface was needed. The principle of selective dewetting was implemented to increase the strain capacity of mixtures. Aggregate coated with paper pulp in a cold mix might be used for superior performance. All types of paper solids could be used. Beer bottle pavements, rubberized pavements, scrap plastic pavement and dried horse manure (DHM) studies were performed in the laboratory to decrease cracking of the surface course due to thermal distress and base or foundation movements. Considering the various new methods for utilization of wasted solids, the stress relieving interface was developed using donated ground tires, emulsion, sand, etc., overlaying base material used in this way. Pavement analogs show that the stress relieving interface (SRI) will improve a pavement system over 400 percent. It is primarily applicable to maintenance operations. Greater improvement may be achieved by the use of a foundation crack arrestor implementing a rubber-sand interlocking layer which utilizes sidewalk sections from discarded tires arranged in a grid pattern between the base and subbase. Scrap plastic was also explored to improve adhesion and cohesion between binder and aggregate in asphaltic concrete. Scrap glass as an aggregate can reduce thermal distress by a factor of 2 except in warm climates and the use of ground tires added to the surface course of flexible pavement improves the mechanical aging index. A membrane using ground tires, can reduce reflection cracking due to base movements by over 400 percent.

Bamum, D Public Works, Vol. 102 No. 11, Nov. 1971, pp 56-60, 4 Fig, 4 Ref

2A 217213

PROTECTIVE COATINGS FOR STRUCTURAL SYSTEMS

A comprehensive review is presented of currently used materials and applications for structural coatings. Coatings for steel are in the main solvent-based, but it is predicted that a high percentage of coatings will be water-based within 5 years. An advantage of 100% solvents products, water-based, and powder coatings is that no solvent is liberated at application: it is estimated that solvent from paints liberated to the atmosphere accounts for 240,000 tons of pollution per year in England. The other topics and binder groups are: alkyds, polyurethanes, chlorinated rubber, epoxies, acrylics, unsaturated polyesters, and copolymers of butadiene, vinyls, elastomeric coatings, modification of resins, pigments, surface preparation, application of paint, emulsion paints, coatings for concrete etc., use of polyurethanes for mortars, high-build coatings, zinc rich primers, specialty-coating suppliers, and economics.

Lowrey, KW Civil Eng & Public Works Review, UK, Vol. 67 No. 795, Oct. 1972, pp 92-7, 12 Fig, 9 Tab, 2 Ref

ACKNOWLEDGMENT: Transport & Road Research Lab, UK/

2A 217366

STUDIES OF THE POSSIBLE USES OF A NEW PIECE OF APPARATUS FOR MEASURING THE MOISTURE CONTENT OF MINERAL, GRANULAR CONSTRUCTION MATERIALS EQUIPMENT FOR MEASURING MOISTURE CONTENT WAS TESTED IN THE LABORATORY AND IN SITU TO DETERMINE ITS POSSIBLE USES. THE APPARATUS IS BASED ON THE PRINCIPLE OF DETERMINING THE DIELECTRIC CONSTANTS AND HIGH-FREQUENCY DAMPING OF MOST GRANULAR MATERIALS IN THE SHORT WAVE RANGE.

Leers, KJ Roeger, K Tonindustrie Zeitung, Germany, Vol. 96 No. 4, 1972, pp 92-7, 12 Fig, 9 Tab, 2 Ref

2A 217394

COMPRESSION STRENGTH ASSESSMENT OF ROAD MATERIALS

THE ROLE OF COMPRESSION TESTING IN ASSESSING THE POTENTIAL THAT GRANULAR MATERIALS HAVE FOR SERVICE AT A GIVEN DEPTH BELOW THE SURFACE OF A SEALED, SO-CALLED FLEXIBLE, ROAD IS DISCUSSED. THIS APPROACH AFFORDS AN OPPORTUNITY TO INTEGRATE DESIGN AND CONSTRUCTION PROCEDURES WITH MATERIAL SELECTED DECISIONS SO THAT MORE EFFICIENT USE MAY BE MADE OF LOCALLY OCCURRING NATURAL MATERIALS. EXPERIENCE GATHERED BY THE MAIN ROADS DEPARTMENT OF WESTERN AUSTRALIA RELATING TO THE USE OF A TEXAS TRIAXIAL TEST PROCEDURE IS PRESENTED. PARTICULAR REFERENCE IS MADE TO THE UTILIZATION OF THIS TEST FOR ASSESSING THE POTENTIAL OF MATERIAL FOR USE IN THE BASE COURSE (PAVEMENT LAYER) OF SEALED, RURAL ROADS. THE EXTENT TO WHICH THE RESULTS FROM THIS COMPRESSION TESTING PROCEDURE MAY PRESENTLY INFLUENCE DESIGN DECISIONS AND CONSTRUCTION PRACTICES APPLICABLE TO BASE COURSE MATERIAL IS DETAILED.

Hamory, G Maines, DB Australian Road Research Board, Vol. 6 No. p15, 1972, pp 143-65

2A 217406

MATERIALS INFORMATION. TECHNICAL INFORMATION ON MATERIALS FOR BUILDING AND CONSTRUCTION-SOURCES AND PRESENTATION

THE COLLOQUIUM WAS IN TWO PARTS. THE FIRST WAS A FORUM SESSION ENTITLED "INFORMATION NEEDED," IN WHICH THE FOLLOWING PAPERS WERE PRESENTED: INFORMATION NEEDED BY MATERIALS PRODUCERS, C. E. HINGLEY; INFORMATION NEEDED BY BUILDERS MERCHANTS, E. M. TATLOW; INFORMATION NEEDED BY ARCHITECTS, H. V. LOBB; INFORMATION NEEDED BY GOVERNMENT, J. P. GRIFFITHS; INFORMATION NEEDED BY LOCAL AUTHORITIES, A. T. MORRIS; INFORMATION NEEDED BY CONSULTING ENGINEERS, R. A. SEXTON-JENKINS; INFORMATION NEEDED BY CONTRACTORS, L. J. MURDOCK; THE SECOND HALF OF THE COLLOQUIUM WAS ENTITLED "INFORMATION PROVIDED:" AND THE PAPERS PRESENTED WERE AS FOLLOWS: INFORMATION PROVIDED BY COLLEGES OF EDUCATION, F. GIBBONS; INFORMATION PROVIDED BY THE ROAD RESEARCH LABORATORY, P. J. MONGAR; INFORMATION PROVIDED BY THE BUILDING RESEARCH STATION; J. W. RICE; INFORMATION PROVIDED BY BUILDING CENTERS, G. GOULDEN; INFORMATION PROVIDED BY INFORMATION CONSULTANTS, E. CORKER. /TRRL/

Byram, D Public Works, Vol. 102 No. 11, Nov. 1971, pp 56-60, 4 Fig, 4 Ref
CONSTRUCTION MATERIALS

Hingley, CE; Tuttle, EM; Lobb, HV; Griffiths, JP

Proc Soc Chem Industry /UK/ Vol. 197 pp. 7 Fig, 7 Phot, 10 Ref

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

2A 217423

MOISTURE MEASUREMENTS IN PAVEMENT USING ELECTRICAL RESISTIVITY METHODS

An electrical resistivity soil moisture gauge has been investigated as a means for measuring moisture variations within pavements. A description of the gauge and associated instrumentation is presented together with an example of its use in examining the wetting of modelled road shoulders by water shed from the seal. Calibration curves of gauge response with moisture content suggest that the electrical resistivity techniques described are sufficiently reliable for monitoring this variable under controlled temperature and salinity environments. /Author/

Mannes, DB

Australian Road Research Vol. 4 No. 10, Dec. 1972, pp 69-78, 4 Fig, 3 Tab, 1 Phot, 12 Ref

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/ IRRD 205 716, 2C34305716

2A 217426

REACTIONS OF AGGREGATES INVOLVING SOLUBILITY, OXIDATION, SULFATES, OR SULFIDES

This report covers available information on reactions involving solubility or oxidation of aggregates while they are enclosed in concrete and reactions involving sulfates or sulfides from aggregates enclosed in concrete. Experience indicates that these phenomena may create local problems that usually take the form of unsightly conditions on concrete construction, such as staining or sporadic spalling and pop-out formation. Reliable methods for detecting deleteriously reactive forms of ferruginous sulfides in mineral aggregates would be a worthwhile addition to testing procedures in areas where these minerals have been found to be of significance in the performance of concrete. /Author/

Midlen, RC

Highway Research Record, Hwy Res Board 1963

2A 217431

A DURABILITY TEST FOR AGGREGATES

A laboratory quality control test has been developed to measure the mechanical durability of California aggregates in terms of a durability index. The degradation test was developed to measure the breakdown of aggregate that would occur during construction and under normal traffic. The equipment and procedures used are similar to those of the sand equivalent and cleanliness value tests. The test results are correlated with the behavior of the aggregates in the field. /Author/

Hingley, FN

Highway Research Record, Hwy Res Board 1964

2A 217434

SYNTHETIC AGGREGATES FOR HIGHWAY CONSTRUCTION

A study was made to identify existing and potential materials suitable for producing synthetic aggregates, to conceive new methods of producing such aggregates, and to evaluate the present and future prospects for their use in highway construction. A large number of existing and potential synthetic aggregates were identified. Several manufactured or by-product materials, such as lightweight aggregates and blast-furnace slag, currently are used as aggregates other by-Prod-
CONSTRUCTION MATERIALS

2A

THE CRUSHED MATERIAL ARE CONSIDERED. THE STUDY BEARS ON THE MAIN STANDARDIZED METHODS OF VARIOUS COUNTRIES, AND IN EACH CASE REFERENCES OF THE DOCUMENTS CONSULTED ARE GIVEN.

Dantinne, R Longueville, P
Memorés Du C.E.R.E.S., Liege /Belgium/ May 1965

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A

NEW SYNTHETIC AGGREGATES FOR ROAD CONSTRUCTION /IN RUSSIAN/.

The technique used in the laboratory and factory is described for producing a new synthetic aggregates (Keramidor) made from non-expanded fired Cambrid clay or sandy clayey silt. The chippings obtained are not susceptible to frost, are non-porous, resistant to wear, and have a high crushing strength and adhere well to bitumen. Bituminous mixes containing 35 percent chippings, 45 percent sand, 20 percent filler and 6 percent bitumen offer the characteristics of high quality asphaltic concrete, and are much quicker to prepare, and experimental section of flexible pavemnt was built in 1964 and its performance is studied. The costs of production are mentioned. /LCPC/RRL/

Bukhaev, V Autonobil Nye Dorogi /Ussr/ Apr. 1966

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A


Dunn, CS Roads & Road Construction, London /UK/ Mar. 1966

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A

IMPORTANCE OF PETROGRAPHIC ANALYSIS AND SPECIAL TESTS NOT USUALLY REQUIRED IN JUDGING QUALITY OF CONCRETE SAND

The difficulties encountered in the concrete constructions of a large and important hydroelectric plant are described. The sand and gravel aggregates from an approved but previously undevel-
OPED DEPOSIT, WHEN PROPERLY PROCESSED, MET ASTM SPECIFICATION REQUIREMENTS. INVESTIGATIONS DISCLOSED THAT THE HIGH WATER REQUIREMENT AND VERY RAPID EARLY STIFFENING CHARACTERISTICS OF IOB CONCRETES WERE CAUSED BY THE SAND. DURING HANDLING AND TRANSPORTING THE SAND AND PLACING AND MIXING THE CONCRETE, THE SAND SUFRED SEVERE DEGRADA-
TION. THE VERY HIGH PERCENTAGE OF FINES THUS CRE-
ATED CONTAINED AN UNUSUALLY LARGE PROPORTION OF MONTMORILLONI DI SWELLING CLAY MINERALS. IT AP-
PEARS THAT SIMILAR DIFFICULTIES ON OTHER JOBS ARE NOT UNCOMMON. A SPECIAL ATTENTION TEST EMPLOYED IN A LATER VERY EXTENSIVE LABORATORY INVESTIGATION IS DESCRIBED. THE PARTICLES ON A SIMILAR ORE TOWARDED SUG-
RECOMMENDED, IN ADDITION TO THE STANDARD ASTM REQUIREMENTS. THE IMPORTANCE OF A THOROUGH PETRO-
GRAPHIC EXAMINATION OF SAND FROM A POTENTIAL SOURCE OF CONCRETE AGGREGATES, INCLUDING THE NA-
TURE OF THE FINES CREATED BY THE SPECIAL ATTENTION TEST, IS STRONGLY AFFIRMED. /AUTHOR/

Davis, RE; Milenk, RC Polivka, M Journal Materials Sept. 1967

2A 217559
AN IMPROVED PARTICLE INDEX TEST FOR THE EVALUATION OF GEOMETRIC CHARACTERISTICS OF
AGGREGATES
PARTICLE INDEX TESTS ON FINE AGGREGATES HAVE INDIC-
ATED THAT THE RESULTS OF THESE TESTS REFLECT THE DISCERNIBLE GEOMETRIC CHARACTERISTICS OF THESE
MATERIALS, AND THAT THE VALUES FOR THE NATURAL SANDS AND THE STONE SANDS ARE IN GOOD AGREEMENT, RESPEC-
TIVELY, WITH THE GENERAL RANGES OF PARTICLE INDEX VALUES FOR THE GRAVEL AND CRUSHED STONE MATERIALS.
THE RESULTS OF PARTICLE INDEX TESTS ON AGGREGATE MIXTURES INVOLVING PARTICLES OF DIFFERENT GEOMET-
RIC FEATURES HAVE SHOWN THAT THE INDEX VALUE OF A MIXTURE VARIES MORE OR LESS LINEARLY WITH THE PER-
CENTAGES OF THE TYPES OF PARTICLES IN THE MIXTURE, INDICATING THAT THE PARTICLE INDEX REFLECTS THE
AVERAGE GEOMETRIC CHARACTERISTICS OF THE INDIVIDU-
AL PARTICLES COMPRISING THE SAMPLE. THE RESULTS OF THE ANGULARITY TEST, SHAPE FACTOR TEST, AND TIME
INDEX TEST HAVE INDICATED THAT THEY ARE ALL RELAT-
ED TO THE PARTICLE INDEX VALUES OF THE AGGREG-
ATE SAMPLES TESTED. HOWEVER, THE FACT THAT THE
PARTICLE INDEX TEST MAY BE APPLIED TO A WIDER RANGE OF AGGREGATE MATERIALS THAN THE OTHER TESTS INDIC-
ATES ITS VERSATILITY AND SUPERIORITY AS A USEFUL TOOL FOR IDENTIFYING THE GEOMETRIC CHARACTERISTICS OF
MINERAL AGGREGATES FOR PAVEMENT PURPOSES. /AU-
THOR/

Huang, EY
Michigan Technological University 54 pp. July 1965

2A 217560
AN EXAMPLE OF THE USE OF AN INDUSTRIAL
BY-PRODUCT: THE APPLICATION TO ROAD-MAKING
TECHNIQUES OF THE REJECTS FROM THE ENRICH-
MENT OF CALCAEROUS IRON ORE AT METZANGE IN LORRAINE.
LORRANE IRON ORE HAS AN IRON CONTENT OF AROUND 30
PER CENT. THE OPERATION OF ENRICHING BY MAGNETIC
SEPARATION GIVES REJECTS OF GRANULARITY 0/22 MM.
WHOSE WATER CONTENT IS NEGLECTIBLE. WORK HAS BEEN
CARRIED OUT IN DIFFERENT LABORATORIES WITH A VIEW
TO MAKING USE OF THESE REJECTS, AND THIS WORK HAS
MADE IT POSSIBLE TO DETERMINE THE AVERAGE CHARAC-
TERISTICS OF THIS MATERIAL. ITS USE FOR ROADMAKING
PURPOSES SEEMS TO BE ESPECIALLY INDICATED, IN PARTICU-
LAR FOR MABE FROM METZANGE IRON ORE. FOR THIS
RECOMMENDED CATALYST: LIME. A SMALL EXPERIMENTAL
WORKING SITE SET UP IN 1965 IN A STEEL WORKS AND IS
THE SUBJECT OF A DETAILED REPORT. MEASUREMENTS OF
DEFLECTIONS, AND CORE SAMPLINGS, WERE FAVORABLE.
/AUTHOR/

Ponteville P Bull Liaison Labs Routiers/ France/ July 1967

2A 217576
CRUSHED STONE: PRODUCTION AND GRADATION
IT IS PREDICTED THAT A MILLION TONS PER DAY OF CRUSHED LIMESTONE AND DOLOMITE FOR ROADSTONE AND
CONCRETE WILL BE REQUIRED TO SATISFY THE PROJECTED
DEMAND FOR EACH OF THE NEXT SEVERAL YEARS. THE
EQUIPMENT REQUIRED TO HANDLE THIS TERRIFIC AMOUNT
OF CRUSHED MATERIAL IS DISCUSSED. THE INVESTMENTS IN
PRODUCTION EQUIPMENT AND PLANT SITES NECESSARY TO
MEET THE CURRENT DEMAND FOR CRUSHED STONE CAN BE
ESTIMATED TO BE IN THE BILLIONS OF DOLLARS. IT IS
POSSIBLE BY VARYING THE SIEVE SIZES AND THE QUANTITIES OF MATERIALS PASSING A GIVEN SIEVE TO OBTAIN EITHER AN AGGREGATE CONTAINING ESSENTIALLY A SINGLE SIZE OF ONE SIZE OR A BALANCED COMBINATION OF DECREAS-
ING SIZES WHICH IS COMMONLY TERMED DENSE GRADED. THE MOST COMMON TYPE OF CRUSHED STONE PRODUCED
FOR CONCRETE OR HIGHWAY WORK. THE SIMPLIFIED PRACTICE RECOMMENDATION (SPR) WAS INITIATED IN 1948 BY THE BUREAU OF PUBLIC ROADS (1) TO DEVELOP A MINIMUM
NUMBER OF STANDARD AGGREGATE GRADATIONS THAT COULD UNIFORMLY DESCRIBE THE MA-
PORTY OF CRUSHED AGGREGATES USED IN CONCRETE AND
HIGHWAY CONSTRUCTION. PLOTS ARE PRESENTED OF GRA-
DEFINITION CURVES FOR DENSE GRADED BASE AGGREGATES
FOR SEVERAL STATES A UNIFORM METHOD OF DESCRIBING
AGGREGATES HAS NOT BEEN ADOPTED AND THIS IS THE
STUMBLING BLOCK IN THE PATH TO UNIFORMITY FOR
AGGREGATE GRADATIONS.

Copas, TL
National Limestone Institute 1967

2A 217596
ENGINEERING AND RELATED PROPERTIES OF PULVERISED
FUEL ASH
LABORATORY INVESTIGATIONS ARE DESCRIBED ON THE
SELF-HARDENING CHARACTERISTICS OF ASHES FROM Dio-
OF SOURCES AND THE VARIATION OF THESE CHARAC-
TERISTICS IN ASHES TAKEN AT DIFFERENT TIMES. SELF-HARDENING HAS BEEN RELATED TO
FREE LIME CONTENT. THE INFLUENCE OF DEGREE OF COM-
PACTION AND COMPACTING MOISTURE CONTENT ON SELF-
HARDENING IS ALSO CONSIDERED. LABORATORY STUDIES ARE COMPARED WITH FIELD EXPERIENCE. LABORATORY
INVESTIGATIONS OF THE STABILIZATION OF PULVERIZED
FUEL (P.F.) ASHES WITH CEMENT AND LIME ARE DESCRIBED
ALONG WITH A STUDY OF THE FROST SUSCEPTIBILITY CHAR-
ACTERS OF UNSTABILIZED AND STABILIZED ASHES USING
THE ROAD RESEARCH LABORATORY FROST TEST. A DE-
SCRIPTION IS THEN GIVEN OF THE SUCCESSFUL USE OF
FINE AND COARSE P.F. ASH IN ROAD CONSTRUCTION WORK IN WARWICKSHIRE. /AUTHOR/

Sutherland, HB Finlay, TW Cram, IA Inst Hwy Engineers Journal, London /UK/ June 1968
2A 217604
THE RELATION BETWEEN LOS ANGELES ABRASION TEST RESULTS AND THE SERVICE RECORDS OF COARSE AGGREGATES
Woolf, DO Highway Research Board Proceedings 1957

2A 217623
QUALITY MATERIALS FOR HIGHWAY CONSTRUCTION THE REASONS FOR HAVING SPECIFICATIONS ON AGGREGATES FOR HIGHWAY CONSTRUCTION ARE DISCUSSED AND IMPROVEMENTS FOR PRESENT SPECIFICATIONS ARE SUGGESTED.
Mather, B Purdue University Road School Proc Dec. 1958
ACKNOWLEDGMENT: Highway Research Board Bibliography

2A 217632
DISTRIBUTION, PRODUCTION, AND ENGINEERING CHARACTERISTICS OF AGGREGATES THIS SECTION OF THE HANDBOOK DEALS WITH SUCH SUBJECTS ON AGGREGATES AS: TYPES AND DEFINITIONS OF RELATED TERMS, ORIGIN, DISTRIBUTION IN NORTH AMERICA, PROPERTIES AND GENERAL REQUIREMENTS IN HIGHWAY CONSTRUCTION, PRODUCTION SPECIFICATIONS, AND METHOD OF TESTING.
Mc, LAUGHLIN JF Woods, KB Mielentz, RC Rockwood, NC Highway Engineering Handbook 1960
ACKNOWLEDGMENT: Highway Research Board, Annotated Bibliography

2A 217638
ASTM STANDARDS ON MINERAL AGGREGATES AND CONCRETE ALL STANDARDS PREPARED BY COMMITTEE C-9 ARE INCLUDED FOR CONCRETE AND CONCRETE AGGREGATES, BUT ONLY THOSE FOR SELECTED NON-BITUMINOUS HIGHWAY MATERIALS, OR THOSE INVOLVING AGGREGATE GRADINGS OR TESTS, DEVELOPED BY COMMITTEE D-4. PERTINENT SPECIFICATIONS OF CEMENT ARE INCLUDED WHICH ARE UNDER THE JURISDICTION OF COMMITTEE C-1 ON CEMENT.
American Society Testing & Materials Dec. 1962
ACKNOWLEDGMENT: Highway Research Board, Annotated Bibliography

2A 217639
A CORRELATION OF PUBLISHED DATA ON LIME-POZZOLAN-AGGREGATE MIXTURES FOR HIGHWAY BASE COURSE CONSTRUCTION ALL AVAILABLE INFORMATION PERTAINING TO LIME-FLY-ASH-AGGREGATE MIXTURES IS CORRELATED.
Hollon, GW Marks, BA Illinois Univ Eng Exp Sta Circulars 1962
ACKNOWLEDGMENT: Highway Research Board, Annotated Bibliography

2A 217640
A TEST FOR EVALUATING THE GEOMETRIC CHARACTERISTICS OF COARSE AGGREGATE PARTICLES A TEST METHOD IS DESCRIBED BY WHICH THE GEOMETRIC CHARACTERISTICS, EMBRACING SHAPE, ANGULARITY, AND SURFACE TEXTURE OF COARSE AGGREGATES MAY BE QUANTITATIVELY EVALUATED. THE TEST HAS BEEN DEVELOPED AS AN OUTGROWTH OF AN EXTENSIVE INVESTIGATION IN WHICH AN ATTEMPT WAS MADE TO DEVISE A SIMPLE PROCEDURE FOR THE EVALUATION OF COARSE AGGREGATES FOR USE IN SOIL-AGGREGATE ROAD CONSTRUCTION. THE RESULTING TEST VALUE IS EXPRESSED AS THE PARTICLE INDEX OF THE AGGREGATE.
Hoang, EY American Soc Testing & Materials Proc 1962
ACKNOWLEDGMENT: Highway Research Board, Annotated Bibliography

2A 217670
MECHANICALLY STABILIZED ROAD COURSES-FROST BLANKET COURSES-ROAD BASES IN GERMAN/ CONTENTS: IMPORTANCE OF MINERAL CONCRETE IN ROAD CONSTRUCTION, A. BOHRINGER. TECHNOLOGY AND TESTING OF MINERAL CONCRETE, K.F. HENKE. MANUFACTURE AND USE OF MINERAL CONCRETE, A. SCHAFER. MECHANICALLY STABILIZED ROADBASE IN ROAD CONSTRUCTION IN VIENNA, R. WRANA. THE PLACEMENT AND COMPACTION OF MINERAL MIXTURES IN ROAD CONSTRUCTION, E. SCHUTTE.
Schriften-reihe Naturstein Str /Ger/ 1967

2A 217679
IN DEFENCE OF AGGREGATES IN FRENCH/ THE IMPORTANCE IS EMPHASIZED OF AGGREGATE QUALITY IN ROAD CONSTRUCTION. THE COST OF IMPROVING AGGREGATES WOULD AFFECT ONLY VERY SLIGHTLY THE COST OF THE COMPLETED WORK AND WOULD INCREASE THE DURABILITY OF THE ROAD. THE FOLLOWING IMPROVEMENTS ARE RECOMMENDED: (1) HOMOGENEITY, RATIONALIZATION AND STANDARDIZATION OF AGGREGATE PRODUCTION TOGETHER WITH THOROUGH GRADING, (2) POSSIBILITY OF SELECTING CRUSHED SAND WITH HIGH CONTROLLED FINES CONTENT OR WASHED SAND WITH FILLER ADDED WHEN NECESSARY, (3) CONTROL AND CORRECTION OF MOISTURE CONTENT SPECIALLY IN SAND AND SOIL MATERIALS TREATED WITH WATER-REPELLENT PRODUCTS AND PROTECTION OF SAND DURING STORAGE WITH PLASTIC FILMS ARE RECOMMENDED, AND (4) SYSTEMATIC SUPPLY OF AGGREGATES, ADEQUATELY LAID OUT STORAGE SPACE, AND EFFICIENT QUALITY CONTROL. /LCPC/RRL/
Durrieu, J Bull Liaison Labs Routiers /France/ Aug. 1968
ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 217683
CONSTRUCTION MATERIALS


ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 217684
A NEW CONSTRUCTION MATERIAL: SLAGGERAM A STRUCTURAL CLAY PRODUCT WITH A SLAG BASE. VISIT TO THE BISRA LABORATORIES /IN FRENCH/. RESEARCH CARRIED OUT IN GREAT BRITAIN INTO THE USE OF BLAST-FURNACE SLAG IN THE MANUFACTURE OF VIBROCRYSTALLINE MATERIALS UTILIZED IN THE CONSTRUCTION INDUSTRY IS REVIEWED. THE SLAGGERAM, FOR WHICH A PATENT HAS BEEN APPLIED IN FRANCE, IS OBTAINED BY FUSION AT 1500 DEGREES C AND THEN THERMAL TREATMENT OF A MIXTURE COMPOSED OF ABOUT 100 KG SLAG, AND 30 KG SODAAsh TO WHICH 10 KG OXIDES OF CHLORINE, SODIUM, AND CAN ONLY BE USED IN ROAD CONSTRUCTION. THIS TYPE OF SAND IS EITHER FLAT OR ANGULAR IN SHAPE. SHOWING THE POSSIBLE USE OF CRUSHED STONE SAND IN ROAD CONSTRUCTION /IN FRENCH/.

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 217685

Lattiers & Tarraucadám, Paris /Fr/ 1968

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 217687

Myshkovskaya, SA Masatova, MP Trudy Soyuzdomii /USSR/ 1967

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 217684
AN INVESTIGATION INTO THE METHODS OF SELECTING SHALES FOR PAVEMENT CONSTRUCTION THE EXPERIMENTAL WORK COMPLETED IS SUMMARIZED IN A PROJECT INVESTIGATING THE BEHAVIOR OF 'LOW GRADE AGGREGATES', I.E. PRINCIPALLY SHALES, ON BEHALF OF THE DEPARTMENT OF MAIN ROADS IN NEW SOUTH WALES SAMPLES WERE TAKEN FROM 50 SHALE DEPOSITS AS WELL AS FROM SECTIONS OF PAVEMENT IN WHICH THE MATERIALS WERE IN USE. THE SHALES WERE SUBJECTED TO DETAILED EXAMINATIONS, WHEREIN CORRELATIONS WERE SOUGHT BETWEEN THE MINERALOGICAL COMPOSITIONS, RESISTANCES TO CHEMICAL AND PHYSICAL WEATHERING AND MECHANICAL BREAKDOWN, AND PERFORMANCES OF THE PAVEMENTS. THE RESULTS WERE USED TO DEVELOP A LABORATORY TESTING PROCEDURE FOR DISTINGUISHING SOUND VARIETIES OF SHALE. STABILIZATION WITH CEMENT WAS SUGGESTED FOR CORRECTING HIGH PLASTICITY RESULTING FROM THE INCORPORATION IN THE PAVEMENTS OF SOIL AND WEATHERING MATERIALS FROM THE QUARRIES. /AUTHOR/RRL/

Croft, JB Australian Road Research Board Proc. 1966

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 217702
SUITABILITY AND QUALITY TESTS FOR ROAD CONSTRUCTION AGGREGATES. PART 1-PROBLEMS AND REQUIREMENTS; PART 2-SAMPLING; PART 3-THE QUALITY CONTROL SYSTEM. A DISTINCTION IS MADE BETWEEN SUITABILITY TESTS, CARRIED OUT ON MATERIALS BEFORE APPLICATION, AND QUALITY TESTS TO DETERMINE PROPERTIES DURING AND AFTER APPLICATION. ALL THESE TESTS ARE BASED ON STANDARDS, GUIDES, RECOMMENDATIONS AND SPECIFICATIONS. AGGREGATES ARE TESTED FOR GRADING, PARTICLE SHAPE, PURITY AND STRENGTH. DETAILS ARE GIVEN OF PERTINENT QUALITY TESTING METHODS AND THESE ARE ILLUSTRATED BY EXAMPLES. /FG/RRL/

Schutte E Strassenbautechnik, Cologne /Ger/ 1968

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 217702
STRENGTH REQUIREMENTS OF AGGREGATES FOR ROAD CONSTRUCTION /IN GERMAN/. A PROPOSAL FOR THE STRENGTH REQUIREMENTS OF AGGREGATES IS PREPARED. IMPACT STRENGTH TESTS, TESTS OF RESISTANCE TO DYNAMIC STRESS IN THE TEST DRUM, AND RESISTANCE TO PRESSURE WERE RECOMMENDED AS TEST METHODS TO SUPPLEMENT THOSE ALREADY IN EXISTENCE. THESE TESTS WERE TO BE CARRIED OUT ON BOTH DENSITY GRADED MIXTURES AND THOSE HAVING A HIGH CONTENT OF voids. DETAILED PROPOSALS ARE MADE REGARDING THE REQUIREMENTS OF AGGREGATES FOR ROAD CONSTRUCTION DEPENDING ON CLASS OF TRAFFIC LOADING, THIS ENABLING AVAILABLE MATERIAL TO BE MORE EXERTLY EVALUATED THAN HITHERTO. /FG/RRL/
CONSTRUCTION MATERIALS

Kunath, H. Natursteinindustrie, Offenbach /Ger/ 1969

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 217715
BLAST FURNACE SLAG AGGREGATES FOR CONCRETE /IN FRENCH/

THIS BIBLIOGRAPHY DEALS WITH THE USE OF BLAST-FURNACE SLAG AGGREGATES FOR CONCRETE, USED ON THEIR OWN OR MIXED. APPLICATIONS TO THE BUILDING INDUSTRY AND ROAD CONSTRUCTION ARE LISTED. /LCPC/RRL/

2A 217778
AGGREGATES ON TIME, ALL THE TIME

A TECHNIQUE IS DESCRIBED IN WHICH ONE LARGE PORTABLE STONE PLANT IN WEST TEXAS, LAST YEAR CRUSHED A LARGE TONNAGE OF ROAD AGGREGATES, MAKING SIX MOVES, AND EVERY TON ON SCHEDULE. THE PLANT IS DESIGNED WITH A COMBINATION OF UNITS TO PROVIDE HIGH HOURLY TONNAGES AND FLEXIBILITY TO BEAT VARYING ROCK CONDITIONS WHILE DELIVERING ONE OR MORE GRADES OF TEXAS STATE HIGHWAY SPECIFICATION MATERIAL. THE CRUSHING PLANT ASSEMBLY IS PIECED TOGETHER TO MEET VARYING SPECIFICATIONS. USING A COMBINATION OF UNITS AVAILABLE TO GIVE THE CAPABILITY TO COPE WITH ALL TYPES OF CALICHE AND ANY OTHER ROCK TYPE. AT ALL LOCATIONS, THE 1968 PRODUCTION WAS KEPT CLOSE TO THE PLANT’S LIMIT. 5 DAYS A WEEK 10 HOURS DAILY, THE SIXTH DAY IS NORMALLY DEVOTED TO PLANT MAINTENANCE, BUT WAS AVAILABLE IN PART FOR CATCH-UP PRODUCTION IN THE EVENT OF BAD WEATHER OR BREAKDOWN. DIAGRAMMATIC SKETCHES ARE PRESENTED OF PLANT SET-UP. DAILY PRODUCTION WAS SCHEDULED TO BE 5 THOUSAND TONS OF 2-INCH MINUS FLEXIBLE BASE MATERIAL.

Swinzeow, GK Creel Technical Reports, Army Dept /US/ 1965

2A 217767
FLY ASH UTILIZATION—SYMPOSIUM


2A 217708
SYNTHETIC AGGREGATES FOR ASPHALT CONCRETE MIXES

THE FINDINGS REPORTED HEREIN FURNISH THE HIGHWAY CONSTRUCTION INDUSTRY WITH BASIC DESIGN CRITERIA FOR THE INCLUSION OF SYNTHETIC AGGREGATES IN ASPHALTIC CONCRETE MIXES AS WELL AS LABORATORY AND FIELD TESTING DATA SUPPORTING FAVORABLE PERFORMANCE OF THIS NEW AGGREGATE USED AS A SUBSTITUTE FOR NATURAL AGGREGATES. THIS REPORT ALSO POINTS UP A NUMBER OF CONCERNS WHICH ARE IMPORTANT TO CONSIDER.” THE AUTHOR OF THIS REPORT, ROBERT F. STEWART, STATED IN HIS CONCLUSION: “THE POSSIBILITY OF LIGHTWEIGHT SYNTHETIC AGGREGATES, MAY BE ENCOURAGING AN EXTENSIVE FIELD TESTING PROGRAM.” /AUTHOR/

Hargrett, ER Gallaway, BM Scott, WW Texas Transportation Institute Oct. 1969

MARY, HENRY W. G. DEDMAN MEASUREMENT OF CARBON IN FLY ASH, ROBERT F. STEWART AND WILLIAM F. FARRIOR, JR. ASTM SPECIFICATIONS ON FLY ASH FOR USE IN CONCRETE, RICHARD C. MUELENZ REACTIONS ON HYDROLYzed I AMINE WITH PULVERIZED COAL FLY ASH, L. JOHN MINNICK FLY ASH AND THE ELECTRIC UTILITY INDUSTRY, JOHN A. TILLINGHAST THE PUBLIC CONCERN FOR ENVIRONMENTAL IMPROVEMENT, KENNETH HOLUM FLY ASH IN THE FUTURE, JOSEPH PURSLOVE, JR.

Faber, JR Capp, JP Spender, JD Interior Department /US/ Mar. 1967

2A 217739
SYMPHONY ON THE SELECTION AND CONSTRUCTION OF BASE MATERIALS IN ROADS


Australian Road Research Board Bulletin Oct. 1969

2A 217740
A RECOMMENDED SYNTHETIC COARSE AGGREGATE CLASSIFICATION SYSTEM (REVISED AUGUST, 1969)

RESEARCH WAS CONDUCTED ON SYNTHETIC AGGREGATES FOR HIGHWAY USE. A REVISION IS PRESENTED OF THE RECOMMENDED SYNTHETIC AGGREGATE CLASSIFICATION SYSTEM FOR HIGHWAY CONSTRUCTION. THE RESULTS OF THE RESEARCH STUDIES THIS CLASSIFICATION SYSTEM IS NOT INTENDED TO REPLACE OR SUPPLANT EXISTING REQUIREMENTS FOR SYNTHETIC AGGREGATES IN HIGHWAY CONSTRUCTION, BUT IS OFFERED AS A SUPPLEMENT TO EXISTING AGGREGATE REQUIREMENTS. THE DRY LOOSE UNIT WEIGHT IS USED AS A QUALITY ACCEPTANCE CRITERIA. IT IS RECOMMENDED THAT THE DRY LOOSE UNIT WEIGHT BE DETERMINED IN ACCORDANCE WITH TEX-404-A. EXCEPT THAT THE AGGREGATES SHALL BE TESTED IN AN OVEN-DRY CONDITION. THE SAMPLES SHALL CONSIST OF THE ONE-HALF TO NO. 4 FRACTION AND SHALL HAVE 30-70 PERCENT BY WEIGHT RETAINED ON THE 3/8 INCH SIEVE. EXAMINATION OF THE TEXAS HIGHWAY DEPARTMENT AGGREGATE GRADATION SPECIFICATIONS FOR PORTLAND CEMENT CONCRETE, SEAL COATS AND HOT MIX ASPHALT PAVEMENTS REVEALS THAT A MAJOR PORTION OF THE AGGREGATE SKELETON WILL BE INCLUDED WITHIN THIS SIZE RANGE. COARSE SYNTHETIC AGGREGATE IS DIVIDED INTO TWO CLASSES AND EACH CLASS IS SUBDIVIDED INTO THREE GROUPS OF DESCENDING PHYSICAL REQUIREMENTS. THE MAXIMUM UNIT WEIGHT VALUES USED FOR GROUP I (35 PCF) WERE TAKEN FROM ASTM DESIGNATION C330-64T. IN ORDER TO DELINEATE GROUP 2 FROM GROUP 1, THE MINIMUM UNIT WEIGHTS FOR GROUP 2 WERE SET AT 55 PCF. THE USE OF THE 35 PCF MINIMAL WEIGHT FOR GROUP 1 IS TO ENSURE THAT ONLY STRUCTURAL QUALITY COARSE AGGREGATES WILL BE USED. A TABLE IS PRESENTED SHOWING THE PERMISSIBLE COARSE AGGREGATE GROUP DEFINED FOR EACH HIGHWAY FUNCTION, FROM SURFACE TREATMENT TO BASE MATERIALS.

Ledbetter, W.B. Galaway, B.M. Moore, W.M. Buth, E Texas Transportation Institute Aug. 1969

THE PROBLEM OR POINT AND CONDITIONS OF ACCEPTANCE OF CONSTRUCTION AGGREGATES

THE PROBLEM OF THE ACCEPTANCE OF CONSTRUCTION AGGREGATES IS REVIEWED. PRODUCERS TAKE GREAT CARE TO MAINTAIN SEGREGATION OF AGGREGATES AT THEIR PLANT. ASSUMING THAT THE CONTRACTOR IS HANDLING THE TRANSPORTATION, THE QUARRY PRODUCERS' RESPONSIBILITY SHOULD END ONCE THE AGGREGATE IS PROPERLY LOADED FOR SHIPMENT FROM APPROVED PILES AND THE INSPECTION TICKET ISSUED AT THE QUARRY. CONTRACTORS MUST TAKE CARE TO AVOID SEGREGATION, DEGRADATION, AND CONTAMINATION AT THEIR PLANTS. CHANGES IN GRADATION CAN ALSO OCCUR WHEN AGGREGATES ARE ROLLED IN TO GRADE. DESPITE THE HIGH QUALITY OF AGGREGATE AS SHOWN BY THE LOS ANGELES ABRASION AND SOUNDNESS TEST MADE ON SAMPLES TAKEN AT THE SOURCE OF PRODUCTION, RESULTS OBTAINED ON SAMPLES FROM A STOCKPILE IN A COMMERCIAL PLANT YARD INDICATED AN AVERAGE OF OVER 9% PASSING THE SIEVE. RATHER THAN LESS THAN 3% AS SPECIFIED. SPECIFICATION REQUIREMENTS RELATIVE TO MATERIALS ARE GENERALLY TO BE CONSIDERED AS APPLYING TO THE MATERIALS IMMEDIATELY BEFORE THEY ARE MIXED WITH OTHER MATERIALS OR SO PROCESSED THAT THEIR CHARACTERISTICS ARE CHANGED. THE AASHO GUIDE SPECIFICATIONS FOR HIGHWAY CONSTRUCTION PROVIDES FOR THE ACCEPTANCE OF MATERIALS ON THE BASIS OF SAMPLES TAKEN AND TESTED DURING THE PRODUCTION, DELIVERY, AND IMMEDIATELY PRIOR TO INCORPORATION AND THE WORK. IT ALSO PROVIDES FOR ACCEPTANCE OF MATERIALS ON THE BASIS OF REASONABLY CLOSE UNIFORMITY.

Limestone, Nat Limestone Institute 1968

2A 217842

INVESTIGATION OF STRUCTURAL GRADE EXPANDED SUCARNOOCHEE (PORTER'S CREEK) CLAY AS HIGHWAY CONSTRUCTION AGGREGATE


Karth, J.B. Stephenson, H.K. Alabama University Mar. 1968

2A 217845

RESEARCH NEEDS RELATING TO PERFORMANCE OF AGGREGATES IN HIGHWAY CONSTRUCTION

WITH THE USE OF CONVENTIONAL DESIGN PROCEDURES, AGGREGATES COMprise MORE THAN 90 PERCENT OF THE MATERIAL REQUIRED FOR THE CONSTRUCTION AND MAINTENANCE OF HIGHWAY PAVEMENTS. IN ORDER TO SUMMARIZE THE MOST IMPORTANT RESEARCH PROBLEMS, THE TOP TWO PROJECTS IN EACH OF THE STUDY AREAS ARE AS FOLLOWS: (1) UNDER PORTLAND CEMENT CONCRETE, THE ROLE OF AGGREGATES PARTICLE CHARACTERISTICS AND GRADATIONS ON PROPERTIES OF FRESH CONCRETE AND PERFORMANCE OF HARDENED CONCRETE ARE STUDIED, (2) UNDER BITUMINOUS MIXTURES AND IDENTIFICATION OF THE SIGNIFICANT AGGREGATE SURFACE PROPERTIES THAT INFLUENCE COATING AND ADHESION ARE STUDIED AS WELL AS THE SOUNDNESS OF AGGREGATE PARTICLES IN BITUMINOUS MIXTURES, (3) UNDER BASE COURSE AND SHOULDER MATERIALS, THE RELATIONSHIP OF AGGREGATE AND BASE COURSE PERFORMANCE UNDER VARYING TRAFFIC LOADS IS STUDIED AS WELL AS THE DETERMINATION OF THE CAUSES OF CHANGE IN GRADATION FOR AGGREGATES USED IN HIGHWAY BASE COURSE CONSTRUCTION. AND (4) AGGREGATE PROPERTIES ARE RELATED TO SKID RESISTANCE OF PAVEMENTS AND DETERMINATION IS MADE OF THE SURFACE CHARACTERISTICS OF AGGREGATES USED IN HIGHWAY CONSTRUCTION.


2A 217849

QUALITY ASSURANCE IN HIGHWAY CONSTRUCTION

QUALITY ASSURANCE IS RELATED TO THE QUESTIONS WHAT TO DO, HOW TO ORDER IT, HOW TO ASSURE GETTING WHAT WAS ORDERED. SPECIFICATIONS WRITTEN TO ANSWER THE SECOND QUESTION HAVE HERETOFORE NOT PERMITTED THE third question to be answered quantitatively. Engineering judgments can usually assure a good product, but "substantial compliance" is difficult to define.

Ledbetter, W.B. Galaway, B.M. Moore, W.M. Buth, E Texas Transportation Institute Aug. 1969
CONSTRUCTION MATERIALS

GALLY OR CONTRACTUALLY; FURTHERMORE, TRUE VARIATIONS IN MATERIALS OR CONSTRUCTION CAN REMAIN UNKNOWN WITHOUT PROPER SAMPLING AND INTERPRETATIVE METHODOLOGY. NEW STATISTICAL METHODS AVAILABLE FOR USE IN QUALITY CONTROL ARE SURVEYED. MEANS OF INCLUDING STATISTICAL QUALITY CONTROL IN SPECIFICATIONS AND TESTS, THE DIFFERENCES BETWEEN PRODUCTION AND ACCEPTANCE TESTING, AND FEDERAL AND STATE EFFORTS TO PROMOTE STATISTICAL CONCEPTS IN QUALITY CONTROL ARE DISCUSSED. THE IMPACT ON CONTRACTOR-STATE RELATIONS IS TREATED BRIEFLY. DETAILED TREATMENT IS GIVEN IN SEPARATE ARTICLES TO STATISTICAL QUALITY ASSURANCE FOR EMBANKMENTS AND BASE COURSES, PORTLAND CEMENT, BITUMINOUS CONSTRUCTION, AND HIGHWAY AGGREGATES.

Mcmahon, TL Halstead, WJ Baker, WM Granley, EC Kelley, JA Public Roads, Us Bureau Public Roads 70

2A 217860
ASH FROM LIGNITE
UTILIZATION OF LIGNITE OR BROWN COAL ASH IN THE 20 MAJOR PRODUCING COUNTRIES IN 1967 WAS ABOUT 2,000,000 TONS, 4 PERCENT OF THE TOTAL PRODUCTION. IN ADDITION TO WORK BEING DONE BY THE AUTHOR, A SUMMARY IS GIVEN OF RESEARCH AND UTILIZATION OF LIGNITE ASH THROUGHOUT THE WORLD. LIGNITE ASH HAS MANY APPLICATIONS INCLUDING AUTOCLAVED CELLULAR CONCRETE BLOCKS, CONCRETE ADDITIVE, SOIL STABILIZATION, CEMENT RAW MATERIAL, FILLER FOR CONSTRUCTION, BRICK, AND MINERAL FILLER. THE IMPORTANCE OF RESEARCH WITH LIGNITE ASH IS EMPHASIZED BY THE WIDE VARIATION IN CHEMICAL AND PHYSICAL PROPERTIES. /AUTHOR/


2A 217873
HAWAIIAN VOLCANIC AGGREGATES
HAWAII IS A VOLCANIC ISLAND THAT IS STILL IN THE PROCESS OF BEING BUILT UP. RECENT LAVA FLOWS CAN BE OBSERVED SIDE BY SIDE WITH ANCIENT FLOWS AND ALSO ON TOP OF ANOTHER. VARYING CONDITIONS AT TIME OF ERUPTION GIVE RISE TO DIFFERENT TYPES OF ERUPTED VOLCANIC MATERIAL SUCH AS LAVA ROCK, CINDERS, ASH, ETC. VARIATIONS IN CLIMATE AND RAINFALL CAUSE DIFFERENCES IN WEATHERING AND SOIL FORMATION. VARIOUS TYPES OF VOLCANIC MATERIAL FOUND IN HAWAII AND THEIR USE AS AGGREGATES AND MATERIAL FOR HIGHWAY BUILDING ARE DESCRIBED. /AUTHOR/

Hirashima, KB Highway Research Board Proceedings 1949

2A 217887
REPORT ON THE FIRST PHASE OF THE LIGHTWEIGHT AGGREGATE RESEARCH
LIGHTWEIGHT AGGREGATE CURRENTLY PRODUCED IN PUERTO RICO WAS EVALUATED FOR USE IN HIGHWAY AND BUILDING CONSTRUCTION. EXPANDED CLAY AND SHALE LIGHTWEIGHT AGGREGATES WERE FOUND SUITABLE FOR SURFACE TREATMENTS FOR HOT MIX SURFACE COURSES IN ASPHALT PAVEMENTS AND ALSO IN CEMENT CONCRETE FOR BUILDINGS. AS NATURAL SANDS ARE BECOMING SCARCE ON THE ISLAND, THE LIGHTWEIGHT AGGREGATE FINE MAY BE USED AS FINE AGGREGATE TO REPLACE SAND IN CEMENT CONCRETE MIXES. IN FUTURE PHASES OF THE STUDY SUITABLE SOURCES OF RAW MATERIALS ON THE ISLAND FOR THE PRODUCTION OF LIGHTWEIGHT AGGREGATES WILL BE Sought, AND TESTING PROCEDURES AND STANDARDS FOR PROPER QUALITY CONTROL OF LIGHTWEIGHT PRODUCTS WILL BE DEVELOPED.

Gandhi, PM Santiago, ER Puerto Rico University Oct. 1970

2A 217894
LOOK AT PROCESSED RUBBLE-IT'S A VALUABLE SOURCE OF AGGREGATES
RECLAIMING PAVEMENT AND STRUCTURAL CONCRETE RUBBLE FROM OBSOLETE HIGHWAYS, DRIVEWAYS, CURB, GUTTERS, SIDEWALKS, PIERS, ABUTMENTS, AND CULVERTS IS VERY ECONOMICAL. HOW THE TEXAS HIGHWAY DEPARTMENT HAS DEMONSTRATED THE TECHNICAL AND ECONOMIC FEASIBILITY OF TRANSFORMING SOLID WASTE INTO A USEFUL BUILDING MATERIAL FOR A HIGHWAY IS DESCRIBED. PROBLEMS ARE DISCUSSED FOR (1) PROCESSING, (2) RUBBLE PREPARATION, (3) EMBANKMENT PREPARATION, (4) ASPHALT-STABILIZED BASE, (5) SURFACE MIXTURES, AND (6) ECONOMICS.

Marek, CR Gallaway, BM Long, RE Roads and Streets Sept. 1971

2A 217904
BOTTOM ASH: AN ENGINEERING MATERIAL
THE PROPERTIES AND USES OF BOTTOM ASH, A BY-PRODUCT FROM BURNING COAL IN POWER PLANTS, ARE DISCUSSED. SELECTED SAMPLES OF BOTTOM ASH FROM THE STATE OF WEST VIRGINIA AND THE SURROUNDING AREA WERE SUBJECT TO ENGINEERING IDENTIFICATION, CLASSIFICATION, AND PROPERTY TESTING. IDENTIFICATION TESTS THAT WERE CONDUCTED INCLUDED GRAIN SIZE DISTRIBUTION, SPECIFIC GRAVITY, AND CHEMICAL ANALYSES TESTS CONDUCTED TO EVALUATE BOTTOM ASH AS AN AGGREGATE AND CONSTRUCTION MATERIAL INCLUDED SULPHATE SOUNDNESS, LOS ANGELES ABRASSION, RELATIVE DENSITY, STANDARD PROCTOR COMPACTATION, CONSTANT HEAD PERMEABILITY, ONE DIMENSIONAL COMPRESSION, AND SHEAR STRENGTH. IT WAS FOUND THAT BOTTOM ASH FROM SEVERAL OF THE SOURCES SATISFIED SPECIFICATIONS RELATED TO THE USE OF THE MATERIAL AS AN AGGREGATE. IN COMPARING THE BEHAVIOR OF BOTTOM ASH TO THAT OF SAND, IT WAS FOUND THAT THE CHARACTERISTICS WERE QUITE SIMILAR. /AUTHOR/


2A 217911
DEGRADATION OF LIMESTONE AGGREGATES DURING CONSTRUCTION
THERE IS GROWING EVIDENCE THAT THE STABILITY OR STRENGTH OF GRANULAR BASES IS NOT DIRECTLY RELATED TO GRADATION, DENSITY, OR PERCENTAGE OF THEORETICAL SOLID VOLUME UNDER THESE CIRCUMSTANCES, QUESTION ARISES AS TO THE IMPORTANCE OF CONTROLLING GRADATION AND COMPACTION IN CONSTRUCTION. THE SAME EVIDENCE INDICATES THAT THE HARDNESS OR STRENGTH OF THE AGGREGATE PARTICLES MAY BE THE CONTROLLING FACTOR. EVEN SO, IF OVERSTRESSED THE BEARING POINTS WILL CRUSH UNTIL SUFFICIENT BEARING AREAS ARE PRODUCED TO WITHSTAND THE STRESS. THIS IS ACCOMPANIED BY VOLUME CHANGE AND DEGRATION. IT CAN BE INFERRED THAT LOAD-INDUCED DEGRADATION PROCEEDS TO A STABLE STAGE. IT HAS BEEN ARGUED AT TIMES THAT GRADATION AND DENSITY ARE REDUNDANT REQUIREMENTS, AND THAT GRADATION REQUIREMENTS SHOULD BE WAIVED IF THE DENSITY IS ACHIEVED IN THE END PRODUCT. INDEED, THE POINT OF TESTING AND ACCEPTANCE WITH RESPECT TO DENSITY IS ON THE ROAD FOLLOWING COMPACTATION. IF GRADATION CONTROL IS DEFERRED TO THIS POINT AND DENSITY IS ACHIEVED, A DILEMMA EXISTS IF NEITHER DENSITY OR GRADATION REQUIREMENTS ARE MET. THE PRESENT STUDY WAS UNDERTAKEN TO DETERMINE WHETHER AND TO WHAT EXTENT CERTAIN PROPERTIES (PARTICULARLY GRADATION) OF KENTUCKY LIMESTONES USED IN BASE CONSTRUCTION CHANGED DURING THE CONSTRUCTION PERIOD. TWELVE CONSTRUCTION
CONSTRUCTION MATERIALS

2A 218606
BITUMINOUS MATERIALS FOR SURFACE TREATMENT

MUCH INTEREST IS BEING EVIDENCED IN MATERIALS INVOLVED IN THE SURFACE TREATMENT OF GRAVEL AND EARTH TYPE ROADS. CORRELATED SERVICE AND LABORATORY TESTS ARE BEING CONDUCTED IN SEVERAL STATES. WITH BITUMENS OF WIDELY DIFFERENT CHARACTERISTICS EMPLOYED UNDER SIMILAR WEAR, THE EXTRINSIC LABILITY IN THE EASTERN AND CENTRAL STATES, THE USE OF TAR PRODUCTS FOR SURFACE TREATMENT IS WELL DEVELOPED AND A WIDE RANGE OF PRODUCTS IS AVAILABLE. IN STATES WEST OF THE ROCKY MOUNTAINS, HOWEVER, TAR HAS BEEN LITTLE USED IN ROAD CONSTRUCTION OR MAINTENANCE. THE TREATMENT OF EARTH ROADS WAS EXTENSIVELY STUDIED IN ILLINOIS. NORTH CAROLINA AND SOUTH CAROLINA HAVE DEVELOPED AN EXTENSIVE USE OF CARPET TREATMENTS OF TOP-SOIL IN SAND-CLAY SURFACES. WISCONSIN AND MINNESOTA ARE STUDYING GRAVEL ROAD TREATMENT BY APPLYING TAR OR BITUMINOUS MATERIALS. OREGON HAS HAD SUCCESS IN THE TREATMENT OF FINE CRUSHED ROCK AND GRAVEL SURFACING. OTHER WESTERN STATES ARE LOOKING AT THE SURFACE TREATMENT AS A PROMISING MEANS OF INCREASING THE SERVICE OF GRAVEL AND CRUSHED ROCK ROADS.

Anderton, BA  Highway Research Board Proceedings 1927

2A 218778
MINNESOTA PRACTICES ON SALVAGING OLD PAVEMENTS BY RESURFACING

DETAILS OF TYPICAL SECTIONS, TYPES OF MATERIALS AND PROPORTIONS USED, SPECIFICATION REQUIREMENTS, TRAFFIC AND COST DATA ARE INCLUDED FOR THE MINNESOTA PRACTICES ON SALVAGING OLD PAVEMENTS BY RESURFACING. /AUTHOR/


2A 219130
ECONOMICS OF VARIOUS TYPES OF HIGHWAY-RAILWAY GRADE INCNKING, SHALLOW Blacktop, FULL-DEPTH BLACK TOP (3 TO 6 INCHES BELOW TIE TO TOP OF RAIL), SHALLOW CONCRETE, FULL-DEPTH CONCRETE, CAST STEEL AND RUBBER

THE INFORMATION OBTAINED FROM A QUESTIONNAIRE SURVEY IS TABULATED AND DISCUSSED. THE REASONS FOR SELECTION OF A PARTICULAR TYPE OF CROSSING WERE BASICALLY ECONOMIC. THE REMOVAL OF SURFACE MATERIAL IS NECESSARY BETWEEN PERIODS OF COMPLETE RECONSTRUCTION THE ORGANIZATION OF CROSSING GANGS IS DISCUSSED AND THE MACHINE USED IS NOTED. /AUTHOR /


2A 219143
TESTING IN THE FEDERAL REPUBLIC OF GERMANY


FOUR TESTING SYSTEMS WHICH APPEAR SUITABLE ARE BRIEFLY DESCRIBED. TEST SECTIONS IN THE FEDERAL REPUBLIC OF GERMANY ARE REVIEWED.

Zieheer, G  Statens Vegvesen Veglagh, Oslo/Norway  Vol. 45 Mar. 1973, pp 105-9, 8 Fig

2A 219247
SYMPOSIUM ON EARTH-MOVING MACHINERY, A SYMPOSIUM ARRANGED BY THE AUTOMOBILE DIVISION 16TH 17TH MARCH 1965


ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 219298
TRACTOR-MOUNTED VIBRATOR USED BY GERMAN TROOPS

CRAWLER-MOUNTED 'TANK' VIBRATOR IS USED EXTENSIVELY FOR COMPACTING SOIL-CEMENT MIXTURES IN ROAD CONSTRUCTION BECAUSE OF ITS ADVANTAGES OVER THE USUAL CYLINDRICAL ROLLER. THE STANDARD MACHINE IS EQIPED WITH A 9-HP. DIESEL ENGINE AND WORKS AT A SPEED OF 10 FT PER MIN OVER THE COMPARATIVELY NARROW ROW WIDTH OF 3 FT 4 INCHES. VIBRATIONS AT THE RATE OF 1,500 PER MIN ARE TRANSFERRED TO THE CRAWLER TREADS, RESULTING IN COMPRESSION OF A SOIL-CEMENT MIX BY MORE THAN 1 IN. UNDER TWO PASSES OF THE MACHINE.

Engineering News-record Apr. 1942

ACKNOWLEDGMENT: Highway Research Board Bibliography

2A 219303
PNEUMATIC-TIRED ROLLERS IN ROAD CONSTRUCTION

THE PROBLEM OF COMPACTING CARRIAGE LAYERS WITH PNEUMATIC-TIRED ROLLERS IS USUALLY STUDIED BY MEANS OF EMPirical METHODS. THE AUTHOR ATTEMPTS TO LOOK AT THIS PROBLEM IN A RATIONAL WAY, STARTING FROM KNOWN THEORIES AND EXPERIMENTAL RESULTS CONCERNING THE BEHAVIOUR OF SOIL UNDER STATIC LOADS. THE BEHAVIOUR OF SOIL UNDER LOADS APPLIED BY A PNEUMATIC-TIRED ROLLER IS ANALYSED BY THE MOHR METHOD TO EXPRESS STRESSES, AND BY INTRINSIC STRAIGHT LINES TO EXPRESS SOIL CHARACTERISTICS. THE STUDY OF THE EQUILIBRIUM OF THE SOIL UNDER LOAD SHOWS THAT THE EQUILIBRUM IS REACHED WHEN LIMIT CONDITIONS ARE EQUAL TO MAXIMA STRESS VALUES, THEREFORE WHEN THE INTRINSIC STRAIGHT LINE WHICH REPRESENTS SOIL CONDITION TANGENTIAL TO THE ENVELOPE OF THE MOHR CIRCLES REPRESENTING THE STRESSES CREATED BY THE COMPACTOR. THE SHAPE OF THIS ENVELOPE DEPENDS ON
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2A

THE CONTACT PRESSURE, AND ON THE SHAPE AND DIMENSION OF THE CONTACT AREA, BY THE USE OF NOMOGRAPHS, IT IS POSSIBLE TO ANALYZE THE INFLUENCE OF LOAD VARIATIONS ON EACH WHEEL AND THE EFFECT OF TYRE PRESSURE ON THE DENSITY REACHED AT VARIOUS DEPTHS. THE MAXIMUM COMPACTABLE DEPTH FOR A PRESCRIBED MINIMUM DENSITY CAN BE EVALUATED TOGETHER WITH THE MAXIMUM ACCESSIBLE DENSITY FOR A GIVEN LOAD.


ACKNOWLEDGMENT. Road Research Laboratory / UK /

2A 219323
LONGITUDINAL AND TRANSVERSE CONTROL FOR BITUMINOUS PAVERS
PROJECTS AMOUNTING TO APPROXIMATELY 67 MILES OF ASPHALTIC CONCRETE ON NEW BASE, 92 MILES OF ASPHALTIC CONCRETE OVERLAY ON OLD SURFACE, AND 277 MILES OF BITUMINOUS MAT OVERLAY ON OLD SURFACE WERE PLACED UNDER CONTRACT IN KANSAS DURING 1958. THE MATERIALS FOR THESE PROJECTS WERE MIXED IN HOT-MIX PLANTS AND PLACED ON THE ROAD THROUGH BITUMINOUS PAVERS. BECAUSE OF THE LIMIT WHICH BITUMINOUS PAVERS CAN LEVEL OR SMOOTH A ROAD SURFACE, THE PROBLEM OF PLACING THE MIXTURE TO A SMOOTH GRADE LINE WITH A TRUE CROWN CONFRONTS BOTH THE ENGINEER AND THE CONTRACTOR ON EACH PROJECT, PARTICULARLY ON OVER- LAYS WITH MODERN HIGH-SPEED TRAFFIC A SMOOTH GRADE LINE AND TRUE CROWN ARE MUSTS IN PAVEMENT CONSTRUCTION. THE DEVELOPMENT OF TWO ATTACHMENTS IS DESCRIBED THAT HAVE BEEN PLACED ON THE LEADING MAKES OF BITUMINOUS PAVERS AND HAVE BEEN SUCCESSFUL IN AIDING THE OPERATORS TO CAUSE THE PAVER SCREEDS TO FOLLOW A SMOOTH THEORETICAL GRADE LINE WITH A DEFINITE UNIFORM CROWN. THIS METHOD OF PAVING REQUIRES SEVERAL NORMAL OPERATIONS, SUCH AS ASCERTAINING A NEW GRADE LINE FROM THE ORIGINAL PROFILE AND THE USE OF PNEUMATIC-TIRED ROLLERS FOR COMPACTION. THIS METHOD OF PAVING REQUIRES LESS OVER-ALL WORK ON THE PART OF THE CONTRACTOR, BECAUSE THE SKIN PATCHING IN ALL CASES CAN BE REDUCED, AND IN SOME CASES ELIMINATED. /AUTHOR/

Drake, FM Highway Research Board Bulletin 1961

2A 219401
THE EVALUATION OF A RANGE OF VIBRATING ROLLERS IN COMPACTING SOILS
RESULTS ARE PRESENTED OF COMPACTION TESTS CARRIED OUT IN TINY LIFTS USING A RANGE OF VIBRATING ROLLERS ON THREE COMMON TYPES OF CONSTRUCTION MATERIALS. FIVE VIBRATING ROLLERS OF MEDIUM TO HEAVY WEIGHT (107 TO 265 LB. PER LINEAL INCH) WERE USED COMPRISING HIGH AND LOW FREQUENCY MACHINES. THE HEAVIEST ROLLER WAS ALSO USED NON-VIBRATING. ALL MACHINES WERE TOWED AT A CONSTANT SPEED OF 1.7 M.P.H. THE MATERIALS TESTED WERE A DOLOMITE CRUSHED ROCK, A SINGLE-SIZED SAND AND A MEDIUM CLAY. COMPACTION TESTING WAS CARRIED OUT UNDER CONTROLLED CONDITIONS OF MOISTURE CONTENT UNDER SHEED-COVER AFTER 2, 4, 8 AND 16 PASSES. COMPACTION RESULTS AND OUTPUTS FOR THE VARIOUS MACHINES ARE COMPARED. THE IMPORTANCE OF CONTROL OF MOISTURE CONTENT IN THE COMPAC- TION OF CRUSHED ROCK WAS SHOWN TO BE OF MORE IMPORT- ANCE THAN FREQUENCY OF VIBRATION IN OBTAINING A HIGH DENSITY. HEAVY VIBRATING ROLLERS DID NOT APPEAR TO BE AN ADVANTAGE IN COMPACTING FINE SAND BUT PROVED AN ADVANTAGE OVER THE LIGHTER VIBRA- TORS IN COMPACTING CLAY. COMPARISONS ARE MADE THROUGHOUT USING THE NON-VIBRATING DRUM ROLLER. DISCUSSION BY VARIOUS ROAD AUTHORITIES AND ROLLER MANUFACTURERS IS INCLUDED. /AUTHOR/

Tynaen, AE Morris, PO Australian Road Research Board Paper No 441, 1968

2A 219403
EQUIPMENT FOR STABILIZED BASE CONSTRUCTION
EQUIPMENT AND TECHNIQUES ARE DESCRIBED FOR SOIL COMPACTION AND SOIL STABILIZATION OF THE ADDITIVE AND MECHANICAL TYPES. THE IMPORTANCE IS EMPHASIZED OF SEGREGATION DURING MATERIAL HANDLING AND DURING THE BLENDING AND MIXING OPERATIONS. FOLLOWING EQUIPMENT IS DESCRIBED AND PICTURED: BLENDING AND BLENDING EQUIPMENT WITH ITS OWN FLUID HANDLING SYSTEM; A METERED FLUID DISTRIBUTOR WITH SPRAY BAR; MEANS OF RAPID DRYING OF OVER-WET MATERIALS BY AERATION; HIGH SPEED, OPEN SEGMENTED WHEEL, SHEEPS- FOOT ROLLER; A HIGH SPEED ROLLER EQUIPPED WITH PAD TYPE WHEEL; A PNEUMATIC ROLLER USED IN HIGHWAY CONSTRUCTION; A TANDEM STEEL WHEEL ROLLER USED PRIMARILY FOR SURFACE ROLLING OF ASPHALTIC CONCRETE; AND HEAVY CLAY PULVERIZED BY A PULVI-MIXER.

Trainor, MJ Ohio Highway Engineering Conf Proc Apr. 1967

2A 221292
BETTER TRAFFIC WITH BETTER ROAD SURFACES

Larsen, J Road Federal Institute / Brazil / 1970

ACKNOWLEDGMENT: Road Research Institute / Brazil /

2A 222245
NEEDED RESEARCH IN THE ENGINEERING AND DESIGN OF TOLL FACILITIES
THOSE RESEARCH NEEDS THAT ARE COMMON TO BOTH TOLL FACILITIES AND NON-TOLL FACILITIES ARE DISCUSSED. SPECIFIC TOPICS COVERED ARE IN THE AREAS OF: (1) THE SAFETY OF THE DRIVER, PASSENGERS, CARGO, MAINTENANCE EMPLOYEES, AND RESIDENTS NEAR THE HIGHWAY; (2) THE CAPACITY OF THE FACILITY; (3) THE SOCIAL AND ENVIRONMENTAL EFFECTS OF HIGHWAYS; (4) INTERMODAL AC- COMMODATION; (5) BETTER QUALITY CONTROL OF MATERIALS AND OPERATIONS DURING CONSTRUCTION; AND (6) THE DEVELOPMENT OF TECHNIQUES AND STANDARDS TO MINIMIZE FUTURE MAINTENANCE REQUIREMENTS.

343
THE CLASSIFICATION METHOD IS SIMPLIFIED AS PERSONS IN THE STUDY, ENGINEERING CLASSIFICATION OF GEOLOGICAL MATERIALS, WERE INITIATED IN 1961 TO PROVIDE A COMPREHENSIVE REFERENCE ON HIGHWAY ENGINEERING. THE STABILITY OF ROCK IN HIGHWAY DESIGN IS DISCUSSED IN RELATION TO THE SITE SELECTION, THE ROCKS LEFT IN PLACE AFTER A CUT OR TUNNEL HAS BEEN EXCAVATED, ROCK FILL AND AGGREGATE SURFACING. METHODS TO DETERMINE THE MECHANICS OF SUCH ROCKS AND THEIR IMPORTANCE IN HIGHWAY DESIGN AND CONSTRUCTION ARE INCLUDED. REPEATED LOAD TRIAXIAL TESTS ON LABORATORY COMPACTED SAMPLES WERE EMPLOYED TO DETERMINE THE AMOUNT OF ELASTIC OR RESILIENT REBOUND FOR EACH SOIL. IN GENERAL, IT WAS FOUND THAT AS THE PERCENT OF THE MINERAL MICA INCREASED THE RESILIENT REBOUND INCREASED, BUT AS THE PLASTICITY INDEX OF THE SOIL INCREASED THE RESILIENCY DECREASED. SOILS FROM THE C-HORIZON WERE MORE RESILIENT THAN THOSE FROM THE B-HORIZON. FOR SOILS FROM THE C-HORIZON THE RESILIENCY INCREASED WITH INCREASING GRAIN SIZE. STERE-OPTICAL MICROSCOPE STUDIES OF SAMPLES BEFORE AND AFTER REPEATED TRIAXIAL TESTS SHOWED THAT SOIL STRUCTURE PLAYED A MAJOR ROLE IN CAUSING THE RESILIENCY IN THESE SOILS. IT WAS CONCLUSIVELY SHOWN THAT SOILS WITH A DISPERSE-LIKE STRUCTURE WERE MUCH MORE RESILIENT THAN THOSE WITH A FLOCCULANT-LIKE STRUCTURE. SOILS, THE STRUCTURE AND RESILIENCY WERE INFLUENCED GREATLY BY MOLDING MOISTURE CONTENT AND METHOD OF COMPACTING.

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4810002 65)

2A 228611 TERRAIN INVESTIGATION TECHNIQUES FOR HIGHWAY ENGINEERS
AIRPHOTO INTERPRETATION, GEOPHYSICAL METHODS OF SUBSURFACE EXPLORATION, AND DIRECT INVESTIGATIONS BY AUGER BORINGS, CORE BORINGS, ETC., ARE DISCUSSED AS TECHNIQUES USED IN TERRAIN INVESTIGATIONS.
CONSTRUCTION MATERIALS

2A 228614
EXPLORATION OF METHODS TO DETERMINE THE OPTIMUM USE OF INDIGENOUS MATERIALS FOR HIGHWAY CONSTRUCTION
A BRIEF REVIEW OF THE VARIOUS SOIL CLASSIFICATION SYSTEMS IS GIVEN AS WELL AS A REVIEW OF TERRAIN EXPLORATION METHODS. THE AASHO TEST METHODS ARE LISTED FOR MEASURING PHYSICAL AND STRENGTH PROPERTIES OF SOILS. METHODS OF ALTERING OR STABILIZING SOILS ARE BRIEFLY EXAMINED. SEVERAL PROPOSALS FOR FURTHER RESEARCH IN THE OPTIMUM USE OF INDIGENOUS MATERIALS ARE PRESENTED. /BPR/

Mullen, WG Gray, EW Chen, CF
North Carolina State University

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4814376 6611C53020480, IC61020578, PB 174 131 $0.00

2A 228628
THE REPEATABILITY OF TEST RESULTS USING VARIOUS CALIFORNIA BEARING RATIO PROCEDURES AND THE RESISTANCE R-VALUE
THIS STUDY WAS CONDUCTED TO COMPARE AND EVALUATE FOUR OF THE STANDARD METHODS FOR DETERMINING THE BEARING CAPACITY OF SOILS FOR HIGHWAY CONSTRUCTION AND, IF POSSIBLE, DRAW A CORRELATION BETWEEN THEIR RESULTS. EVALUATION OF THE METHODS WAS BASED UPON STATISTICAL CONCEPTS, USING THE COEFFICIENT OF VARIATION, STANDARD DEVIATION AND MEAN VALUES. STANDARD TEST PROCEDURES USED WERE THE STATIC AND DYNAMIC CBR, AASHO 3-POINT CBR AND R-VALUE. FOUL SOIL TYPES, RANGING FROM CLAY THROUGH SANDY GRAVEL, WERE TESTED BY THE STANDARD METHODS. FROM THE DATA AVAILABLE IT APPEARS THAT THE R-VALUE TEST PROCEDURE GIVES THE MOST SATISFACTORY RESULTS. THE NEED FOR ADDITIONAL TESTING OF THOSE SOILS NOT INCLUDED IN THIS STUDY IS INDICATED. TESTING OF ADDITIONAL SOIL TYPES WOULD ENHANCE THE KNOWLEDGE ALREADY GAINED FROM THIS STUDY AND ALLOW A CLOSER CORRELATION OF THE DIFFERENT TESTING METHODS. /AUTHOR/

Sorbo, VK
Utah State Department Highways, Bureau of Public Roads /US/

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4653304 68)PB 179860, 3C61021214

2A 228657
ROCK RIPPABILITY STUDY
THE FEASIBILITY OF PREDICTING QUANTITIES OF RIPPABLE AND NON-RIPPABLE ROCK ON PROPOSED CONSTRUCTION PROJECTS WAS DETERMINED USING SEISMIC SOUNDINGS, supplemented by test borings and electrical resistivity measurements. SIX PROJECTS SCHEDULED FOR CONSTRUCTION IN DIFFERENT GEOLOGIC SETTINGS WERE SELECTED FOR INVESTIGATION AND FIELD WORK HAS BEEN COMPLETED ON ALL SIX. TO DATE, ONLY THREE OF THE PROJECTS HAVE BEEN CONSTRUCTED. NON-RIPPABLE MATERIAL WAS ENCOUNTERED ON ONLY TWO OF THE PROJECTS. INVESTIGATED, AND IT WAS FOUND THAT THE DISTRIBUTION OF THIS MATERIAL WERE NOT APPARENT DUE TO THE GEOLOGIC CONDITIONS PRESENT. IT ALSO BECAME APPARENT DURING THE COURSE OF THE STUDY THAT THE DEPTH CAPABILITY OF THE SEISMOGRAPH USED, A SOILTEST TERRA-SCOUT, WERE TOO LIMITED TO PERMIT ADEQUATE INVESTIGATION OF CUTTING. REPORTS AND DISCUSSIONS REGARDING: (1) METHODS OF MODIFYING OR TREATING EXPANSIVE CLAYS AND SHALES TO PREVENT DEFORMATION, (2) FACTORS AND CHARACTERISTICS OF EXPANSIVE CLAYS USED IN HIGHWAY DESIGN ON, IN OR WITH EXPANSIVE CLAYS AND SHALES, AND (3) SELECTED STATE SUMMARIES OF PROBLEMS WITH EXPANSIVE CLAYS, AND DESIGN OR TREATMENT METHODS, INCLUDING CASE HISTORIES. THESE PROCEEDINGS ARE COMPLETE IN TWO VOLUMES. A 22-PAGE CONDENSATION OF THE PROCEEDINGS IS BEING PUBLISHED AS FEDERAL HIGHWAY ADMINISTRATION REPORT FHWA-RD-73-72, ENTITLED "SUMMARY OF PROCEEDINGS OF WORKSHOP ON EXPANSIVE CLAYS AND SHALES IN HIGHWAY DESIGN AND CONSTRUCTION," BY D. R. LAMB AND S. J. HANNA. THE SUMMARY IS AVAILABLE THROUGH THE SAME AGENCIES AS THE COMPLETE PROCEEDINGS.

Lamb, DR Hanna, SJ
Wyoming University Proceeding Vol. 2 FHWA-RD-73-72, May 1973, 318 pp

ACKNOWLEDGMENT: Federal Highway Administration PB-225844

2A 228744
SUBSURFACE SOIL EXPLORATION
THE USE OF GEOPHYSICAL TESTING EQUIPMENT IN ROAD CONSTRUCTION IS REPORTED, BASICALLY, THERE ARE TWO TYPES OF THESE INSTRUMENTS USED FOR SHALLOW /100 FT OR LESS/ SUBSURFACE INVESTIGATION: REFRACTION SEISMOGRAPHS AND ELECTRICAL EARTH RESISTIVITY UNITS. THE OPERATIONAL TECHNIQUES OF BOTH ARE DESCRIBED. /RRL/

Thompson, SV Rural and Urban Roads

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 228804
GEOPHYSICAL METHODS IN HIGHWAY ENGINEERING

Paterson, NR Meidav, T Canadian Good Roads Association Proc

2A 228816
A MODERN APPROACH TO HIGHWAY MATERIALS SAMPLING
HIGHWAY ENGINEERING, PARTICULARLY IN DEVELOPING COUNTRIES WITH INADEQUATE STAFF, CAN BENEFIT CON-
SIDERABLY BY MAKING FULL USE OF ALL AVAILABLE TECHNIQUES. TWO SUCH TECHNIQUES, AIR-PHOTO INTERPRETA-
TION APPLIED TO HIGHWAY MATERIALS AND STATISTICAL CONTROL OF SAMPLING AND TESTING, HAVE BEEN USED
WITH SUCCESS IN SOUTH AFRICA. THE AUTHORS DESCRIBE THE BASIC PRINCIPLES INVOLVED IN THE ADOPTION OF
THOSE TOOLS AND QUOTE SOME EXAMPLES TO INDICATE THE BENEFITS THAT CAN BE DERIVED. /AUTHOR/

Kantey, BA  Morse, RK  Int'l Conf Soil Mech & Found Eng Proc

ACKNOWLEDGMENT: Canadian Good Roads Association

2A 228826

SPECIAL TESTS FOR DESIGN OF HIGH EARTH
EMBANKMENTS ON US 101

THE TEST DATA NECESSARY FOR THE DESIGN OF HIGH
EMBANKMENTS IN THE CALIFORNIA MOUNTAINS CANNOT BE
OBTAINED WITH CONVENTIONAL TRIAXIAL EQUIPMENT.

SPECIAL TESTS WERE PERFORMED TO OBTAIN
SINGULAR-TUBULAR TESTS WERE PERFORMED ON 12-IN.
DIAMETER BY 28-IN. HIGH SPECIMENS OF LESS THAN 3-IN.
PRECONFINED PRESSURES UP TO 125 PSI IN AN
ATTACHMENT TO SIMULATE THE ACTUAL STRESS CONDITIONS
ON MATERIALS THAT WERE OF THE SAME TYPES AND SIZES AS
THOSE CONTEMPLATED FOR THE ACTUAL EMBANKMENTS.

LARGER CONFINING PRESSURES, 550 PSI, WERE ALSO
USED BUT THE SPECIMENS SIZES WERE REDUCED TO 6-IN.
DIAMETER BY 14-IN. HEIGHT, AND THE MAXIMUM PARTICLE SIZE
WAS REDUCED TO 1 1/2-IN. TESTS WERE CONDUCTED TO
OBTAIN BOTH TOTAL AND EFFECTIVE STRESSES DEGRADA-
TION OF THE MATERIALS UNDER COMPACTION, CONSOLIDA-
TION AND SHEARING WAS DETERMINED. THE TEST DATA
HAVE BEEN USED FOR THE DESIGN OF THE 384-FT HIGH
EMBANKMENT ACROSS SQUAW CREEK IN MENOCINO
COUNTY. CONSTRUCTION OF THE SQUAW CREEK EMBANK-
MENT WAS BEGUN ON JUNE 1, 1966. THIS EMBANKMENT WILL
CONTAIN THREE DISTINCT TYPES OF MATERIAL, (A) SE-
LECTION ROCKY MATERIAL FOR TOW SUPPORT; (B) SELECTED
GRANULAR MATERIAL, CONTAINING ONLY A MINOR QUAN-
TITY OF SHALE, CLAY, SOIL OR VEGETABLE MATTER, WHICH
WILL BE COMPACTED TO 93 PERCENT RELATIVE COMPAC-
TION AT A MOISTURE CONTENT OF 1 TO 3 PERCENT LESS
THAN OPTIMUM, AND (C) RANDOM ROADWAY EXCAVATION
BY NORMAL CONSTRUCTION PROCEDURES AT 90 PERCENT
RELATIVE COMPACATION. PLATFORMS AND GAGES WILL BE
INSTALLED TO OBSERVE THE BEHAVIOR OF THE EMBANK-
MENT DURING AND AFTER CONSTRUCTION. ADDITIONAL
TESTING WILL BE DONE TO COMPLEMENT THE TESTING
PROGRAM DESCRIBED AND TO CHECK ON THE ORIGINAL
DESIGN OF THE EMBANKMENT. /AUTHOR/

Hall, EB  Smith, TW  California Division Highways

Acknowledgment: Highway Res Abstracts Hwy Res Board

2A 228830

MOLE VERSUS CONVENTIONAL: A COMPARISON OF TWO
TUNNELING DRIVING TECHNIQUES

IN NORTHWEST NEW MEXICO THE U.S. BUREAU OF RECLAMA-
TION IS BUILDING THE NAVAJO INDIAN IRRIGATION PROJECT
AS A PART OF THE WATER CONVEYANCE SYSTEM. TWO TUNNELS WERE BUILT. TUNNEL 1, 2 MI LONG, WAS
DRIVEN WITH A HUGHES TUNNELING MACHINE. ONE-QUAR-
TER MILE AWAY IS TUNNEL 2 WHICH WILL EVENTUALLY BE
5 MI LONG. THIS TUNNEL IS BEING DRIVEN BY A MOLE.
THE AUTHOR PRESENTS OBSERVATIONS MADE WHILE WORKING IN BOTH TUNNELS. COMPARISONS ARE
MADE OF ROCK BEHAVIOR, SUPPORTS, TECHNIQUES, PERSONNEL, AND ADVANTAGES AND DISADVANTAGES OF
USING A MOLE; A TUNNELING MACHINE OFFER THE FOLLOWING ADVANTAGES: NEAR-CONTINUOUS OPERATION,
HIGH DAILY FOOTAGE, MINIMUM OVERBREAK RESULTING IN A NEARLY 30 PERCENT REDUCTION IN CONCRETE, LESS
PERSONNEL, SAFER OPERATION, LESS SUPPORTS REQUIRED, MINIMUM CLEANUP OPERATIONS, DYNAMITE NOT RE-
QUIRED RESULTING IN INCREASED SAVINGS. DISADVANTAGES ARE: NEEDS LONG SECTION TO PAY FOR ITSELF,
CIRCULAR SECTION ONLY, SPECIALIZED OPERATOR REQUIRED, SUPPORTS DIFFICULT TO INSTALL, LONG WAIT FOR
DELIVERY. LARGE INITIAL INVESTMENT, MACHINE HAS TO BE DESIGNED FOR TUNNELS ON ACCOUNT OF DIFFERENT DIAME-
TERS AND GEOLOGIC CONDITIONS, LIMITED TO SOFTER MATERIALS, NEEDS LARGE VENTILATION SYSTEM. /AU-
THOR/

Bennett, NB  Highway Research Record, Hwy Res Board

2A 228871

COMBINED TECHNIQUES FOR TERRAIN INVESTIGATION
THE COMBINED TECHNIQUE METHOD IS DESCRIBED AND
DEMONSTRATED FOR TERRAIN INVESTIGATION AT TEST SITES
IN OHIO. THIS METHOD IS DEFINED AS AN ECONOMICAL
COMBINATION OF INDIRECT AND DIRECT METHODS OF
PROCURING THE SURFACE AND SUBSURFACE INFORMATION
CONCERNING SOILS AND ROCKS THAT ENGINEERS AND
CONTRACTORS REQUIRE FOR ESTABLISHING THE BEST LOCATION
OF A CONSTRUCTION PROJECT OR FOR LOCATING
NATURAL RESOURCES SUCH AS UNDERGROUND WATER,
SAND AND GRAVEL AGGREGATES OR MINERALS. THE COM-
BINATIONS OF TECHNIQUES DESCRIBED ARE GENERALLY
USEFUL FOR DEFINING AREAL EXTENT, DEPTH AND STRATI-
FICATION OF SOIL, SOIL AGGREGATE COMPOSITIONS AND
ROCK LAYERING SYSTEMS TO DEPTHS OF 100 TO 200 FEET.
THERE ARE TEN STEPS IN COMBINED-TECHNIQUES METHOD.
PHOTO INTERPRETATION, utilizing PANCHROMATIC, COLOR AND INFRARED PHOTOGRAPHY AT APPROPRIATE
SCALES AND FILM-FILTER COMBINATIONS, IS INITIALLY PRO-
GRAMMED FOR A PROPOSED HIGHWAY ALIGNMENT SEG-
MENT. THIS PORTION OF THE PROCEDURE IS THEN
COMPROMISED BY EITHER ELECTRICAL-RESISTIVITY OR
SEISMIC-REFRACTION SURVEYS OR BOTH, AS DICTATED BY
THE TERRAIN. LIMITED BORING DATA ARE UTILIZED FOR
CALIBRATION NEEDS, AND ADDITIONAL BORINGS ARE OBT-
AINED WHERE NECESSARY TO VERIFY AND COMPLEMENT
THE PHOTO INTERPRETATION AND GEOPHYSICAL ANALYSIS
OF THE SUBSURFACE.

Mintzer, OW  Struble, RA  Highway Research Record, Hwy Res Board

2A 228879

TWIN BORES AT GREEN RIVER
A ROCK MECHANICS INVESTIGATION WAS CONDUCTED CON-
TEMPORANEOUSLY WITH THE CONSTRUCTION OF TWIN TUNNELS
ON THE GREEN RIVER MARGINAL ROUTE. THIS INVESTIGA-
TION WAS CONDUCTED TO DETERMINE: (1) THE ACTUAL
SUPPORT REQUIREMENTS BY MEASUREMENT OF THE
TIME-STRAIN-LOAD PROPERTIES OF THE TUNNEL ROCK AND
/2/ THE MODE OF LOADINGS /THE PROCESS BY WHICH ROCK
STRAIN IS TRANSLATED INTO LOAD IN THE SUPPORT SYS-
TEM/; FOUR INSTRUMENT STATIONS EACH CONSISTING OF
FOUR LOAD MEASURING INSTRUMENTS PROD, LOAD CELLS
WHICH MEASURE THE AMOUNT OF STRAIN ON THE INITIAL
STEEL STRUCTURE/ AND THREE DISPLACEMENT MEASUR-
ING INSTRUMENTS WERE INSTALLED. THE INVESTIGATION
WAS DESIGNED TO PROVIDE A CONTINUING REVIEW OF
ORIGINAL DESIGN ASSUMPTIONS DURING ACTUAL TUNNEL
EXCAVATIONS, TO DEVELOP RECOMMENDATIONS FOR MODI-
FYING THE DESIGN OF THE ORIGINAL STEEL DESIGN TO
CONFORM MORE CLOSELY WITH MEASURED ROCK CONDITIONS,
AND TO PROVIDE QUANTITATIVE DATA FOR THE CONTROL OF
THE TUNNEL SUPPORT SYSTEM COSTS. THE RESULTS
ACHIEVED PROOF THAT ROCK MECHANICS INSTRUMENTA-
TION CAN BE SUCCESSFULLY APPLIED TO REDUCE TUNEL
CONSTRUCTION COSTS AND INCREASE SAFETY.

Wyoming State Highway Department 1 Fig. Aug. 1966
CONSTRUCTION MATERIALS

2A 228978
FIELD INVESTIGATION OF SOIL COMPACTION
A FULL SCALE FIELD RESEARCH STUDY WAS UNDERTAKEN TO INVESTIGATE THE EFFECTIVENESS OF VARIOUS METHODS OF COMPACTING SOIL FOR HIGHWAY CONSTRUCTION AND TO DETERMINE THE RESULTING SOIL PROPERTIES USING RAPID FIELD METHODS FOR MEASUREMENT OF MOISTURE, DENSITY, STRENGTH AND STIFFNESS. THE MEASUREMENTS INCLUDED MOISTURE AND DENSITY WITH A PORTABLE BACK-SCATTERING NUCLEAR DEVICE, MOISTURE AND DENSITY WITH SAND CONE APPARATUS, PENETRATION RESISTANCE WITH A CONE PENETROMETER, CALIFORNIA BEARING RATIO, STIFFNESS WITH A 6-IN. BEARING PLATE AND SEISMIC VELOCITY WITH A PORTABLE SEISMOGRAPH.

Selig, ET World Highways
ACKNOWLEDGMENT: Int'l Road Fedn World Meetings Proc

2A 229052
PROCEEDINGS OF THE THIRD ASIAN REGIONAL CONFERENCE ON SOIL MECHANICS AND FOUNDATION ENGINEERING

Belcher, DJ Highway Research Board Proceedings

2A 229149
APPLICATION OF GEOLOGY TO ENGINEERING PRACTICE
CONTENTS: CHARLES PETER BERKEY, JOHN L. SAVAGE, ROGER RHOADES THE GEOLOGIST IN THE ENGINEERING ORGA-
2A CONSTRUCTION MATERIALS


*Geological Society of America Bulletin*

2A 229203

SOIL DESCRIPTION

THESE REFERENCES ON SOIL DESCRIPTION INCLUDE SELECTIONS ON SOIL CLASSIFICATION SYSTEMS, LATERITES AND THEIR STABILIZATION, RELATION BETWEEN CHEMICAL COMPOSITION AND PHYSICAL CHARACTERISTICS OF SOME SOILS, WEATHERING OF VOLCANIC ASH AND PUMICE, GLAZES FROM VOLCANIC ASH, SOILS OF CUBA, WELDED TUFTS AND FLOWS IN A RHOLITE PLATEAU, MILLAN BREC SIAI GEOLOGY OF HIGHWAY LOCATION, CONSTRUCTION, LATERITIES IN ROAD CONSTRUCTION, SOIL SURVEY OF HAWAII, VOLCANIC RAW MATERIALS IN WEST INDIES, BEHAVIOR OF VOLCANIC SOILS IN HIGHWAY CONSTRUCTION, TESTING QUALITY OF CALICHES, ESTIMATING BEARING CAPACITY OF ROAD CRUTS, SOILS OF EQUATORIAL REGIONS, MICACEOUS SOILS, VOLCANIC CINDER CONCRETE, RADIOACTIVITY OF VOLCANIC SEDIMENTS, BERYLLIUM-BEARING TUFT, AND CLAY MINERALS IN SOIL.

Highway Research Information Service

2A 219204

SURVEY & TREATMENT OF MARSH AND MUSKEG DEPOSITS

THESE REFERENCES ON SURVEY & TREATMENT OF MARSH AND MUSKEG DEPOSITS INCLUDE SELECTIONS ON ENGINEERING PROPERTIES OF MUSKEG RELATED TO ROAD CONSTRUCTION, SOIL MECHANICS BIBLIOGRAPHY, HYDRAULIC FILL CAUSEWAY, CONSOLIDATION OF ALLUVIAL CLAY, CONSOLIDATION OF SOILS BY DRAIN WELLS, UNSTABLE SUBGRADE, STABILIZATION BY SAND DRAINS AND BY BLASTING, BLASTERS HANDBOOK, FILL SETTLEMENT USING EXPLOSIVES, ROAD CONSTRUCTION OVER ORGANIC TERRAIN, CONSOLIDATION CHARACTERISTICS OF ORGANIC SOILS, METHODS AND COSTS OF FILLING OF HIGHWAY OVER SWAMPS, DITCHING AND DRAINAGE IN MUSKEG AREAS, CLASSIFICATION OF ORGANIC SOILS, PAVING PERFORMANCE OVER MUSKEG, CORROSION IN MUSKEG, EMBANKMENT CONSTRUCTION IN MUSKEG, EMBANKMENT TESTING IN MUSKEG, SUBGRADE AND SOIL FOUNDATIONS, INTERPRETATION OF MUSKEG AND PERMAFROST CONDITIONS FROM AERIAL PHOTOGRAPHS, FILL SETTLEMENT BY SURCHARGING, LABORATORY TESTS ON PEAT, AERIAL SURVEYS OVER ORGANIC TERRAIN, DENSITY AND WATER MEASUREMENTS IN PEAT, TREATMENT OF SOFT FOUNDATIONS, AND STABILIZATION OF MARSH DEPOSITS.

Highway Research Information Service

2A 229239

GEOLOGY SAND AND ROAD CONSTRUCTION (2)


Wiegens, H Politechnisch Tidsskrift /Neth/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 229260

SOIL INVESTIGATIONS FOR ENGINEERING CONSTRUCTION (IN GERMAN)

A COMPREHENSIVE INSTRUCTION MANUAL DEALING WITH THE FOLLOWING SUBJECTS: (1) INVESTIGATIONS BEFORE THE START OF CONSTRUCTION; (2) WORKING PROGRAM AND PROGRESS OF INVESTIGATIONS; (3) SOIL TYPES AND THEIR DESCRIPTION AND CLASSIFICATION FOR CONSTRUCTIONAL PURPOSES; (4) FIELD TESTS OF THE SURFACE AND SUBSOIL; (5) LABORATORY TESTS; (6) CONDITION DESCRIPTION, (7) BEHAVIOR UNDER LOADING AND CHEMICAL BEHAVIOR. (8) SPECIAL INVESTIGATIONS (MICROSCOPIC, X-RAY, COLLOIDAL-ELECTRONIC, THERMOCHEMICAL)-TESTS ON THE FINISHED STRUCTURE, (9) OBSERVATIONS AND MEASUREMENTS OF EARTHWORK, (10) TESTS OF COMPACTION, SETTLEMENT, DEFORMATION, SLIPPING, (11) OBSERVATIONS AND MEASUREMENTS OF STONE, CONCRETE, WOOD OR STEEL STRUCTURES, AND (12) STANDARDS AND SPECIFICATIONS. /FG/RRL/

Schultze, E Muhs, H Springer Verlag /Germany/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 229263

APPARATUS FOR THE RAPID DETERMINATION OF FINE-GRAIN PARTICLES IN COURSE-GRAINED SOILS AND CONSTRUCTION MATERIALS (IN GERMAN)


Haas, H Strasse Und Autobahn /Germany/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 229282

THE PH OF FRESH AND WEATHERED DOERITE AS AN INDICATOR OF DECOMPOSITION AND OF STABILIZATION REQUIREMENTS

WEATHERED DOERITE WHICH JUST PASSES THE ROUTINE SELECTION TESTS CONTINUES TO DECOMPOSE AFTER BEING LAID IN A ROAD FOUNDATION, AND THIS HAS BEEN THE CAUSE OF MANY FAILURES, OF THE BASE-COURSE IN PARTICULAR. THE PH OF A FRESH BASIC IGNEOUS ROCK HAS BEEN FOUND ALWAYS TO BE IN THE VICINITY OF 8 AND IT CHANGES TOWARDS NEUTRAL WHEN DECOMPOSITION REACHES THE MONTMORILLONITE STAGE AND EVEN INTO THE ACIDIC RANGE WHEN KAOXINITE, AND FINALLY BAUXITE ARE FORMED. LABORATORY INVESTIGATIONS WERE CARRIED OUT IN WHICH DOERITE SAMPLES WERE IMMERSED IN DIFFERENT PH MEDIA. IT WAS FOUND THAT MAINLY IRON WAS MOBILIZED IN THE ACIDIC AND CALCIUM IN THE ALKALINE RANGE. THESE INVESTIGATIONS SHOWED
CONSTRUCTION MATERIALS

FURTHER THAT THE DETERMINATION OF THE PH OF A SINGLE SAMPLE TAKEN FROM A WEATHERING SUCCESION HAS NO PRACTICAL SIGNIFICANCE BUT THAT THE COMPARISON OF THE PH OF AT LEAST TWO SUCH SAMPLES, EACH FROM A DIFFERENT LAYER IN THE WEATHERING SUCCESION, PROVIDES INFORMATION ON EITHER LOSS OR PRECIPITATION OF DISSOLVED MATERIAL. IT HAS PROVED POSSIBLE TO DEFINE A NUMBER OF TYPICAL PH DEVELOPMENTS OF WEATHERING SUCCESIONS. ALTHOUGH WORK IN THIS FIELD IS STILL FUNDAMENTAL, IT CAN ALREADY BE CONCLUDED THAT Saturating THE MOISTURE IN THE ROAD FOUNDATION WITH CALCIUM, SUCH RAISING THE ALKALINITY, MIGHT PREVENT FURTHER MOBILISATION AND RETARD DECOMPOSITION. THIS CAN BE ACHIEVED WITH THE USUAL CHEMICAL STABILISERS BUT ALSO WITH GROUND LIME SPOURILYN. IT WAS INTRODUCED IN THESE SIMPLE PH MEASUREMENTS MAY BE SUFFICIENT TO DETERMINE THE OPTIMUM CHEMICAL STABILISATION REQUIREMENTS. SHORT DEFINITIONS OF TECHNICAL TERMS USED ARE GIVEN IN THE APPENDIX. /RRL/AUTHOR/

Caus, KA Soil Mech & Fdn Eng Proc /South Africa/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 229393
ROAD CONSTRUCTION IN WEATHER-SENSITIVE LOESS MATERIALS: I N RUSSIAN/

Hackelberg, F Knop, F Strassen Und Tiefbau /Germany/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 229336
NEW REQUIREMENTS CONCERNING STONE MATERIALS /IN RUSSIAN/
THE IMPROVEMENT OF SPECIFICATIONS FOR STONE MATERIALS IS DISCUSSED. BY INCREASING THE LIFE-TIME OF ROAD SURFACINGS AND WIDENING THE FIELD OF APPLICATION OF NATURAL AND SYNTHETIC STONE MATERIALS, LOWER CONSTRUCTION COSTS COULD BE ACHIEVED. THESE NEW SPECIFICATIONS WOULD BE IN AGREEMENT WITH THOSE USED IN OTHER COUNTRIES. /LPC/RRL/

Polyakov, AI Kurdenkov, BI Automobil Nye Dorogi /USSR/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 229344
FORECASTING THE SUSCEPTIBILITY OF CIVIL ENGINEERING MATERIALS TO WEATHERING /IN FRENCH/
THROUGH CHANGES IN THEIR ENVIRONMENT, NATURAL ROCK MATERIALS USED IN CIVIL ENGINEERING CONSTRUCTION CAN ALTER. ENDANGERING THE STABILITY OF STRUCTURES TO THIS PROCESS. DIFFERENT FROM WEATHERING IN GEOLOGY, GEOFORMOLOGY, OR PEDOLOGY, IS CONNECTED WITH THE SPECIFIC CONDITIONS OF EACH STRUCTURE AND IS VERY RAPID. TO FORECAST WEATHERING AT THE PROJECT STAGE AND ON THE SITE, THE PROPERTIES OF THE MATERIALS AND THEIR CONDITIONS OF USE MUST BE TAKEN INTO ACCOUNT, AND SIMPLE AND RAPID QUANTITATIVE TESTS MUST BE CONDUCTED. A STUDY IS MADE OF THE MECHANISM OF WEATHERING, AND THE CRITERIA USED FOR PREDICTING THE MAIN CAUSES OF DISORDER IN NATURAL ROCKS USED IN CIVIL ENGINEERING ARE LISTED: (1) DECREASE IN STRENGTH AND DISINTEGRATION OF ROCKS CONTAINING ACID FELDSPAR BY DISSOLUTION OF LEACHING PRODUCTS IN COMPOSITE, BASIC, ACID, OR LATERITIC MEDIA; (2) DECREASE IN STRENGTH AND DISINTEGRATION BY SWELLING OF CLAYEY MINERALS OR HYDROXIDES; (3) SUPERFICIAL PROGRESSIVE ACIDIFICATION OF AGGREGATES; (4) FORMATION OF WATER VAPOR IN HOT-COATED AGGREGATES; (5) SUPERFICIAL PROGRESSIVE ACIDIFICATION OF AGGREGATES SUBJECTED TO LEACHING, AND (6) PRECIPITATION OF IRON HYDROXIDE ON THE SURFACE OF STORED AGGREGATES. SIMPLE AND RAPID TESTS ARE PROPOSED FOR EACH OF THESE PHENOMENA. /LCPC(A)/RRL/

Struilliou, R Bull Liaison Labs Routiers /France/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 229351
FRICTION BETWEEN SANDS AND CONSTRUCTION MATERIALS /IN ITALIAN/
AFTER REVIEWING RECENT TRENDS IN THE STUDY OF SURFACE FRICTION, THIS ARTICLE EXAMINES THE RESULTS OF (AND THE APPARATUS USED IN) A SERIES OF TESTS, CONCERNING THE FRICTION BETWEEN SANDS OF TWO DIFFERENT GRAIN SIZES AND CONCRETE SURFACES OF DIFFERENT ROUGHNESS, OR STEEL. THE PRIMARY AIM OF THIS RESEARCH IS TO SHOW THE DEPENDENCE OF THE FRICTION COEFFICIENT VALUE ON THE RELATIVE SLIDING MANIFESTED. /RRL/

Beraldi, G Pisa University /Italy/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 229353
SOIL VARIABILITY AND ITS EFFECTS ON FLEXIBLE PAVEMENT DESIGN
A STUDY WAS MADE OF SOIL VARIANCE AS IT PERTAINS TO DESIGN OF FLEXIBLE TYPE PAVEMENTS. THE RESULTS SHOWED THAT SOIL VARIANCE IS A FUNCTION OF THE PROPERTY BEING MEASURED AND THAT, IN SO FAR AS DESIGN OF PAVEMENTS IS CONCERNED, ITS SIGNIFICANCE IS DEPENDENT ON TRAFFIC AND ENVIRONMENTAL CONDITIONS AT THE SITE. A METHOD FOR SELECTING A DESIGN VALUE FROM AN ARRAY OF SOIL DATA IS PRESENTED. THIS ANALYSIS INDICATED THAT THE OPTIMUM DESIGN VALUE IS GENERALLY, BUT NOT ALWAYS, LESS THAN THE MEAN TEST VALUE AND THAT IT IS DEPENDENT ON TRAFFIC, ENVIRONMENTAL CONDITIONS. SOIL VARIABILITY, CONSTRUCTION VARIABILITY AND PAVEMENT COSTS; GUIDE LINES FOR SAMPLING AND SELECTION OF SOIL STRENGTH VALUES ARE PRESENTED. THESE ARE BASED ON THE FACTORS OF TRAFFIC ANTICIPATED DEGREE OF SATURATION, AND SOIL VARIANCE. /RRL/A/

Yoder, EJ Rhodesian Engineer /Southern Rhodesia/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 229368
PORTUGUESE STUDIES ON ENGINEERING PROPERTIES OF LATERITIC SOILS
THE FREQUENT OCCURRENCE OF LATERITIC MATERIALS IN THE PORTUGUESE OVERSEAS PROVINCES AND THE NEED TO USE THEM IN ROAD CONSTRUCTION MADE IT NECESSARY TO CARRY OUT STUDIES IN ORDER TO IMPROVE THEIR TECHNICAL AND ECONOMICAL CONDITIONS OF USE. AN UP TO DATE ACCOUNT OF THE STATE OF THESE STUDIES AND CONCLUSIONS REACHED, WITH PARTICULAR REFERENCE TO ROAD SPECIFICATIONS FOR THE MECHANICAL STABILIZATION OF LATERITIC MATERIALS, IS GIVEN. A NEW PARAMETER-SWELLING-WAS INTRODUCED IN THESE SPECIFICATIONS AND A PROPOSAL PRESENTED FOR THE ACCEPTANCE OF
LATERITIC MATERIALS WITH CONSISTENCY LIMITS HIGHER THAN THOSE RECOMMENDED IN CURRENT SPECIFICATIONS (AASHO M 145-49 AND ASTM D (241-55T) AS LONG AS SWELLING DOES NOT EXCEED 10 PERCENT. /RRL/

Soil Mech & Fdn Eng Conf Proc /Mexico/

ACKNOWLEDGMENT: Transport Road Research Lab /UK/

2A 229349

A SWELLING TEST FOR THE STUDY OF LATERITIC SOILS THE POSSIBILITY OF SAFELY EXCEEDING THE RECOMMENDED LIMITS IN CURRENT SPECIFICATIONS CONCERNING THE USE OF LATERITIC SOILS IN ROAD CONSTRUCTION WAS INVESTIGATED. CONSISTENCY LIMITS WERE INVESTIGATED IN RELATION TO SWELLING. AND DETAILS ARE GIVEN OF A NEW SOIL SWELLING TEST AND RESULTS OBTAINED. /RRL/

De, CASTRO E Soil Mech & Fdn Eng Conf Proc /Mexico/

ACKNOWLEDGMENT: Transport & Road Research Laboratory /UK/

2A 229376

UTILIZATION OF LATERITIC SOILS FOR CONSTRUCTION PURPOSES AN INVESTIGATION IS MADE INTO THE SUITABILITY OF LATERITIC SOILS FOUND IN THE PHILIPPINES FOR ROAD CONSTRUCTION THE CHEMICAL PROPERTIES, GRADING, CONSISTENCY LIMITS, COMPACTABILITY, UNCONFINED COMPRESSION, CONSTRUCTION, AND FUNDAMENTAL PROPERTIES OF RAW LATERITIC SOIL SAMPLES AND OF MIXTURES OF LATERITIC SOIL WITH VOLCANIC CINDER, HYDRATED LIME AND PORTLAND CEMENT WERE STUDIED IN THE LABORATORY. TESTS ON THE MIXTURES SHOW AN INCREASE IN STRENGTH AS MEASURED BY UNCONFINED COMPRESSION TESTS AND CBR TESTS COMPARED TO RESULTS OBTAINED WITH RAW LATERITIC SOIL. LABORATORY DATA WERE USED DURING THE CONSTRUCTION OF 4 EXPERIMENTAL ROAD SECTIONS, EACH SECTION CONTAINING A PARTICULAR SOIL MIXTURE USED FOR THE SURFACING COURSE. OBSERVATIONS ARE BEING CARRIED OUT WITH A VIEW TO EVALUATING THE PERFORMANCE OF EACH MIXTURE. /RRL/

Santos, JC Soil Mech & Fdn Eng Conf Proc /Mexico/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 229377

THE USE OF LATERITIC SOIL IN ROAD CONSTRUCTION-GABON /IN FRENCH/ DETAILS ARE GIVEN OF THE GEOGRAPHY, CLIMATE AND VEGETATION OF GABON, AND TYPES OF LATERITIC SOIL FOUND IN THE COUNTRY. A COMPARATIVE STUDY IS MADE OF CBR TEST AND CLASSIFICATION TEST RESULTS WITH A VIEW TO DRAWING UP SPECIFICATIONS CONCERNING THE USES OF LATERITIC SOIL. THE MAJORITY OF THE NETWORK IN GABON CONSISTS OF LIGHTLY-TRAFFICKED EARTH ROADS. DATA ON THE DESIGN OF A NEW ROAD UNDER CONSTRUCTION AND METHODS OF STABILIZATION USED FOR ITS BASECOURSE ARE PRESENTED. /RRL/

Mellier, G Philippennat, G Soil Mech & Fdn Eng Conf Proc /Mexico/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 229386

THE ENGINEERING SIGNIFICANCE OF PLEISTOCENE STRATIGRAPHY IN THE SASKATOON AREA, SASKATCHEWAN, CANADA IT WAS RECOGNIZED THAT REPEATED STAGES AND SUB-STAGES OF GLACIATION IN SASKATCHEWAN DURING THE PLEISTOCENE EPOCH PRODUCED A SERIES OF OVERLAPPING SEDIMENTS IT WAS SHOWN THAT THESE SEDIMENTS COULD BE ANALYZED FOR ENGINEERING PURPOSES WITHIN A THREE-DIMENSIONAL STRATIGRAPHIC FRAMEWORK. PRELIMINARY FIELD INVESTIGATIONS INDICATED THAT A STRATIGRAPHIC ANALYSIS COULD BE RELATED TO CONSTRUCTION PROBLEMS FOUND ON HIGHWAY EMBANKMENT CONSTRUCTION, GRAVEL LOCATION, AND TUNNEL EXCAVATION. FURTHERMORE, LABORATORY STUDIES INDICATED THAT THERE WERE SIGNIFICANT DIFFERENCES IN THE ENGINEERING PROPERTIES OF DIFFERENT DRIFT-STRATIGRAPHIC UNITS. IT WAS SHOWN THAT THE BEHAVIOR OF THE TILL UNITS DURING CONSTRUCTION COULD BE EXPLAINED IN TERMS OF THE FUNDAMENTAL ENGINEERING PROPERTIES OF SOILS SUCH AS SHEAR STRENGTH PARAMETERS AND COMPRESSIBILITY. FINALLY, IT APPEARED TO BE PROBABLE THAT THE BASIC CONCEPTS DEVELOPED IN THIS STUDY WOULD APPLY TO OTHER AREAS COVERED BY GLACIAL SEDIMENTS. /RRL(A)/

Macdonald, AB Sawet, EK Canadian Geotechnical Journal

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

2A 229443

INTRODUCTION TO THE REFRESHER COURSE ON HIGHWAY GEOTECHNICS /IN FRENCH/ THIS ARTICLE CONSIDERS THE SPECIFIC CHARACTERISTICS OF HIGHWAY GEOTECHNICS. THEIR RELATION WITH SOIL HETEROGENEITY, AND THEIR VARIATION AS A FUNCTION OF COMPACTION AND MOISTURE CONTENT. /TRRL/

Pasquet, A Revue Gen Des Routes & Aerodr /France/ No. 461, Jan. 1971, 1 Fig, 7 Phot, 12 Ref

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

2A 229533


Bennett, EF Malpin, GW Highway Research Board Bulletin

250
DEALING WITH SLOPE DESIGN, STRUCTURE FOUNDATIONS, AND LANDSLIDE PROBLEMS. FURTHER STUDY OF THE POSSIBLE USE OF NATURAL POTENTIALS, GENERALLY PRESENT IN THE EARTH, TO FURTHER EVALUATE LANDSLIDE CONDITIONS IS WARRANTED. THE REFRACTION SEISMIC TEST CONTINUES TO HAVE USEFUL APPLICATIONS IN SUBSURFACE EXPLORATIONS FOR HIGHWAY CONSTRUCTION, SMALL-SCALE REFRACTION SEISMIC TESTS SHOW PROMISE AS A NEW, ECONOMIC, AND RAPID MEANS OF EVALUATING THE STABILITY OF SOILS AND ROCKS, ALONG WITH THE CURRENTLY USED PROCEDURES. /AUTHOR/

ACKNOWLEDGMENT: Geophysical Abstracts

2A 229966
SIGNIFICANCE OF THE SOIL SURVEY REPORT IN THE SELECTION AND PRELIMINARY ASSESSMENT OF SITES FOR AIRPLANE LANDING STRIPS
COMPARISONS WERE MADE BETWEEN CONDITIONS PREDICTED FROM INDEPENDENT INTERPRETATION OF SOIL SURVEY REPORTS AND ACTUAL ENGINEERING EXPERIENCE, FOR TWO AIRFIELD LOCATIONS IN CALIFORNIA. IT WAS CONSIDERED NECESSARY THAT THE SOILS OF THE PARTICULAR LOCALITIES CHOSEN FOR EXAMINATION FILLED THESE REQUIREMENTS. (1) they MUST HAVE BEEN INCLUDED IN SOIL SURVEYS FOR WHICH MAPS AND DESCRIPTIVE REPORTS EXIST, (2) they MUST BE SUFFICIENTLY REPRESENTATIVE OF A RANGE OF DIFFERENCES IN SOIL PROPERTIES THAT THEY WILL PROVIDE A REASONABLY SIGNIFICANT SAMPLE FOR CONSIDERATION, (3) they MUST HAVE BEEN USED AS THE ACTUAL MATERIALS OF SUBGRADE CONSTRUCTION FOR AIRPLANE RUNWAYS, AND (4) they MUST HAVE BEEN SUBMITTED TO QUANTITATIVE PHYSICAL EXAMINATION AND TESTING IN AN ENGINEERING LABORATORY FOR THE PURPOSE OF GUIDING CONSTRUCTION DESIGN. IN ORDER TO DETERMINE THE VALUE OF SOIL SURVEY REPORTS IN THE SELECTION AND PRELIMINARY ASSESSMENT OF AIRFIELD SITES, ESTIMATES WERE MADE OF THE ENGINEERING PROPERTIES AND CONSTRUCTION PROBLEMS OF CERTAIN SOIL TYPES IN CENTRAL CALIFORNIA, UPON WHICH AIRFIELD RUNWAYS HAD BEEN CONSTRUCTED FOR ARMY USE. NUMERICAL ESTIMATES WERE MADE ONLY FOR RANGES IN VALUES OF PLASTIC LIMIT, PLASTICITY INDEX AND BEARING RATIO, AS WELL AS FOR EXPANSION AND SHRINKAGE, QUANTITATIVE FEATURES THAT HAD BEEN MADE IN THE ENGINEERING LABORATORY. IT IS CONCLUDED THAT THE PROPER INTERPRETATION OF INFORMATION CONTAINED IN AGRICULTURAL SOIL SURVEY REPORTS CAN BE USED TO EXCELLENT ADVANTAGE IN THE SELECTION AND PRELIMINARY ASSESSMENT OF SITES PRIOR TO ENGINEERING CONSTRUCTION.

Bodman, GB Highway Research Board Bulletin

2A 229570
MAPS FOR CONSTRUCTION MATERIALS
THE GEOLOGIST SHOULD BE USED IN PREPARING MATERIAL MAPS FOR CONSTRUCTION MATERIALS. THIS WILL RESULT IN COMPLETELY SELF-SUFFICIENT GEOLOGIC ENGINEERING CONSTRUCTION. THREE PRINCIPAL KINDS OF CONSTRUCTION MATERIAL MAPS ARE DISCUSSED: MATERIAL-SITE, MATERIAL DISTRIBUTION, AND SURFACE GEOLOGY. THE MATERIAL-SITE MAP IS AN INVENTORY OF MATERIALS THAT HAVE ALREADY BEEN FOUND AND TESTED. THE MATERIAL-DISTRIBUTION MAP IS BASED ON THE GEOLOGIC MAPS AVAILABLE FOR THE REGION. THE SURFACE-GEOL OGY MAP COMBINES MANY OF THE USEFUL FEATURES OF THE OTHER TWO KINDS. IT IS CONSTRUCTED TO A RELATIVELY LARGE SCALE, SHOWING THE OUTCROP AREAS OF ALL GEOLOGIC FORMATIONS AND THE LOCATIONS OF EXISTING PITS AND QUARIES IN THE AREA. THE SURFACE-GEOL OGY MAP, ALTHOUGH EXPENSIVE TO PREPARE, IS THE MOST SATISFACTORY SINCE IT PROVIDES COMPLETE INVENTORY OF ALL

2A 229561
GEOLOGY, A DIAMOND IN THE ROUGH, PRESENTS SEVERAL FACETS USEFUL TO THE GEOLOGIST AND ENGINEER
THE EXPANDING USE OF GEOPHYSICS IN SHALLOW SUBSURFACE INVESTIGATIONS FOR HIGHWAY AND OTHER ENGINEERING PROJECTS IS EVIDENCED BY THE WEALTH OF PUBLISHED PAPERS NOW AVAILABLE DESCRIBING SUCH WORK. USE OF THE EARTH RESISTIVITY TEST IS ESPECIALLY NOTED WHEN APPLIED TO SUBSURFACE INVESTIGATIONS

Evans, FK Highway Research Board Bulletin

2A 229548
USE OF SOILS MAPS IN OPERATION AND PLANNING OF COUNTY HIGHWAY ACTIVITIES
A DETAILED SOIL SURVEY WAS CONDUCTED ON INGHAM COUNTY, MICHIGAN. RESULTS OF THE SURVEY WERE PUBLISHED WITH A SOILS MAP ADEQUATE TO PROVIDE CONSIDERABLE INFORMATION. THE SURVEY AND PRELIMINARY ASSESSMENT AND BEARING RATIO, AS WELL AS FOR EXPANSION AND SHRINKAGE, QUANTITATIVE FEATURES THAT HAD BEEN MADE IN THE ENGINEERING LABORATORY. IT IS CONCLUDED THAT THE PROPER INTERPRETATION OF INFORMATION CONTAINED IN AGRICULTURAL SOIL SURVEY REPORTS CAN BE USED TO EXCELLENT ADVANTAGE IN THE SELECTION AND PRELIMINARY ASSESSMENT OF SITES PRIOR TO ENGINEERING CONSTRUCTION.

Belcher, DJ Highway Research Board Bulletin

2A 229542
HOW TO CALCULATE A CALCULATED RISK. AN ENGINEERING APPRAISAL OF LIMESTONE LANDFORMS
LANDFORMS ARE LAND UNITS IN WHICH THE GEOLOGY, ROCKS, AND SOILS ARE ELEMENTS THAT MAY BE ANALYZED BY THE SPECIAL TECHNIQUES OF THE GEOLOGIST AND THE SOIL SCIENTIST. THE LANDFORM TECHNOLOGIST HAS CONDUCTED FOUR SPECIAL GEOLOGIC STUDIES: (1) GRAVEL AND SAND RESOURCES OF PARTICULAR AREAS, (2) RECONNAISSANCE GEOLOGY, (3) GROUND-WATER INVESTIGATIONS, AND (4) SEISMIC STUDIES. STUDY METHODS AND FINDINGS ARE PRESENTED.

Carrier, LW Highway Research Board Bulletin

2A 229534
GEOLOGIC METHODS AND INTERPRETATIONS
TOPOGRAPHIC CHARACTERISTICS OF TERRAINS, AND THE PHYSICAL PROPERTIES AND STRUCTURES OF THE UNDERLYING MATERIALS MUST BE CONSIDERED IN THE DESIGN AND CONSTRUCTION OF MODERN MAJOR HIGHWAYS. THE PHYSICAL FEATURES OF THE TERRAIN SUCH AS THE TOPOGRAPHY, ROCKS, AND SOILS ARE ELEMENTS THAT MAY BE ANALYZED BY THE SPECIAL TECHNIQUES OF THE GEOLOGIST AND THE SOIL SCIENTIST. THE LANDFORM TECHNOLOGIST HAS CONDUCTED FOUR SPECIAL GEOLOGIC STUDIES: (1) GRAVEL AND SAND RESOURCES OF PARTICULAR AREAS, (2) RECONNAISSANCE GEOLOGY, (3) GROUND-WATER INVESTIGATIONS, AND (4) SEISMIC STUDIES. STUDY METHODS AND FINDINGS ARE PRESENTED.

Evans, FK Highway Research Board Bulletin

ACKNOWLEDGMENT: Geophysical Abstracts
AVAILABLE CONSTRUCTION MATERIAL AND THE BEST POSSIBLE BASIS FOR THE SEARCH FOR A MATERIAL TO MEET CERTAIN SPECIFICATIONS. IT IS ALSO USEFUL FOR ESTIMATING AVAILABLE QUANTITIES OF MATERIAL, THE CHARACTER AND THICKNESS OF OVERBURDEN, THE EXISTENCE OF POSSIBLE CAUSES OF FAILURES OF CONSTRUCTION, AND THE KIND OF EXCAVATION TO BE EXPECTED AT ANY ONE PLACE.

Byrne, FE Highway Research Board Bulletin

2A 229571 DEVELOPMENT OF GEOPHYSICAL METHODS OF SUBSURFACE EXPLORATION IN THE FIELD OF HIGHWAY CONSTRUCTION

A STUDY WAS MADE OF GEOPHYSICAL METHODS OF EXPLORING THE SUBSTRATA AS APPLIED TO HIGHWAY ENGINEERING PROBLEMS, INCLUDING THE DEVELOPMENT OF INSTRUMENTS AND METHODS OF INTERPRETATION OF THE DATA OBTAINED. EARTH RESISTIVITY AND REFRACTION SEISMIC APPARATUS WERE ADAPTED OR DEVELOPED FOR USE IN THE SHALLOW SUBSTRATA. DATA WERE COLLECTED ON APPLICATION OF THIS EQUIPMENT TO SUCH PROBLEMS AS SLOPE DESIGN, CLASSIFICATION OF EXCAVATION MATERIALS ON GRADING PROJECTS, FOUNDATION STUDIES FOR BRIDGES, BUILDINGS AND OTHER STRUCTURE, INVESTIGATION OF TUNNEL SITES, LOCATION OF SAND, GRAVEL, SOLID ROCK AND SPECIAL SOILS FOR USE IN CONSTRUCTION, DETERMINATION OF DEPTH OF PEAT AND MUCK IN SWAMPY AREAS, AND STUDIES OF EXISTING AND POTENTIAL SLIDE AREAS. THE GEOPHYSICAL METHODS OF TEST UNDER CONSIDERATION DEFINITELY ESTABLISHED THEIR VALUE IN CONNECTION WITH HIGHWAY WORK, PARTICULARLY FOR USE IN PRELIMINARY SURVEYS. DATA OBTAINED SHOWED THAT BOTH THE SEISMIC AND THE RESISTIVITY METHODS OF TEST FAVE MERIT, PARTICULARLY AS RAPID AND RELATIVELY INEXPENSIVE METHODS OF EXPLORATION FOR USE IN PRELIMINARY SURVEYS.

Moore, RW Highway Research Board Bulletin

2A 229626 SOIL SERIES AS A BASIS FOR DETERMINING CEMENT REQUIREMENTS FOR SOIL-CEMENT CONSTRUCTION

ONE OF THE MOST IMPORTANT TOOLS OF THE SOILS ENGINEER IS A GOOD METHOD OF IDENTIFYING SOILS. IT PERMITS PROPER CLASSIFICATION AND COMPARISON OF SOILS FOR ENGINEERING PURPOSES. PROPER IDENTIFICATION MAKES CLASSIFICATION WORK SIMPLER WHENEVER THE SAME SOILS ARE ENCOUNTERED ON FUTURE PROJECTS. AN EXCELLENT SOIL IDENTIFICATION METHOD IS THE PEDALOOICAL SYSTEM DEVELOPED BY THE U.S. DEPARTMENT OF AGRICULTURE. THIS METHOD PROVIDES THE BASIS FOR THE PROJECT DESCRIBED IN THIS PAPER. IT HAS BEEN KNOWN FOR SOME TIME THAT SOILS OF THE SAME SERIES AND HORIZON, AS IDENTIFIED BY THE DEPARTMENT OF AGRICULTURE'S SYSTEM REQUIRE THE SAME CEMENT FACTOR FOR SOIL-CEMENT CONSTRUCTION. ONCE THE CEMENT FACTORS FOR A GIVEN SOIL SERIES ARE ESTABLISHED IT IS UNNECESSARY TO CONDUCT TESTS FOR SOIL-CEMENT CONSTRUCTION. INQUIRING THE SAME SERIES AND HORIZON WHERE IT IS ENCOUNTERED, SINCE IT IS NOT UNCOMMON FOR SOME SOIL SERIES TO COVER LARGE AREAS, SOMETIMES HUNDREDS OF SQUARE MILES, THE IMPORTANCE OF THIS RELATIONSHIP IS OBVIOUS. THE DATA OBTAINED SHOWED THAT BOTH THE SEISMIC AND THE RESISTIVITY METHODS OF TEST FAVE MERIT, PARTICULARLY AS RAPID AND RELATIVELY INEXPENSIVE METHODS OF EXPLORATION FOR USE IN PRELIMINARY SURVEYS.

Michael, RD Highway Geology Symposium, Iowa State U

2A 229633 THE EFFECTS OF PEAT DEPOSITS ON HIGHWAY DESIGN IN IOWA

PROBLEMS ENCOUNTERED IN IOWA IN HIGHWAY DESIGN WITH THE PEAT DEPOSITS ARE REVIEWED. INTERSTATE HIGHWAY CONSTRUCTION IN NORTHERN IOWA HAS MADE IT NECESSARY TO LOCATE HIGHWAYS OVER ADVERSE SOIL CONDITIONS. DETAILED STUDIES OF INDIVIDUAL PEAT DEPOSITS ARE NECESSARY FOR HIGHWAY LOCATION, AND A REASONABLE CLASSIFICATION MUST BE ADOPTED. CLASSIFICATION METHODS FOR PEAT DEPOSITS USED IN IOWA ARE REVIEWED. A SOILS ENGINEER AVOIDS PEAT DEPOSITS WHEN POSSIBLE BECAUSE OF THE NECESSARY TREATMENT PLUS A DELAY IN CONSTRUCTION THAT MAY BE NECESSARY. IT IS CAUTIONED THAT PEAT DOES NOT HAVE TO BE EXCEPTIONALLY DEEP TO CAUSE CONCERN TO HIGHWAY DESIGNERS. IT IS CONCLUDED THAT DETAILED STUDIES OF THE INDIVIDUAL PEAT DEPOSITS ARE NECESSARY FOR HIGHWAY LOCATION.

Blattert, RE Highway Geology Symposium, Iowa State U

2A 229647 USE OF SOIL SURVEY DATA BY THE SMALL HIGHWAY ORGANIZATION

THE SMALL STATE OR COUNTY HIGHWAY ORGANIZATION IS OFTEN RELUCTANT TO ADOPT METHODS BEING USED BY HIGHLY TRAINED TECHNICIANS IN LARGE HIGHWAY ORGA-
CONSTRUCTION MATERIALS

2A 229687
THE TENDENCY TOWARD A GREATER UTILIZATION OF SPECIALISTS IN THE HIGHWAY ENGINEERING FIELD

Matalucci, RV Abdel-hady, M Highway Research Board Special Reports

2A 229665
SURFACE AND SUBSURFACE EXPLORATION BY INFRARED SURVEYS

Tennessee Highway Conference Proc
Tennessee Department of Highways

2A 229698
DISCUSSION OF EMBANKMENT PORE PRESSURES DURING CONSTRUCTION

Olinger, DJ Highway Research Board Bulletin

2A 229666
SURFACE AND SUBSURFACE EXPLORATION BY INFRARED SURVEYS

Some of the basic principles are summarized relating to infrared radiation (IR) various applications of infrared photography and imagery to surface and subsurface exploration. In the development of pore pressure for highway construction and other engineering projects. Major conclusions from this study are the following: (1) IR photography and imagery highlight variations in soil texture, composition, and moisture that may not usually be recorded by conventional photography, (2) the chlorophyll effect, although not specifically investigated in the appraisal of cultivated land for right-of-way acquisitions, and (3) hidden subsurface conditions and geological features that are of greatest importance during highway site selection and design can be exposed with IR instrumentation—features such as muck pockets, underground cavities, volcanic and hydrothermal activities, subsurface drain-

AGE SYSTEMS, AND BURIED UTILITIES AND CONduits with FURTHER RESEARCH IN THE TECHNIQUES USED FOR REMOTE SENSING IN THE INFRARED, SURFACE, AND SUBSURFACE EXPLORATION AND DRAINAGE STUDIES FOR CONSTRUCTION OF HIGHWAYS, AIRPORTS, AND OTHER PROJECTS MAY BE GREATLY FACILITATED. (AUTHOR)

Olinger, DJ Highway Research Board Bulletin

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Olinger, DJ Highway Research Board Bulletin

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Olinger, DJ Highway Research Board Bulletin

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Olinger, DJ Highway Research Board Bulletin

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Olinger, DJ Highway Research Board Bulletin
CONSTRUCTION MATERIALS

WERE HIGH. A GRAPH IS PRESENTED OF TYPICAL PORE PRESSURES IN THE CORE AT DIDDINGTON DAM, MANGLA DAM AND AYER ITAM DAM. MR. LITTLE AGREES WITH MOST OF THE AUTHORS' CONCLUSIONS BUT HE HAS NOT SO FAR MET HIGH PORE PRESSURES IN A FILL OF HEAVILY OVERCONSOLIDATED CLAY NOR WITH THE TYPE OF FILL USED AT SHEK PIK DAM, EVEN AT WATER CONTENTS APPRECIABLY ABOVE OPTIMUM. REFERENCES: EMBANKMENT PORE PRESSURES DURING CONSTRUCTION. WALTER C. SHERMAN, GEORGE W. CLOUGH, ASCE PROC. PAPER 5867, MARCH, 1968.

De, OLIVEIRA H G Rao, KK Little, AL Am Soc Civil Engr J Soil Mech Div

2A 229712 TERRAIN EVALUATION FOR ROAD ENGINEERS IN DEVELOPING COUNTRIES
EXISTING ROAD-LOCATION AND MATERIALS SURVEYS ARE OFTEN CARRIED OUT WITHOUT REFERENCE TO VARIATION IN TERRAIN CONDITIONS. TERRAIN EVALUATION RELATES THE SOIL'S PROPERTIES AND THE ASSOCIATED ENGINEERING PROBLEMS AND SOLUTIONS TO A LAND-CLASSIFICATION SCHEME. THEREFORE, ESTABLISHING A SYSTEM FOR STORING AND RELATING INFORMATION FROM ONE PROJECT TO ANOTHER, THE BASIC UNIT OF THE CLASSIFICATION IS THE LAND FACET WHICH BY DEFINITION IS REASONABLY UNIFORM IN PROPERTIES AND BEHAVIOR. THE SYSTEM FACETS RECUR TOGETHER IN HIGHER-LEVEL UNITS CALLED LAND SYSTEMS WHICH ARE USUALLY IDENTIFIED ON AIR-PHOTO PRINT LAY-DOWNS AT SCALES ABOVE 1:60,000. AT THIS LEVEL THE LAND SYSTEM CAN STORE MORE GENERAL INFORMATION RELATING TO AVAILABILITY OF MATERIALS, SUITABLE CONSTRUCTION METHODS AND COSTS OF CONSTRUCTION OR MAINTENANCE. A TERRAIN EVALUATION CAN LEAD TO A MORE LOGICAL SOIL-SURVEY PROCEDURE, CONCENTRATING EFFORT ON PROBLEMS RELEVANT TO THE PROJECT. THIS CAN OFTEN LEAD TO A DECREASE IN THE AMOUNT OF SURVEY WORK, TOGETHER WITH AN INCREASE IN ITS EFFECTIVENESS. THE PAPER IS ILLUSTRATED BY EXAMPLES OF TERRAIN-EVALUATION STUDIES FROM NORTHERN NIGERIA AND WESTERN MALAYSIA. /AUTHOR/

Dowling, JW Beaven, PJ Inst Hwy Engineers Journal, London /UK/

2A 229729 A DROP HAMMER PENETROMETER FOR DETERMINING THE DENSITY OF SOILS AND GRANULAR MATERIALS
THE APPLICATION OF A DROP HAMMER PENETROMETER WAS INVESTIGATED AS A METHOD OF DETERMINING THE DENSITY OF SOILS AND BASE MATERIALS USED IN HIGHWAY CONSTRUCTION. DESCRIPTION IS GIVEN OF THE DROP HAMMER PENETROMETER, SAMPLE PREPARATION AND TEST PROCEDURE, CALIBRATION PROCEDURE AND PRACTICAL APPLICATIONS OF THE DROP HAMMER PENETROMETER. RESULTS INDICATE THAT THE DROP HAMMER PENETROMETER CAN BE USED TO ESTIMATE RAPIDLY THE DRY DENSITY OF SEMI-DRY SANDY SOILS AND CRUSHED GRANITE GNEISS. TO MAKE THIS DETERMINATION FOR MATERIALS WHICH HAVE BEEN CALIBRATED, THE MOISTURE CONTENT AS WELL AS THE PENETRATION RESISTANCE IS REQUIRED. IT IS ANTICIPATED THAT THE USE OF THE PENETROMETER IN THE FIELD WOULD BE RESTRICTED TO THOSE SOILS FOR WHICH GOOD CORRELATION HAD BEEN ESTABLISHED AND, IT IS RECOMMENDED THAT BECAUSE OF POSSIBLE THIXOTROPIC BEHAVIOR, THE TIME LAG BETWEEN COMPACTION AND PENETROMETER READINGS BE KEPT TO A MINIMUM. THE OVERALL STANDARD ERROR OF THE PROCEDURE FOR ALL MATERIALS TESTED WAS FOUND TO BE 2.2 PCF. THE TOTAL TIME REQUIRED TO DETERMINE THE UNIT WEIGHT OF A CALIBRATED SOIL OR BASE MATERIAL BY THE USE OF THE DROP HAMMER PENETROMETER (AND THE SPEEY MOISTURE TESTER TO MAKE THE NECESSARY MOISTURE DETERMINATION) WAS APPROXIMATELY 15 MINUTES.

Rostron, JP Schwartz, AE Gioiosa, TE Highway Research Record, Hwy Res Board

2A 229737 SOILS AND ROCK INFORMATION: SYSTEMS FOR STORAGE AND RETRIEVAL
THE WEALTH OF INFORMATION IN THE HIGHWAY RESEARCH FIELD, IN RESPECT PARTICULARLY TO THE SOIL MECHANICS OR GEOTECHNICAL FIELD IS DESCRIBED. TYPES OF INFORMATION STORAGE AND RETRIEVAL SYSTEMS AVAILABLE TO PROCESS THESE DATA ARE OUTLINED AND DISCUSSED FROM ANNUAL SYSTEMS TO COMPUTER-BASED SYSTEMS; THE OPERATIONS ARE DESCRIBED OF THE HIGHWAY RESEARCH INFORMATION SERVICE (HRIS) OPERATED BY THE HIGHWAY RESEARCH BOARD, NATIONAL RESEARCH COUNCIL UNDER THE NATIONAL ACADEMY OF SCIENCES-NATIONAL ACADEMY OF ENGINEERING. THE SCOPE OF THE INFORMATION STORED IN THE SYSTEM IS AS BROAD AS THE PROBLEMS OF PLANNING, LOCATING, CONSTRUCTION, OPERATING, AND MAINTAINING TRANSPORTATION SYSTEMS; OPERATIONS OF THE SYSTEM ARE DESCRIBED.

Guinnee, JW Mobley, AB Eng Geol & Soils Eng Symp Proc, Boise

2A 229794 PROPOSALS FOR THE APPLICATION OF THE PUCE PROGRAM OF TERRAIN CLASSIFICATION AND EVALUATION TO SOME ENGINEERING PROBLEMS

Aitchison, GD Grant, K Australian Road Research Board Proc

2A 229795 ENGINEERING EXPECTATIONS FROM TERRAIN EVALUATION
ANY SYSTEM OF TERRAIN EVALUATION FOR ENGINEERING IS INTENDED TO BE BASIS FOR THE STORAGE AND RETRIEVAL AND COMMUNICATION OF INFORMATION. THE COMPLETE FEEDBACK CYCLE OF EVALUATION AND APPLICATION IN TERRAIN EVALUATION CAN BE CONSIDERED TO
CONSTRUCTION MATERIALS

WORK ONLY IN RELATION TO A SPECIFIC ASPECT OF ENGINEERING. CONSEQUENTLY, THE NEED FOR MANY PARTICULAR BRANCHES OF TERRAIN ENGINEERING IS APPARENT. EACH BRANCH BEING RELATED TO A SPECIFIC ENGINEERING EXPECTATION. THEREFORE, ENGINEERING EXPECTATIONS FROM TERRAIN EVALUATION MAY BE OF SUCH VARIETY AS TO DEFY ANY DETAILED ATTEMPT AT DESCRIPTION AND CLASSIFICATION. CATEGORIES ARE DELINEATED IN A TABLE WHICH MAY SERVE TO INDICATE AN AWARENESS OF THE BROAD NATURE OF THE ENGINEERING EXPECTATIONS FROM A TERRAIN EVALUATION. IT MAY BE SEEN THAT A FEASIBILITY STUDY FOR ROAD DEVELOPMENT IN AN UNDERDEVELOPED REGION WOULD INVOLVE THE ENGINEERING EXPECTATIONS OF THE RESULTS OF ALL EARTH SCIENCE STUDIES TOGETHER WITH AWARENESS OF SOIL EQUIVALENT.


THE OBJECT OF THE PUCE (TERRAIN PATTERN–TERRAIN UNIT–TERRAIN COMPONENT–EVALUATION) PROGRAM OF TERRAIN CLASSIFICATION AND EVALUATION IS TO PROVIDE A FRAMEWORK FOR THE STORAGE AND TRANSFER OF TERRAIN INFORMATION RELEVANT TO ENGINEERING PROJECTS, SUCH AS ROAD CONSTRUCTION. THIS PAPER DESCRIBES PROGRESS MADE IN THE DEVELOPMENT OF AN AUTOMATIC STORAGE AND RETRIEVAL SYSTEM FOR TERRAIN CLASSIFICATION AND EVALUATION DATA BASED ON THE PUCE PROGRAM AND DESIGNED FOR USE ON CDC 3600 AND 3200 COMPUTERS IN AUSTRALIA. INFORMATION PERTINENT TO THE TERRAIN CLASSIFICATION SYSTEM IS RECORDED ON SPECIALY DESIGNED DATA SHEETS AND IS FED TO THE COMPUTER BY MEANS OF Punched CARDS FOR STORAGE ON MAGNETIC TAPE. THE PRESENT SYSTEM PERMITS RAPID COLLATION AND PRESENTATION OF DATA. WHEN FULLY DEVELOPED IT WILL FACILITATE THE EXTRAPOLATION OF ENGINEERING INFORMATION FROM ONE LOCALITY TO OTHER AREAS OF SIMILAR TERRAIN AND THE TRANSFER OF DATA FROM ONE ENGINEERING GROUP TO ANOTHER. /AUTHOR/

THE SAND EQUIVALENT TEST FOR QUALITY CONTROL OF QUARRY PRODUCTS

THE USE OF STATISTICAL QUALITY CONTROL IN INDUSTRY HAS LONG BEEN RECOGNIZED AS AN IMPORTANT ADJUNCT TO EFFICIENT OPERATION, BUT IN THE EQUALLY COMPETITIVE FIELD OF ROAD CONSTRUCTION LITTLE IS MADE OF STATISTICAL TECHNIQUES AS AN AID TO SPECIFICATION WRITING AND THE CONTROL OF MATERIAL QUALITY. PAVEMENT MATERIALS ARE CUSTOMARILY SPECIFIED IN TERMS OF PLASTICITY INDEX AND MECHANICAL GRADING: HOWEVER THESE TESTS ARE NOT CONVENIENT FOR THE CONTROL OF PRODUCTION AND THE SAND EQUIVALENT TEST HAS FOUND EXTENSIVE USE IN THIS REGARD. TO EVALUATE THE CONTROL ACHIEVED BY THIS TEST, RESULTS FOR MATERIALS SUPPLIED BY SOME MELBOURNE QUARRIES OVER A PERIOD HAVE BEEN CORRELATED WITH PLASTICITY INDEX AND GRADING RESULTS. AFTER ALLOWING FOR THE EFFECT ON THE SAND EQUIVALENT TEST OF MOISTURE IN THE SAMPLE THE TEST WAS FOUND TO BE A SATISFACTORY INDICATOR OF QUALITY. THE EFFECT OF TEMPERATURE AND THE INFLUENCE OF THE VARIOUS ROCK TYPES, GRADING, AND CLAY CONTAMINATION ON THE SAND EQUIVALENT TEST WAS ALSO INVESTIGATED. THE PAPER CONCLUDES WITH THE DEVELOPMENT OF A TENTATIVE METHOD OF QUALITY CONTROL FOR QUARRY AND PLANT MIXED PRODUCTS USING THE SAND EQUIVALENT TEST /AUTHOR/

2A 229833

THE APPLICATION OF GEOPHYSICAL METHODS TO GRADEING AND OTHER HIGHWAY CONSTRUCTION PROBLEMS

FOR DETERMINING THE PRESENCE AND LOCATION OF SOLID ROCK FOUNDATIONS AND FOR CLASSIFYING SOILS AND OTHER UNDERLYING STRATA WHERE COBBLE SIZE OR SMALLER IS OF CONCERN, THE MORE DETAIL REQUIRED ABOUT THE DEPTH TO MATERIAL OF STILL GREATER RIGIDITY, SUCH AS SOLID ROCK. /AUTHOR/

2A 229839

TOPSOIL, SAND-CLAY AND GRADED MIX ROADS IN SOUTHEASTERN UNITED STATES

TOPSOIL, SAND-CLAY, SAND-CLAY-Gravel, Chert, Pebble, Soil, Disintegrated Granite, Float, and Limerock are used in highway construction for base and surface courses. Gradation should be from course to fine in order that a dense mass may be obtained with as low porosity as possible. Specifications for graduation and physical characteristics are presented for base course materials in tabular form for North Carolina, Georgia, and Alabama. The tables deal with mechanical analysis and physical characteristics of coarse and fine aggregates, including liquid limit, plasticity index, shrinkage limit, moisture equivalent, etc. /HICKS, LD ABERCROMBIE, WF LAND, JL WILLIS, EA HIGHWAY RESEARCH BOARD PROCEEDINGS/

2A 229841

GRADED MIX ROADS IN MISSOURI

THE CONSTRUCTION OF GRADED MIX ROADS DURING 1937-1938 WAS LIMITED TO PROVIDING BASES FOR THEIR BITUMINOUS Wearing COAT TREATMENTS. THE MATERIALS USED, SUCH AS CRUSHED LIMESTONE, CHERT GRavel, and Chert Mine Tailings, are determined by the locality. Since 1937 the depth of stabilized compacted material was increased to 6 in. Mixed in one course and compacted in thin increments by SHEEPSFOOT TAMPERs. OTHER CHANGES THAT DEVELOPED IN THE CONSTRUCTION METHOD AFTER NOTING INCREASED RAVELING AND Pitting, CONSISTED OF TWO COURSE CONSTRUCTION. THE SHORTENED MIXING TIME PRODUCED A FINISHED MIX AND COMPACTED THE MATERIAL TO A DENSE AND STABLE CONDITION WHILE CL Ay-AGGREGATE STABILIZED. /HICKS, LD ABERCROMBIE, WF LAND, JL WILLIS, EA HIGHWAY RESEARCH BOARD PROCEEDINGS/
CONSTRUCTION MATERIALS

ZATION WAS BEING DEVELOPED, THE PRIMARY CONSIDERATION HAS BEEN TO OBTAIN A PLASTIC INDEX OF ABOUT 15. HOWEVER, REGARDLESS OF THE PLASTIC INDEX, LITTLE OR NO RAVELING OCCURS WHEN A THIN BITUMINOUS ARMOR COAT IS APPLIED AFTER THE BASE HAS BEEN PRIMED AND COMPACTED. SOMETIMES A WATER-BOUND MACADAM BASE WILL SUFFICE.

Schappler, RC  Highway Research Board Proceedings

2A 229979
NOTES ON SIMPLE CONDUCTIVITY AND PH MEASUREMENTS AS INDICATORS OF THE PRESENCE OF DELETERIOUS SOLUBLE SALTS IN BASE-COURSES

THE IMPORTANCE OF DELETERIOUS SOLUBLE SALTS IS BECOMING INCREASINGLY RECOGNIZED AS A FACTOR IN CERTAIN ROAD FAILURES IN SOUTHERN AFRICA. EXISTING METHODS IN USE BY ROADS AUTHORITIES FOR THE DETECTION AND DETERMINATION OF SOLUBLE SALTS ARE RELATIVELY TEDIOUS. THE SIMPLE AND EXTREMELY RAPID CONDUCTIVITY AND PH METHODS USED IN PEDOLOGICAL WORK ARE DESCRIBED, AS WELL AS A FEW EXPERIMENTS IN CONNECTION WITH THEIR APPLICATION TO CALCAREOUS. IT IS SUGGESTED THAT THE SATURATED SOIL PASTES CONDUCTIVITY METHOD, CARRIED OUT ON A MATERIAL ALREADY PREPARED FOR AND LEFT OVER FROM A ROUTINE LIQUID LIMIT DETERMINATION, AND SUPPLEMENTED WHEN NECESSARY BY A SIMPLE QUALITATIVE TEST FOR SULFATE—IS PROBABLY ADEQUATE AS AN INDICATOR TEST FOR THE PRESENCE OF DELETERIOUS AMOUNTS AND TYPES OF SOLUBLE SALTS IN ROAD MATERIALS. THE SLIGHTLY LONGER BUT MORE ACCURATE SATURATION EXTRACT METHOD IS ALSO APPLICABLE. CONDUCTIVITY METHODS ARE READILY APPLICABLE TO ALL ROAD CONSTRUCTION MATERIALS INCLUDING NATURAL SOILS, CRUSHER-RUN AND WATERS.

TENTATIVE CONSERVATIVE ONE-FOURTH INCH SOIL PASTE CONDUCTIVITY LIMITS FOR BASE-COURSE OF 3.5 AND 0.5 MHQ/CM ARE SUGGESTED FOR SODIUM CHLORIDE AND SODIUM SULFATE AND MAGNESIUM SULFATE RESPECTIVELY. LIMITS FOR COMPACTION, CURING AND CONCRETE WATERS SHOULD BE ASSESSED AFTER CONSIDERATION OF THE SALINITY OF THE MATERIAL AND THE AMOUNT OF SALTS LIKELY TO BE ADDED BY THE WATER. /ARTICLE/

Nat list: Road Research /South Africa/  Rs/23/68

ACKNOWLEDGMENT: Via /South Africa/

2A 229910
SOIL PARTICLE SIZE DISTRIBUTION BY A CENTRIFUGE METHOD IN COMPARISON WITH SEDIMENTATION PROCESSES

A CENTRIFUGAL SEDIMENTATION METHOD FOR THE ISOLATION OF PARTICLES OF SOIL IN THE MICRON AND SUB-MICRON RANGE IS DISCUSSSED. IT WAS STANDARDIZED AGAINST NORMAL HYDROMETER TECHNIQUES AND HAS PROVED TO BE RAPID AND EFFICIENT. THE CONCENTRATION OF DISPERSING AGENT UNDER CONSTANT TEMPERATURE, WAS FOUND TO BE A VARIABLE WHICH COULD EXPLAIN SOME ABNORMALITIES IN PARTICLE SIZE DISTRIBUTION ANALYSIS. THE PROCEDURE WAS DEVISED FOR THE PURPOSE OF OBTAINING SOIL COLLOIDAL PARTICLES OF APPROXIMATELY KNOWN DIAMETERS, IN ORDER THAT THEIR CHEMICAL AND PHYSICAL PROPERTIES COULD BE INVESTIGATED WITH OTHER SOIL PARAMETERS, IN THE ASSESSMENT OF GRAVEL AS A ROAD-MAKING MATERIAL. THE THEORY UNDERLYING THE METHOD HAS NOT BEEN CONSIDERED. /AUTHOR/

Denham, SC  Main Roads /Australia/ Aug. 1970

ACKNOWLEDGMENT: Australian Road Research Board

2A 229916
GEOLOGIC SETTING OF LANDSLIDES ALONG SOUTH SLOPE OF PINE MOUNTAIN, KENTUCKY

LANDSLIDES ALONG THE SOUTH SLOPE OF PINE MOUNTAIN IN SOUTHEASTERN KENTUCKY ARE INTEGRALLY RELATED TO BEDROCK GEOLOGY. MOST OF THE SLIDES ARE PLANAR BLOCK GLIDES OF SANDSTONE AND INTERBEDDED SHALE AND SILTSTONE THAT HAVE SLID DOWN DIP SLOPES ON FLOORS OF SHALE, COAL, OR UNDERCLAY. THE CENTRAL PORTION OF A 1/2-MILE WIDE SLIDE THAT HAD BEEN STABLE FOR MANY YEARS RECENTLY SLID WHEN THE TOE WAS CUT INTO DURING HIGHWAY CONSTRUCTION. THE OLD SLIDE PROBABLY ORIGINATED AS A PLANAR BLOCK GLIDE, BUT IT DEVELOPED ROTATIONAL ASPECTS AT THE TOE AND FLANKS. STRATA UNDERLYING THE SOUTH SLOPE OF PINE MOUNTAIN ARE OF PENNSYLVANIAN AGE AND INCLUDE MASSIVE SANDSTONE, INTERBEDDED SILTSTONE AND SHALE, AND THIN BEDS OF COAL AND UNDERCLAY. BEDDIP GENERALLY SOUTHEASTWARD BUT FLATTEN ABRUPTLY AT THE FOOT OF THE MOUNTAIN AND ARE NEARLY HORIZONTAL SOUTHERN OF IT. THE CUMBERLAND RIVER FLOWS THIS FLEXURE ALONG MUCH OF PINE MOUNTAIN AND IN MANY PLACES CUTS LATERALLY AGAINST THE DIPPING BEDS. LANDSLIDES HAVE BEEN OCCASIONAL ON THE TOE WHERE DIPPING BEDS MAY OCCUR WHERE DIPPING STRATA OF PINE MOUNTAIN ARE UNDERCUT BY RIVERS OR BY CONSTRUCTION WORK, OLD BUT PRESENTLY STABLE SLIDES MAY BE REACTIVATED WHEN CUT INTO BY HIGHWAY OR OTHER EXCAVATIONS. /AUTHOR/

Froelich, AJ  Highway Research Record, Hwy Res Board

2A 229922
SAFETY FACTORS IN SOIL MECHANICS


Meyerholz, GG  Canadian Geotechnical Journal

2A 229937
CLIMATE, ENGINEERING PETROLOGY AND THE DURABILITY OF NATURAL ROAD BUILDING MATERIALS IN SOUTHERN AFRICA

CONSTRUCTION MATERIALS

Disintegration by Cursing Tests, Especially the 10% Finest Aggregate Crushing Test on Dry and Wet Material. South African Natural Road Building Materials are Divided into Nine Groups According to the Similarity of Their Engineering Properties. The Great Importance of Quartz in Assessing Durability is Stressed and Materials Engineers are Advised to Become Familiar with This Mineral. /Author/

Weinert, HH
Nat Inst Road Research /S Africa/

2A 229975
Soil Tests for Design of Runway Pavements
A Review is Made of the Soil Tests Employed by the U. S. Engineer Department and the Aviation Engineers for the Design of Flexible and Rigid Runway Pavements. Field Bearing Tests and Their Application to Both Flexible and Rigid Pavement Design and the Use of the California Bearing Ratio Test for Flexible Pavement Design Were Investigated. There Will Seldom Be Time to Conduct All the Required Laboratory and Field Tests Before Design and Construction of Runway Pavements. Therefore This Evaluation Has Been Seved Up on the Basis of Field and Simple Laboratory Tests for Quick Classification of the Soils.

Middlebrooks, TA Bertram, GE Camper, WH DISCUSSER Smith, JR DISCUSSER Goldbeck, AT DISCUSSER
Highway Research Board Proceedings

2A 229978
Aerial Photographs and the Distribution of Constructional Materials
Aerial Photographs Record Individual and Distinctive Patterns and Textures of Different Types of Soil and Rock. Aerial Photographs May Best Be Interpreted by Considering Them as Soil Maps or Geologic Maps. These Are Briefly Described and Their Relation to Aerial Photographs is Illustrated. /Author/

Eardley, AJ
Highway Research Board Proceedings

2A 230137
Radar: A Promising Underground Eye for Construction
A New System, Dubbed "ESP," Sends Radar Pulses Down into the Earth and Records the Reflections From Interfaces of Different Soils, Rock, Water, and Buried Conduits. In Operation, Pulses Are Continuously Transmitted and Their Reflections Received With a Small Flat, Four-Wheeled Antenna Unit Towed by a Light Van. A Cable Connects the Unit with Recording Instruments Within the Van. The Tapes Recording the Reflections Are Then Fed Into a Computer, and a Continuous Radar Picture is Printed Out. Geologists Interpret the Pictures and Convert Them to Profile Drawings. Radar Exploration Techniques Now Being Developed Could Be Used for Analyzing the Condition of Existing Pavements and Supporting Subgrade Material and Helping Contractors to Estimate the Yield of Potential Gravel Pits. /Author/

Fourrier, P
New England Construction Vol. 37 No. 4, July 1972, pp 52-3

2A 230281
Subsurface Corrosion Study
Results of Corrosion Testing of Soil Samples Recovered From Borings Made in 1969 Along the Then Benning Route and a Portion of the Pentagon Route of the Washington Metropolitan Area Metro System Are Summarized. The Subsurface Investigation Is Covered by Report No. 28 in the Series. Report No. 32 Contains a Series of Geological Sections Along the Subway, Summary Tables Listing the Test Properties of Soil and Water Samples Relevant to Corrosion Characteristics, and a Text With Some General Conclusions as to the Significance of the Test Data. /Author/

Mueser, Rutledge, Wentworth, & Johnston
Sept. 1969, 185 pp

Acknowledgment NTIS NTIS PB 216 089, SC 61231133

2A 230349
The Need for Uniformity in Testing of Expansive Soils
Numerous and Widely Different Methods Are Currently Available for Testing and Classifying Potentially Expansive Soils and Although There is Considerable Overlap and Some Basic Agreement Between These Methods, There is Also a Simultaneous Lack of Consistency and Great Opportunity for Error. In Many Practical Problems Involving Expansive Soils, an Errorful Misclassification of the Soil Leads to a Level of Treatment Which is Needlessly Costly, Either Due to Subsequent Damage and Repairs or Due to Undeclared to Subsequent Design. The Existing Methods for Recognition and Classification of Expansive Soils Can Be Divided Into Three Main Categories as Follows: (1) Indirect Methods, or Three Main Those Which Employ a Measurement of a Related Soil Property as an Indication of Swell Potential, (2) Direct Measurement of One-Dimensional Swell in a Loaded Swell Test; and (3) Methods of Determining and Calculating the Amount of Swell. In Loaded Swell Tests on Soils of Any Given Composition: (1) Initial Water Content; (2) Initial Dry Density; (3) Soil Structure; (4) Surcharge Load; (5) Solution Characteristics; (6) Time Allowed for Swell; (7) Curing Time for Sample; (8) Stress History; (9) Sample Size and Shape; and (10) Temperature. It Is the Author's Opinion That a Reliability and Reproducibility Test Which Is to Be Considered a Basis for the Classification of Potentially Expansive Soil Must Standardize at Least These Variables: Initial Water Content, Initial Density, Method of Compaction, Surcharge Load or Loads and Sequence of Application, Time Allowed for the Test, Time Required for Sample Curing and Sample Size and Shape. Standardization of These Factors in One Test and Classification Procedure Is Long Overdue and Would Be of Significant Value. Two Test Methods Are Discussed; One Is the Test Method Evolved in Los Angeles in the Late 1960's, and the Other Is the Test Method Proposed by W. G. Holtz and Published in ASTM STP 479, Special Procedures for Testing Soil and Rock for Engineering Purposes, Fifth Edition. 1970.

Krazynski, LM

2A 230350
Controlled Field Tests of Expansive Soils
Research Is Being Conducted by the Waterways Experiment Station (WES) to Investigate Techniques for Reliable and Rapid Laboratory and Field Measurements of Total Suction by Thermocouple Psychrometers. A Laboratory Psychrometer, Two Field Psychrometers (Prototype P and Type F), and a Com-
MERCIALLY AVAILABLE PSYCHROMETER WERE CHOSEN FOR STUDY. THE FIELD THERMOCOUPLE PSYCHROMETERS WERE INSTALLED AT VARIOUS DEPTHS NEAR JACKSON, MISSISSIPPI, AND ON LACKLAND AIR FORCE BASE (LABF) NEAR SAN ANTONIO, TEXAS. FROM THE TEST RESULTS OBTAINED THE FOLLOWING CONCLUSIONS WERE DRAWN: (1) IN THE LABORATORY, TOTAL SUCTION READINGS BY THERMOCOUPLE PSYCHROMETERS ARE IN GOOD AGREEMENT WITH MATRIX SUCTIONS MEASURED BY PRESSURE MEMBRANE APPARATUS AFTER CONSIDERING THE OSMOTIC SUCTION. PSYCHOMETRIC READINGS ARE MADE RAPIDLY AFTER EQUILIBRIUM IS ATTAINED. EQUILIBRIUM IS ATTAINED IN THE LABORATORY WITHIN 24 HOURS. (2) IN SITU SUCTION DATA SHOW GOOD AGREEMENT BETWEEN THE DIFFERENT TYPES OF FIELD PSYCHROMETERS. THE PSYCHROMETER READINGS AT LAEB SHOW A RECENT DRYING TREND WHICH IS GENERALLY CONSISTENT WITH PIEZOMETRIC AND FIELD WATER CONTENT DATA OBTAINED FROM NUCLEAR PROBE MEASUREMENTS. (3) THE LIFESPAN OF THE COMMERCIAL PSYCHROMETER WAS LIMITED AT THE JACKSON AND LACKLAND TEST AREAS, DUE TO CORROSION OF THE ONE-MIL-DIAMETER THERMOCOUPLE, WITH SOME FAILING WITHIN THREE AND NINE MONTHS AFTER INSTALLATION.

Johson, LD Mcanear, CL
Workshop Proceedings Vol. 1 Apr. 1973, pp 137-59, 6 Fig, 6 Tab, 24 Ref

2A 230511

METHOD FOR DETERMINING THE POTENTIAL VERTICAL RISE, PVR (TEXAS TEST METHOD TEX-124-E)

A PROCEDURE IS PRESENTED WHICH PROVIDES A MEANS FOR THE DETERMINATION OF THE POTENTIAL VERTICAL RISE (PVR) IN A SOIL STRATA, SUCH AS MAY BE ENCOUNTERED IN THE PLACEMENT OF A ROADWAY, BRIDGE, OR BUILDING FOUNDATION. A SHORT EXAMPLE IS GIVEN WITH ILLUSTRATION how THE TEST METHOD WORKS. BY USING THE DETERMINATION OF PVR IN CONJUNCTION WITH THE UNIT LOADS TO BE IMPOSED BY THE STRUCTURE, THE ENGINEER MAY CHOOSE OPTIONS ON THE METHODS OF CONSTRUCTION TO BE EMPLOYED AND THE REMEDIAL PROCEDURES TO USE IN SECURING THE GREATEST VALUE FOR HIS CONSTRUCTION MONEY. SOME OF THE CHOICES, DEPENDENT UPON THE DEPTH, AMOUNT OF SWELLING CLAYS, AND OTHER CONDITIONS ARE AS FOLLOWS: (1) REMOVAL OF NEAR THE SURFACE CLAY LAYERS AND REPLACEMENT WITH GRANULAR MATERIAL. (2) PONDING WITH WATER FOR THIRTY OR MORE DAYS TO BRING DRIER CLAYS TOWARD OPTIMUM CONDITIONS. (3) STABILIZATION OR MODIFICATION OF CLAY LAYERS NEAR THE SURFACE USUALLY USING LIME. (4) UTILIZATION OF DENSITY AND MOISTURE CONTROL METHODS AND MOISTURE PRESERVATION SUCH AS ASPHALT MEMBRANES OR WIDE GRANULAR SECTIONS, WHICH IS OF GREAT MERIT AFTER PONDING; (5) EMPLOYING IN BUILDINGS THE USE OF AMPLE STEEL IN GRADE BEAMS, TOP AND BOTTOM, OR THE USE OF HEAVY STEEL IN FOUNDATION SHAFTS AND INSULATING THEM FROM THE CLAY; AND (6) SUCH OTHER MEASURES AS LEAVING AIR SPACE UNDER GRADE BEAMS, SUSPENSION OF FLOORS FROM FOUNDATION SHAFTS OR THE USE OF EXPANSION JOINTS TO SEPARATE THE FLOOR FROM FOUNDATION GRADE BEAMS.

Smith, AW
Workshop Proceedings Vol. 1 May 1973, pp 189-205, 3 Fig, 2 Tab, 4 Ref

2A 230517

FIELD EVALUATION OF NUCLEAR GAGES USED IN COMPACTION CONTROL OF EMBANKMENTS

THIS STUDY WAS DESIGNED TO EVALUATE NUCLEAR MOISTURE DENSITY GAGES UNDER ACTUAL FIELD CONDITIONS. A PRELIMINARY EVALUATION OF ONE NUCLEAR-CHICAGO D/M SYSTEM SHOWED FAVORABLE RESULTS, HENCE A MORE EXTENSIVE STUDY WAS CONDUCTED WITH ELEVEN ADDITIONAL NUCLEAR GAGES. A COMPLETE D/M SYSTEM WAS ASSIGNED TO EACH OF PENNSYLVANIA ENGINEERING DISTRICTS AND USED ON VARIOUS CONSTRUCTION PROJECTS. THESE GAGES WERE USED IN THE FIELD FOR ONE FULL YEAR, AND THE RESULTS WERE COMPARED TO THE SATUNCCO METHOD FOR DETERMINING DENSITY AND THE OVEN-DRIED AND READY MOISTURE METHODS FOR DETERMINING DENSITY CONTENT. TEST RESULTS WERE COMPILED AND TABULATED BY IBM 650 DATA PROCESSING MACHINE. TABULATIONS WERE REQUESTED TO ISOLATE VARIABLES AFFECTING CORRELATION OF NUCLEAR TO SAND-CONE RESULTS. THESE VARIABLES ARE SOIL TYPE, SOIL GRADEATION, CONSTRUCTION TYPE, EMBANKMENT, SOIL CEMENT, SUBBASE, ETC. AND D/M SYSTEMS. STANDARD DEVIATIONS WERE COMPUTED FOR SERIES OF GROUPED TESTS TO DETERMINE THE REPEATABILITY OF BOTH METHODS FOR MEASURING MOISTURE AND DENSITIES OF CONSTRUCTION MATERIALS. /AUTHOR/

Maclean, DJ Lewis, WA
Highway Research Record, Hwy Res Board

2A 230470

ARABIAN SALT-BEARING SOIL (SABKHA) AS AN ENGINEERING MATERIAL

SABKHA IS ESSENTIALLY A CARBONATE SAND CONTAINING VARYING PROPORTIONS OF EVAPORITIC MINERALS AND IS FOUND IN THE SALT FLATS OF THE ARABIAN PENINSULA. THIS REPORT DISCUSSES THE HIGHWAY ENGINEERING PROPERTIES AND USES OF THE MATERIAL AND COMPARED ITS PERFORMANCE WITH THAT OF SIMILAR SALINE MATERIALS IN OTHER ARID AREAS OF THE WORLD. THE MANNER IN WHICH THE EVAPORITIC MINERALS CONTRIBUTE TO THE PERFORMANCE OF THE MATERIAL IN ROAD CONSTRUCTION IS ESSENTIALLY UNDERSTOOD IN ORDER TO FIND OUT MORE ABOUT THEIR INFLUENCE ON THE PERFORMANCE OF SABKHA ROAD BASES. A FULLSCALE EXPERIMENT HAS BEEN CONSTRUCTED TO STUDY THE RELATIVE PERFORMANCE UNDER TRAFFIC OF THREE DIFFERENT SABKHAS USED AS ROAD BASES UNDER A THIN BITUMINOUS SURFACING. /AUTHOR/

Ellis, CI
Transport & Road Research Lab /UK/ R&d Rpt No Lr 523, 1973, 20 pp, 5 Fig, 3 Tab, 2 Phot, 28 Ref

2A 230503

BRITISH PRACTICE IN THE DESIGN AND SPECIFICATION OF CEMENT- STABILIZED BASES AND SUBBASES FOR ROADS


Maclean, DJ Lewis, WA
Highway Research Record, Hwy Res Board

2A 230517

FIELD EVALUATION OF NUCLEAR GAGES USED IN COMPACTION CONTROL OF EMBANKMENTS

THIS STUDY WAS DESIGNED TO EVALUATE NUCLEAR MOISTURE DENSITY GAGES UNDER ACTUAL FIELD CONDITIONS. A PRELIMINARY EVALUATION OF ONE NUCLEAR-CHICAGO D/M SYSTEM SHOWED FAVORABLE RESULTS, HENCE A MORE EXTENSIVE STUDY WAS CONDUCTED WITH ELEVEN ADDITIONAL NUCLEAR GAGES. A COMPLETE D/M SYSTEM WAS ASSIGNED TO EACH OF PENNSYLVANIA ENGINEERING DISTRICTS AND USED ON VARIOUS CONSTRUCTION PROJECTS. THESE GAGES WERE USED IN THE FIELD FOR ONE FULL YEAR, AND THE RESULTS WERE COMPARED TO THE SATUNCCO METHOD FOR DETERMINING DENSITY AND THE OVEN-DRIED AND READY MOISTURE METHODS FOR DETERMINING DENSITY CONTENT. TEST RESULTS WERE COMPILED AND TABULATED BY IBM 650 DATA PROCESSING MACHINE. TABULATIONS WERE REQUESTED TO ISOLATE VARIABLES AFFECTING CORRELATION OF NUCLEAR TO SAND-CONE RESULTS. THESE VARIABLES ARE SOIL TYPE, SOIL GRADEATION, CONSTRUCTION TYPE, EMBANKMENT, SOIL CEMENT, SUBBASE, ETC. AND D/M SYSTEMS. STANDARD DEVIATIONS WERE COMPUTED FOR SERIES OF GROUPED TESTS TO DETERMINE THE REPEATABILITY OF BOTH METHODS FOR MEASURING MOISTURE AND DENSITIES OF CONSTRUCTION MATERIALS. /AUTHOR/

Worona, V Gunderman, WG
Highway Research Record, Hwy Res Board
LIME AND PHOSPHORIC ACID STABILIZATION IN MISSOURI

This Report presents information accumulated since 1958 on a 17.37-MI chemical stabilization project in Worth and Gentry Counties in northwest Missouri. The results of field investigations and laboratory research tests, preliminary to construction in 1961-62, are reviewed. Explanation of the design procedure and on-site mix designs, maximum pavement thickness chart, is included also. Reported are results of tests during construction, and those of subsequent investigations by Benkelman Beam, Rut Gage, Roughometer and core drill. The first section of the Report is limited to details of the lime stabilization on all three projects, F-297/7, and F-297/9, in Worth County and F-524/2, in Gentry County. The second section reviews the design, construction and performance of the 16 test sections composing 2 MI of project F-524/2, Gentry County, in which various combinations of 4- and 6-IN. Thicknesses of rolled stone base were constructed on untreated glacial clay subgrade, on a 5-IN. subbase of that soil mixed with lime or with phosphoric acid, or on a 5-IN. ROLLED STONE SUBBASE. /Author/

Thomas, CE Jones, WG Davis, WC Highway Research Record, Hwy Res Board

EVALUATION OF EXPERIMENTAL STABILIZED SOIL BASE CONSTRUCTION, WEBSTER COUNTY, IOWA

This paper presents a portion of the results of an experimental stabilized soil road base program initiated by the Iowa State highway commission and the Webster county engineers office. The 8.056-MI long site chosen is typical techniques, gradation specifications preceding introduction of the stabilizing agent(s); discussion of use of lime as a pretreating agent for reduction of plasticity and increase of friability, comparison of laboratory and field standard proctor moisture-density relationships in-place field density determinations using oil density and standard proctor penetrometer methods, and variation of unconfined compressive strength of 7-Day moist-cure specimens with variations in moisture and density. /Author/

Hoover, JM Highway Research Record, Hwy Res Board

A SOIL ASPHALT STABILIZATION REPORT

The lack or gradual depletion of aggregate sources within economical distance of many highway construction projects has resulted in an increasing interest in the stabilization of fine-grained soils. Sandey soils are fairly common in this province and deposits can generally be found in close proximity to our highway projects. This has made possible their economic use as a base course material, and sands have been utilized in many instances since 1959, using Portland cement as a stabilizing additive. The past few years have seen increased activity into the development of methods of asphalt stabilization of fine-grained materials. Oregon, Washington, and several U.S. States have had success using these materials in sub-base construction. In this connection a section of base course, employing an asphalt-stabilized sand sub-base, was placed by the Department of Highways during the past season. The purpose of placing this asphalt base were two-fold, being /1/ to evaluate asphalt stabilization of some of our typical sand types under Alberta climatic and environmental conditions, and /2/ to develop a successful alternate to soil-cement for the obvious economic reasons. /NAPA/

Daczyszyn, JM Kathol, B Canadian Tech Asphalt Assoc Proc

SUMMARY OF TREATMENTS FOR HIGHWAY EMBANKMENTS ON SOFT FOUNDATIONS

Evaluation and solution of foundation problems involving highway embankments in New York State are being summarized. Critical soils areas are located and sufficient data obtained to determine the soil properties. By establishing close coordination between the location engineers and soils engineers, it is often possible to avoid critical soils problems having expensive solutions by minor shifts in alignment. The most economical and satisfactory solution to an embankment foundation problem is determined not only by the soil properties, but also by consideration of construction time, right-of-way, location of project, cost and availability of construction materials, and highway geometrics. /Author/

Moore, LH Highway Research Record, Hwy Res Board

OBSERVATIONAL APPROACH AND INSTRUMENTATION FOR CONSTRUCTION ON COMPRESSIBLE SOILS

The observational approach for construction on compressible soil is described, which consists of using observations and measurements to evaluate the performance of structures, both existing and under construction. For the purpose of deciding on corrective measures or improving design and construction of future structures, horizontal and vertical movements, deflection measurement, settlements and heaves, water table, pore water pressure, and engineering properties are measured. The instrumentation includes surveying methods, settlement plates, water level gage, the Wilson slope indicator, piezometers, strain gages, and earth pressure cells. /Author/

Lacroix, Y Highway Research Record, Hwy Res Board

ASPHALTIC STABILIZATION OF SELECTED SAND AND GRAVEL BASE COURSES

A program was conducted in Gratiot County, Michigan, to evaluate substandard base course materials when stabilized with asphalt cements. This field study was correlated to laboratory studies on asphalt percents, temperature of mixing, temperature of testing, Marshall stability and unconfined compression. Tabulated and graphical data is presented to show Marshall stability test results and unconfined compression test results. Asphaltic content, stability and strength were related to total void volume in prepared and tested samples. Maximum strengths and stabilities occurred at densities slightly lower than optimum density for a given mixture. The strength and stability of base course materials varied directly with the asphalt content, inversely with temperature, and directly with density up to a critical density value beyond which density affects are must less. Unconfined compression tests indicate values of 80 to 90 pounds per square inch at temperatures of 77 degrees F would be adequate for
CONSTRUCTION MATERIALS

BASE COURSE CONSTRUCTION MATERIALS STABILIZED WITH ASPHALT CEMENT.

Riley, JC Blomquist, GC Highway Research Circular Hwy Res Board

2A 230554

AUTOMATIC EMBANKMENT ANALYSIS EQUILIBRIUM AND INSTABILITY CONDITIONS

FORMALIZATION OF THE CONCEPT HAS BEEN MADE THAT MANY STRESS STATES OCCUR IN A BODY OF CLAY. EACH STATE DEPENDING UPON THE MANNER IN WHICH FINAL CONFIGURATION OF THE BODY WAS OBTAINED. THE RESTRICTED CLASS OF SOLUBLE BOUNDARY VALUE PROBLEMS WERE EXTENDED BY THE USE OF THE FINITE ELEMENT METHOD FOR PLANE ELASTICITY AND THE SOLUTION OF THE RESULTING ALGEBRAIC EQUATIONS BY DIGITAL COMPUTER. THE DIFFERENCE BETWEEN BUILT-UP AND CUT-DOWN EMBANKMENTS WAS ILLUSTRATED PRINCIPALLY WITH REFERENCE TO POSSIBLE SLIP-LINES. AN AUTOMATIC PLOT OF THESE LINES TOGETHER WITH PRINTOUT STATEMENTS OF A MEASURE OF SAFETY FOR EACH LINE ALLOWED THE POTENTIAL FAILURE SURFACES IN AN EMBANKMENT TO BE ACCURATELY DESCRIBED. THE IMPORTANCE OF THE INITIAL LOCAL STATE OF STRESS IN THE EARTHS SURFACE PRIOR TO CONSTRUCTION OF AN EMBANKMENT WAS GRAPHICALLY ILLUSTRATED.

Brown, CB King, IP Geotechnique UK

ACKNOWLEDGMENT: Highway Res Abstracts Hwy Res Board

2A 230556

A METHOD OF DETERMINING SWELL POTENTIAL OF AN EXPANSIVE CLAY

THE SWELL PREDICTION METHOD PROPOSED BY THE AUTHORS UTILIZES THE RESULTS OF CONSOLIDOMETER TESTS ON UNDISTURBED SAMPLES OF THE SWELLING CLAY. A UNIQUE SPLIT TUBE SAMPLER WITH REMOVABLE INNER RINGS WAS DEvised AND BUILT TO OBTAIN THE SAMPLES. SEPARATE CONSOLIDOMETER SAMPLES ARE TESTED FOR EACH OF THREE LOADING CONDITIONS TO SIMULATE: (1) SWELL DUE TO UNLOADING ONLY; (2) SWELL DUE TO SATURATION ONLY AND (3) SWELL DUE TO BOTH UNLOADING AND SATURATION. SINGLE LOADING AND UNLOADING CYCLES ARE USED TO EXPEDITE TEST RESULTS. THE CONSOLIDOMETER DATA, IN CONJUNCTION WITH THE ACTUAL LAYER THICKNESS OF THE SWELLING CLAY, ARE THEN USED TO PREDICT THE AMOUNT OF SWELLING TO BE EXPECTED AT GRADE. THE RESEARCHERS HAVE NOT YET HAD THE OPPORTUNITY TO USE THEIR METHOD TO PREDICT SWELLING IN ACTUAL HIGHWAY CONSTRUCTION, BUT A POST FACTO PREDICTION ON AN AREA OF OBVIOUS PAVEMENT DISTRESS CHECKED THE ACTUAL SWELL TO WITHIN APPROXIMATELY FIVE HUNDREDTHS OF A FOOT. /BPR/

Budge, WD Sampson, E Schuster, RL Colorado University Hpr-1/2

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4650002 65)

2A 230557

STABILIZATION OF SILTY SOILS IN ALASKA, PART 1


Peyton, HR Lund, JW Alaska Department Highways

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4650002 65)

2A 230560

SOIL-CEMENT CONSTRUCTION USING LOESS SOIL

GRANULAR MATERIALS SUITABLE FOR HIGHWAY BASE COURSES ARE SCARCE IN WESTERN IOWA THIS PAPER REPORTS ON THE DESIGN CONSTRUCTION PROCEDURES AND PROBLEMS, AND RESULTS OF LABORATORY AND FIELD TESTING INVOLVED IN THE CONSTRUCTION OF TWO EXPERIMENTAL SECTIONS OF TWO ROADS IN WESTERN IOWA IN WHICH LOESS SOIL-CEMENT WAS USED AS THE BASE CLAY CONTENT AND CONSOLIDATION STRONGLY AFFECTED THE DEGREE OF PULVERIZATION ATTAINABLE GOOD VALUES OF EITHER BEING TROUBLESOME HEAVY SPIKE DRAGS CAUSED COMPACTION PLANES ON BOTH SECTIONS A SINGLE BITUMINOUS SEAL COAT DID NOT ADEQUATELY PROTECT THE BASE ON ONE ROAD TWO COATS APPEARED SATISFACTORY ON THE OTHER IN GENERAL FREEZE-THAW LOSSES FROM CORES TAKEN FROM THE COMPLETED ROADS WERE GREATER THAN THOSE FROM CORRESPONDING LABORATORY SPECIMENS UNCONFINDED COMPRESSIVE STRENGTH OF CORES AT 8 DAYS CURING AVERAGED 400 PSI LESS THAN 7-DAY LABORATORY SPECIMENS


ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4310001 65)

2A 230583

QUALITY CONTROL ANALYSIS, PART 2, SOIL AND AGGREGATE BASE COURSE

AN ATTEMPT HAS BEEN MADE TO DETERMINE THE EXTENT OF VARIABILITY OF SOIL AND AGGREGATE BASE COURSE CHARACTERISTICS USING DATA COLLECTED FROM COMPLETED PROJECT FILES ONE OF THE BASIS OF THIS VARIABILITY NUMERICAL LIMITS HAVE BEEN ESTABLISHED USING STATISTICAL QUALITY CONTROL TECHNIQUE THE HISTORICAL DATA TEND TO FOLLOW NORMAL DISTRIBUTION UNSTABILIZED AGGREGATE BASE COURSE HAS LESS VARIABILITY THAN STABILIZED BASE COURSES AND THE SIGMAS ARE CONSIDERABLY DIFFERENT FOR DIFFERENT CONTRACTORS.

Iowa State Highway Commission Jan65, Jan. 1965

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4650002 65)

2A 230587

STABILIZATION OF SILTY SOILS IN ALASKA-PHASE II

PREVENTION OF FROST HEAVE AND OF STRENGTH LOSS ON THE WINTER TREATMENT OF THE A-4 TYPE USED FOR HIGHWAY CONSTRUCTION IN ALASKA WERE STUDIED EFFECTS OF PORTLAND CEMENT TETRA SODIUM PYROPHOSPHATE TSPP CALCIUM CHLORIDE SODIUM HYDROXIDE TRI SODIUM PHOSPHATE AND PLASTIC MEMBRANES ON HEAVE RATE HEAVE RATIO FROST PENETRATION PERMEABILITY AND AFTER THAW CALIFORNIA BEARING RATIO WERE CONSIDERED TSPP WAS THE ONLY CHEMICAL WHICH

Louisiana Department Highways

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4721183 65)

2A 230597

STABILIZATION OF SILTY SOILS IN ALASKA-PHASE II
CONSTRUCTION MATERIALS

2A

EFFECTIVELY REDUCED PERMEABILITY. TSPP AT 0.5% RATE AND SODIUM HYDROXIDE AT 0.3% RATE WERE MOST EFFECTIVE TREATMENTS FOR FROST HEAVE CONTROL. TSPP TREATMENT COSTS ABOUT $2 PER CU YD AND SODIUM HYDROXIDE ABOUT $1.70 PER CU YD. PROVIDING A CLOSED SYSTEM BY USE OF A PLASTIC MEMBRANE ALSO PROVED SUCCESSFUL.

Peyton, Kennedy, Lund,
Alaska University

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4651022 66)PB 174 ‘247,
IC62020038, IC62020379, IC6202066

2A 230636

STABILIZATION OF CHINLE CLAY BY ELECTRO-OSMOTIC TREATMENT - PHASE II


O. BANNON Niese, Kuhn, Lee,
Arizona State University

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4651032 67)PB 176 176,
IC62020103

2A 230647

SUATIBILITY OF SYNTHETIC AGGREGATES MADE FROM CLAY-TYPE SOILS FOR USE IN FLEXIBLE BASE

AN INVESTIGATION WAS CONDUCTED TO DETERMINE THE LIMITING RANGE OF NATURAL SOILS WHICH CAN BE FIRED TO PRODUCE AGGREGATES SUITABLE FOR USE IN FLEXIBLE BASE MATERIALS. THE FINDINGS OF THE LIMITED STUDY ARE LISTED: (1) THE CLAY MATERIALS, MONTMORILLONITE, ILLITTE, AND KAOLINITE WILL NOT HYDRATE UNDER ATMOSPHERIC CONDITIONS ONCE THEY ARE COMPLETELY DEHYDRATED. THEY BECOME CHEMICALLY STABILIZED FOR USE AS HIGHWAY CONSTRUCTION MATERIALS. COMPLETE DEHYDRATION CAN BE ACCOMPLISHED BY HEATING THE CLAY TO 1400 DEGREES F FOR A PERIOD OF 15 MINUTES. (2) INCOMPLETE DEHYDRATION OF AGGREGATES MADE BY DEHYDRATING CLAY-TYPE SOILS CAN BE DETECTED BY A RELATIVELY SIMPLE LABORATORY TEST. (3) MOST CLAY-TYPE SOILS HAVING A RELATIVELY HIGH STRENGTH WHEN AIR-DRIED CAN BE FIRED TO PRODUCE HARD, DURABLE AGGREGATE SUITABLE FOR USE IN FLEXIBLE BASE AND ASPHALTIC CONCRETE. IT IS INDICATED THAT SYNTHETIC AGGREGATES PRODUCED FROM SOILS THAT ARE SUITABLE FOR FLEXIBLE BASE AND ASPHALTIC CONCRETE WILL USUALLY BE SUITABLE FOR USE AS PORTLAND CEMENT CONCRETE AGGREGATES. HOWEVER, THERE ARE MANY CHEMICAL COMPOUNDS PRESENT IN SYNTHETIC AGGREGATES PRODUCED FROM NATURALLY OCCURRING SOILS. SOME, THOUGH NOT DETRIMENTAL IN FLEXIBLE BASE AND ASPHALTIC CONCRETE APPLICATION, MAY ADVERSELY AFFECT THE HYDRATION OF PORTLAND CEMENT CONCRETE.

Moore, WM Van, PELT R Scrivner, FH Kunze, GW
Texas Transportation Institute, Texas State Department of Highways & Public Trasp, Bureau of Public Roads /US/

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4811416 66)PB 178 157,
IC62021168

2A 230659

LIME TREATED SOILS FOR PAVEMENT CONSTRUCTION PROPERTIES AND CHARACTERISTICS OF LIME-SOIL MIXTURES ARE DISCUSSED AND THE SUITABILITY DEMONSTRATED OF SUCH MIXTURES FOR USE IN PAVEMENT STRUCTURES. CRITERIA ARE PRESENTED FOR EVALUATING SOIL-LIME MIXTURES FOR USE IN MODIFIED SUBGRADES, SUBBASES AND BASE COURSES. THESE CRITERIA WERE DEVELOPED FROM BOTH LABORATORY AND FIELD EXPERIMENTS. PLUS AS THEORETICAL STRESS COMPUTATIONS. FOR EXAMPLE, IF A SOIL-LIME SUBBASE HAVING AN 8-INCH COVER IS TO BE CONSTRUCTED (BASE PLUS BITUMINOUS SURFACING = 8 INCHES), LABORATORY SPECIMENS OF THE SOIL-LIME MIXTURE, CURLED IN A MANNER EQUIVALENT TO THAT EXPECTED IN THE FIELD AND THEN IMMERSED IN WATER FOR 8 DAYS, SHOULD RETAIN AN UNCONFINED COMPRESSIVE STRENGTH OF 1. EAST PSI. CURED SPECIMENS OF THE MIXTURE SUBJECTED TO 3, 7 OR 10 FREEZE-THAW CYCLES SHOULD RETAIN STRENGTHS OF 70, 110 OR 140 PSI, RESPECTIVELY. AFTER BEING IN SERVICE FOR ONE WINTER, THE ACTUAL SUBBASE SHOULD RETAIN A STRENGTH OF AT LEAST 40 PSI.

Thompson, MR
Illinois University, Urbana, Illinois Division of Highways, Bureau of Public Roads /US/

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4651152 66)IC62020234, IC62020676, IC62020763, IC62021324, IC62021259, IC62020792, IC63020299

2A 230673

BENEFICIATION OF LOW GRADE SOILS - PART I

RESULTS ARE PRESENTED OF A TESTING PROGRAM OF 9 CLAY SOILS THAT HAVE BEEN DEFINED AS PROBLEM SOILS BECAUSE THEY EXHIBIT HIGH VOLUME CHANGES. HAVE LOW BEARING VALUES WHEN WET AND ARE HIGHLY ELASTIC, WHICH MAKES THEM DIFFICULT TO COMACT. THE SOILS WERE STABILIZED WITH HIGH-CALCUM, HYDRAULIC HYDROTreated LIME. THE EFFECTS OF LIME ON THE ATTERBERG LIMITS, CBR AND UNCONFINED COMPRESSIVE STRENGTH ARE PRESENTED. THE MAJOR CONCLUSION IS THAT LOW GRADE SOILS OF PUERTO RICO CAN BE IMPROVED BY LIME TREATMENT TO THE EXTENT THAT THEY ARE ACCEPTABLE HIGHWAY CONSTRUCTION MATERIALS.

Puerto Rico Department Public Works, Bureau of Public Roads /US/

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4651137 68)IP62080792, IC62020103

2A 230706

DETERMINATION OF DESIGN COEFFICIENTS FOR SOIL-MIXTURES FOR USE IN THE ILLINOIS FLEXIBLE PAVEMENT STRUCTURAL DESIGN PROCEDURE


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BE USED EFFECTIVELY AND ECONOMICALLY AS QUALITY HIGHWAY CONSTRUCTION MATERIALS. THE WORK WAS UNDERTAKEN TO PERMIT APPLICATION OF THE FINDINGS IN HFR-76 IN PAVEMENT DESIGN BY DEVELOPING TENTATIVE STRENGTH COEFFICIENTS AND MATERIAL REQUIREMENTS AND LIMITATIONS FOR INCLUSION OF THE USE OF LIME-STABILIZED-SOIL MIXTURES AS BASE AND SUBBASE IN THE ILLINOIS FLEXIBLE PAVEMENT STRUCTURAL DESIGN PROCEDURE. /BPR/

Acknowledgment: Bureau of Public Roads /US/ 1C6202131

Thompson, MR
Illinois Division of Highways, Bureau of Public Roads /US/ No Hfr-94

2A 240714
FINAL SUMMARY REPORT MATERIALS DEVELOPMENT AND UTILIZATION

STUDY OBJECTIVES WERE TO DEVELOPE TECHNIQUES AND PROCEDURES FOR ACHIEVING MAXIMUM UTILIZATION OF LOCAL AND ON-SITE MATERIALS IN PAVEMENT CONSTRUCTION WITH PARTICULAR REFERENCE TO ILLINOIS SOILS AND MATERIALS. STABILIZATION TECHNIQUES CONSIDERED WERE CEMENT, LIME, BITUMINOUS, LIME-FLY ASH, AND COMBINATION (LIME-CEMENT, LIME-BITUMEN). RESEARCH FINDINGS FROM THE STUDY HAVE BEEN PREVIOUSLY DISSEMINATED IN VARIOUS REPORTS. THE REPORTS ARE REFERENCED AND ABSTRACTED IN THE FINAL SUMMARY REPORT. COMMENTS CONCERNING RESEARCH IMPLEMENTATION, RESEARCH BENEFITS, AND FOLLOW-UP RESEARCH ARE PRESENTED. /BPR/

Acknowledgment: Bureau of Public Roads /US/ REPORT PENDING. 1C62021967

Thompson, MR
Illinois Division of Highways, Bureau of Public Roads /US/ No Hfr-94

2A 240715
IMPROVED TENSILE STRENGTH FOR CEMENT-TREATED BASES AND SUBBASES

THIS REPORT SUMMARIZES THE FINDINGS OF AN EVALUATION AND INTERPRETATION OF THE RESULTS FROM PREVIOUS STUDIES CONCERNING THE TENSILE AND SHRINKAGE CHARACTERISTICS OF CEMENT-TREATED MATERIALS. THE EFFECTS ON TENSILE STRENGTH PRODUCED BY EIGHT FACTORS PREVIOUSLY SHOWN TO BE IMPORTANT ARE ANALYZED IN DETAIL, AND THE EFFECTS ARE EVALUATED IN TERMS OF THEIR SIGNIFICANCE AND RELATIONSHIP TO SHRINKAGE CRACKING OF CEMENT-TREATED MATERIALS. BASED ON THESE EVALUATIONS, A MODIFICATION IS PROPOSED FOR THE TEXAS HIGHWAY DEPARTMENT MIX DESIGN PROCEDURE, WHICH SHOULD IMPROVE TENSILE STRENGTH AND MINIMIZE SHRINKAGE CRACKING. IN ADDITION, RECOMMENDATIONS REGARDING THE CONSTRUCTION OF CEMENT-TREATED BASES AND SUBBASES FOR IMPROVED TENSILE STRENGTH AND REDUCED SHRINKAGE CRACKING ARE MADE. /FHWA/

Acknowledgment: Bureau of Public Roads /US/ 1C6202131

Caulley, RF Kennedy, TW
Texas Univ, Center for Highway Research Interim 1996. 50 pp

Acknowledgment: Texas Highway Department, Federal Highway AdministrationFHWA 50119, NTIS PB 222 779, 1C62023289

2A 240791
STRENGTH GAIN PHENOMENON IN EARTHEEN EMBANKMENT CONSTRUCTION

CONSTRUCTION OF EMBANKMENTS ON SOILS OF VERY LOW SHEAR STRENGTH OR BEARING CAPACITY DEMANDS AN ADEQUATE KNOWLEDGE OF THE RATE OF STRENGTH-GAIN AS THE CONSOLIDATION OR SETTLEMENT OF SUBSOIL PROGRESSES DUE TO EMBANKMENT LOADS. LABORATORY INVESTIGATIONS WERE CARRIED OUT TO KNOW THIS STRENGTH-GAIN PHENOMENON OF THREE PROBLEMATIC TYPES OF SOILS AT DIFFERENT PERCENTAGE OF CONSOLIDATION UNDER DIFFERENT LOAD-INCREMENTS. /RRL/A

Sutaria, TC Indian Roads Congress Road Res Bull

Acknowledgment: Road Research Laboratory /UK/

2A 240807
BASES AND FOUNDATIONS

CONTENTS: EVALUATION OF THE STRENGTH OF BASES DETERMINATION OF FOUNDATION DISPLACEMENT SURFACE FOUNDATIONS EXECUTION OF SURFACE FOUNDATION CONSTRUCTION WORKS ON LAND COVERED WITH WATER SOIL STABILIZATION FILE FOUNDATIONS AND ISOLATED FILES CONSTRUCTION OF FILE FOUNDATIONS AND ISOLATED FOUNDATIONS LARGE VOLUME FOUNDATIONS FOUNDATIONS UNDER SPECIAL CONDITIONS CHOICE OF THE TYPE OF FOUNDATION AND BASE /LCPC/A/RRL/

Kosterin, EV Vyssaja Skola /USSR/

Acknowledgment: Road Research Laboratory /US/ 1C62022413

2A 240820
PRACTICAL APPLICATION OF ELECTRO-OSMOSIS

WHERE OTHER METHODS HAVE FAILED ELECTRO-OSMOSIS HAS PROVED SUCCESSFUL IN STIFFENING WET CLAYS. IT IS ALSO EFFECTIVE IN LOWERING THE WATER-TABLE TO ALLOW FOUNDATIONS TO BE CONSTRUCTED, TO RECLAIM BOGGED AND SALTED AREAS, AND TO DRAW CHEMICAL STABILIZER INTO THE SOIL TO STABILIZE THE SUBSOIL. THE PRINCIPLE OF ELECTRO-OSMOSIS IS DESCRIBED, AS ARE EXAMPLES OF ITS APPLICATION IN VARIOUS COUNTRIES. /RRL/

Gladwell, JK New Zealand Engineering

Acknowledgment: Road Research Laboratory /UK/

2A 240824
ROLE OF THE CALCULATED RISK IN EARTH WORK AND FOUNDATION ENGINEERING

THE MEANING OF THE TERM CALCULATED RISK IS FIRST EXPLORED AND THE TERMS UNKNOWN RISK AND HUMAN RISK ARE INTRODUCED. SEVERAL CASE HISTORIES ARE THEN REVIEWED FOR THE PURPOSE OF DEMONSTRATING THE IMPORTANCE OF RISKS IN EARTHWORK AND FOUNDATION ENGINEERING. THE FINAL SECTION DEALS WITH THE QUESTION OF HOW TO COPE WITH RISKS, WITH EMPHASIS ON THE USE AND ABUSE OF BOARDS OF CONSULTANTS FOR PROJECTS INVOLVING GREAT HAZARDS TO LIFE AND PROPERTY. /RRL/A

Casagrande, A Am Soc Civil Engr J Soil Mech Div

Acknowledgment: Road Research Laboratory /UK/

2A 240834
SOIL SOLIDIFICATION AND SOIL STABILIZATION IN ROAD CONSTRUCTION, PARTS 1 AND 2

THE AUTHOR DISCUSSES SOIL SOLIDIFICATION AND STABILIZATION USING MECHANICAL METHODS, CEMENT, BITUMINOUS BINDERS, LIME, AND SOME CHEMICALS, AND THE ADVANTAGES AND DISADVANTAGES OF EACH METHOD. MECHANICAL STABILIZATION IMPROVES THE PARTICLE DISTRIBUTION AND INTERNAL FRICTION, STABILIZATION WITH CEMENT INCREASES THE BEARING CAPACITY OF SOIL, BITUMINOUS BINDERS CAN IMPROVE THE SUB-SOIL, BUT CANNOT BE USED WITH PLASTIC SOILS. LIME CHANGES THE SOIL STRUCTURE AND IMPROVES THE SOIL, PARTICULARLY WHEN APPLIED TO COHESIVE SOILS, AND IS, THEREFORE, PARTICULARLY RECOMMENDED FOR USE WITH THESE. BASICALLY THE METHOD SELECTED SHOULD DEPEND UPON THE SOIL BEING STABILIZED. /RRL/

Klinger, B Strassenbau Technik Cologne /GER/

Acknowledgment: Road Research Laboratory /UK/

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CONSTRUCTION MATERIALS

2A 230839

COMPACTION OF FINE SANDS

Some data on the compaction of clean fine sand pumped from Botany Bay and used as filling on extensions of Sydney Airport, and also of a fine dune sand used in the construction of a highway on the same project, are described. The compaction results indicate that clean fine sands can be readily compacted with pneumatic-tyred rollers, and also that the compaction which can be achieved increases with increase in tyre pressure, though the increase was not great for tyre pressures in excess of about 40 lb/sq in. /RRL/

Cockrane, RH Australian Civil Eng & Construction

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 230983

THE NATURE AND PROPERTIES OF THE SUBGRADE SOIL AT MELBOURNE AIRPORT

During civil engineering construction and near Melbourne Airport, the soil was found to be very unstable after rain, and construction traffic tended to become bogged. The unusual sensitivity to rainfall was found to be due to the high concentration of sodium chloride in the soil together with approximately 40 per cent of the clay mineral Montmorillonite. When the salt concentration in the soil water was reduced by rain the Montmorillonite tended to disperse, resulting in a rapid decrease in strength. The addition of lime to the soil prevents dispersion and 1 per cent would be expected to produce a strong and stable material. /RRL/A/

Russam, K Dumbleton, MJ Australian Road Research Board Proc

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 230862

LIME STABILIZATION, CALIFORNIA EXPERIENCE WITH LIME TREATMENT IN ROAD CONSTRUCTION

The chemical reactions of hydrated lime and its application to various aggregates are discussed. The technique of drill-lime stabilization is outlined and an example cited of its successful employment. Treatment with lime requires the correct amount of lime and water, uniform mixing, proper compaction and adequate curing. It is most effective with clayey soils and gravel clay mixtures with which it may cause an increase in friability, sand equivalent and R-value, resistance to deformation, and a decrease in plasticity index and amount of volume change. Reference is made to research projects carried out in this field by the materials and research department of the Division of Highways. /RRL/

Zube, E Gates, C California Highways & Public Works

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 230865

LIME IS A PROBLEM SOLVER WITH WISCONSIN GLACIAL SUBGRADES

Soil stabilization methods on a number of road projects in Wisconsin since 1961 are described. As well as lime, these methods have been used, but the article deals mainly with the application of lime. /RRL/

Roads and Streets

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 230895

THE PROPERTIES OF CHALK IN RELATION TO ROAD FOUNDATIONS AND PAVEMENTS

Studies have been made of a number of properties of chalk with particular reference to road construction. The moisture retention properties, permeability, and frost susceptibilities of a wide range of chalks have been examined. The relation between the heave and the saturation moisture content is given for recompacted samples ranging from the chalk to oolitic limestone. The effect on the frost susceptibility of recompacted soft chalk of grading, stabilization with cement and adding Bentonite has also been examined. Although the addition of cement reduced the frost heave, comparison of the results with Bentonite suggested that the primary effect of the cement was to reduce its mechanical sensitivity. Following on preliminary laboratory experiments, therefore, a method was evolved, in which the bitumen coating is strengthened with glass fiber wool and thus rendered more able to withstand mechanical loading. The tests showed that a foundation soil treated in this way remained intact even when rain water had intermixed with plastic soil. In the section of the Fulda-Wurzburg motorway under construction, because of the bad summer for construction work of 1963, the method was used on a large scale. In the course of construction, because of the initially soft condition of the bitumen coating, the emulsion was replaced by hot bitumen. In summary, it is established that a bitumen/glass fiber wool covering is a useful and economic remedy for foundation soil which is sensitive to the weather. /RRL/

Stahlf, U Bitumen /Germany/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 230901

EXPERIENCE IN THE CONSTRUCTION OF ROAD EMBANKMENT ON SOFT SOILS

This well-known American expert reports on the problems of road construction in the U.S.A. on soils of low load carrying capacity, including excavation and displacement of weak soils and the value of sand drains. U.S.A. experience is summarized by the author as follows: 1/ If soft, humus layers are underneath road fills, more or less uneven settling is the result, producing more or less wavy
ROAD SURFACES AND VERY OFTEN OVER-EXPENSIVE REPAIRS. IN THE PEAT BLASTING METHOD WITH THE HELP OF JETTING OF PREPARED CHARGES SHOULD BE DEVELOPED IN LARGE-SCALE TESTS, AND THE DRIVING OF SAND DRAINS THROUGH ORGANIC SOILS OF WEAK STRUCTURE IS NOT ONLY A WASTE OF MONEY BUT OFTEN CAUSES DIFFICULTIES WHICH COULD BE AVOIDED WITHOUT SAND DRAINS. SHOULD, HOWEVER, SAND DRAINS BE ADVISABLE IN A PARTICULAR CASE, THEY MUST BE SO LAID THAT THE SOFT SOIL STRATUM IS DISTURBED AS LITTLE AS POSSIBLE. /RRL/

Casagrande, L Strasse Und Autobahn /Germany/

Acknowledgment: Road Research Laboratory /UK/

2A 230902
ROAD STABILIZATION WITHOUT BINDERS
SERVICE ROADS ARE STILL EXTENSIVELY BEING BUILT BY SOIL STABILIZATION WITHOUT BINDERS. THE FOLLOWING METHODS OF STABILIZING WITHOUT BINDERS ARE DISCUSSED: 1/ SCREENED (CLASSIFIED) STONE (CHIPPINGS), 2/ UNSCREENED STONE, AND 3/ MECHANICAL COMPACTING. IN THIS CONTEXT, SOME WELL-BUILT ROADS OF THE STATE AND PRIVATE FORESTRY UNDERTAKINGS ARE INSTANCED WHERE STABILIZATION WITHOUT BINDERS HAS BEEN USED ALMOST EXCLUSIVELY. IN THESE CASES, LOCALLY AVAILABLE MATERIALS ARE PREDOMINANTLY USED. /RKL/

Klempert, B Wasser Und Boden /Germany/

Acknowledgment: Road Research Laboratory /UK/

2A 230903
PEAT BLASTING IN THE CONSTRUCTION OF THE HOLLAND LINE

Kipp, R Strasse Und Autobahn /Germany/

Acknowledgment: Road Research Laboratory /UK/

2A 230907
TECHNOLOGICAL QUESTIONS ON STABILIZATION IN ECONOMIC FARM ROAD CONSTRUCTION
THE TOOLS REQUIRED FOR THE MIXED-IN-PLACE METHOD FOR SOIL CONSOLIDATION ARE COMPARED. INFLUENCES SUCH AS SIZE OF SECTIONS, DISTANCE THE BUILDING MATERIALS HAVE TO BE TRANSPORTED, ATMOSPHERIC CONDITIONS AND MANAGEABILITY ARE CONSIDERED. THE COMPARISON FAVORS THE EMPLOYMENT OF SINGLE MIXERS, WHICH ALLOW CONTINUOUS PRODUCTION AND INVOKE LITTLE COST. AT A DAILY PRODUCTION OF 2,000 SQUARE METERS, THE SAVING, AS COMPARED TO MULTIPLE MIXERS, IS APPROXIMATELY 10 PER CENT. HOWEVER, THEY ARE MORE ADAPTABLE TO WEATHER CONDITIONS AND ARE ESPECIALLY ADVANTAGEOUS WHEN HYDRAULIC BINDERS ARE USED. /RRL/FG/

Freudeleburg, G Fauth, C Strasse, Berlin /Germany/

Acknowledgment: Road Research Laboratory /UK/

2A 230912
AN EXAMPLE OF EMBANKMENT CONSTRUCTION ON SOFT GROUND- COURTENAY BAY CAUSEWAY
THE COURTENAY BAY CAUSEWAY PROVIDES A TWO LANE HIGHWAY LINK BETWEEN EAST SAINT JOHN AND THE CITY OF SAINT JOHN NEWBRUNSWICK. IT IS ABOUT ONE-HALF MILE LONG, 30 FEET IN MAXIMUM HEIGHT, AND CUTS OFF THE NORTH END OF COURTNEY BAY FROM THE SEA. SIGNIFICANT SITE CONDITIONS ARE FOUNDATION SOIL CONSISTING OF UP TO 6 FEET OF ORGANIC Silt and silt-like CLAY, AND A NORMAL TIDAL RANGE OF ABOUT 28 FEET. THE CAUSEWAY, AS BUILT, UTILIZED ABOUT 114,000 CU. YDS. OF QUARTZITE ROCK FILL ON A SAND AND GRAVEL BLANKET LAYER OF 78,000 CU. YDS. THE PAPER PRESENTS A CASE HISTORY OF DESIGN AND CONSTRUCTION WITH OBSERVATIONS OF SETTLEMENT AND PERFORMANCE. /CGRA/

Estes, W Matich, MA Transactions Engineering Inst /Can/

2A 230919
THE CONSOLIDATION OF PEAT - A LITERATURE REVIEW
A CHARACTERISTIC FEATURE OF PEATS IS THEIR EXTREMELY COMPRRESSIBLE NATURE, CONSEQUENTLY, CONSTRUCTION OF ROADS AND OTHER STRUCTURES ON PEATS NORMALLY CAUSES EXTENSIVE SETTLEMENT. APPLICATION OF THE CLASSICAL CONSOLIDATION THEORY IN THE ANALYSIS OF SETTLEMENT OF PEATS HAS PRODUCED CONSIDERABLE DISCUSSION, AS HAS THE QUESTION OF THE RELATIVE CONTRIBUTIONS OF PRIMARY AND SECONDARY CONSOLIDATION TO THE OVER-ALL SETTLEMENT, A LARGE BODY OF LITERATURE HAS ACCUMULATED ON THE PROBLEM OF CONSOLIDATION OF PEAT, BOTH IN THE LABORATORY AND IN THE FIELD. THE GREAT MAJORITY OF THIS LITERATURE HAS BEEN PRODUCED SINCE 1958 WITH AN EXTENSIVE INCREASE IN CONSTRUCTION ON PEATLANDS. THIS REPORT BRIEFLY REVIEWS THE LITERATURE. /CGRA/

Macfarlane, I C Nrc Div Bldg Res Tech Papers

2A 230922
LIME STABILIZATION ON BOUCHERVILLE BYPASS
FOR THE FIRST TIME QUEBEC WILL USE HYDRATED LIME TO STABILIZE CLAY SOILS. SOIL CEMENT WAS USED AS A STABILIZATION FACTOR AND ITS USE IS INCREASED. /CGRA/

Heavy Construction News /Canada/

2A 230925
SURCHARGE DISPLACES 20 FT BOG
THE PROBLEM WAS TO BUILD A HIGHWAY OVER AN OLD LAKEBED OF UNSTABLE MARL. TO CONSTRUCT A STABLE FOUNDATION, THE MUCK WAS DISPLACED BY A ROLLING SURCHARGE OF SAND. THE WORK HAD TO BE CARRIED OUT DURING THE WINTER AND COMPLETED BEFORE THE SPRING THAW TO PREVENT THE MACHINERY FROM GETTING BOGGED DOWN. /CGRA/

Salmins, G Engineering and Contract Record /Can/

2A 230931
PROCEEDINGS OF THE SIXTH INTERNATIONAL CONFERENCE ON SOIL MECHANICS AND FOUNDATION ENGINEERING VOLUME II
CONTENTS: DIVISION 3' SHALLOW FOUNDATIONS AND PAVEMENTS. THE THEORY AND PRACTICE FOR FOUNDATIONS OF BUILDINGS AND OTHER WORKS, INCLUDING BEARING CAPACITY, PRESSURE DISTRIBUTION, SETTLEMENT, UNDERPINNING AND LABORATORY METHODS OF FOUNDATIONS INCLUDING THOSE FOR ROADS, RUNWAYS, AND RAIL TRACKS. DIVISION 4' DEEP FOUNDATIONS. THE THEORY AND PRACTICE FOR DEEP FOUNDATIONS, INCLUDING BEARING CAPACITY, SETTLEMENT, AND TESTING. DIVISION 5: EARTH AND ROCK PRESSURES. EARTH AND ROCK PRESSURES ON RETAINING WALLS, STRUTTED EXCAVATIONS, CRATERED EXCAVATIONS, BULKHEADS, BURIED CON-
DUITS, SHAFT AND TUNNEL LININGS, PRESSURE IN SILOS AND BINS, THEORETICAL, MODEL AND FIELD INVESTIGATIONS OF EARTH PRESSURE AND ITS DISTRIBUTION, AND RELATED CONSTRUCTION PROBLEMS, DIVISION 6' EARTH AND ROCK DAMS, SLOPES AND OPEN EXCAVATIONS, THE PERFORMANCE OF EARTH AND ROCK DAMS DURING CONSTRUCTION AND IN USE, EARTH AND ROCK DAMS AND LEVEES AND ASSOCIATED FOUNDATION AND SEEPAGE PROBLEMS, NATURAL SLOPES, CUTTINGS, AND OPEN EXCAVATIONS NOT STRUTTED OR RETAINED, THEORETICAL, MODEL, AND FIELD INVESTIGATIONS OF SLOPE STABILITY, COMPACTION, PORE WATER PRESSURES, AND CONSTRUCTION MATERIALS IN SOIL AND ROCK DAMS AND SLOPES. /AUTHOR/ 

Int'l Conf Soil Mech & Fdn Eng Proc

ACKNOWLEDGMENT: Canadian Good Roads Association

2A 230944
THE PERFORMANCE OF A TIMBER CRIB FOUND ON SOFT VERY SENSITIVE LACUSTRINE CLAY
A TIMBER CRIB INTAKE STRUCTURE WAS CONSTRUCTED OFFSHORE IN A LAKE FOUNDED ON A VERY SOFT TO SOFT CLAY OF HIGH MOISTURE CONTENT AND SENSITIVITY. THE CLAY IS A LATE GLACIAL FRESH-WATER SEDIMENT WHICH HAS BEEN CONSOLIDATED BY PRESSURES PROBABLY NOT EXCEEDING OVERBURDEN PRESSURE. SAMPLING AND TESTING OF THE CLAY INDICATED A TWO-PART CONSOLIDATION CURVE WITH THE BREAK OCCURRING AT A POINT ABOUT 400 LB/SQ. FT. IN EXCESS OF THE INSITU OVERBURDEN PRESSURE. BEYOND THE BREAK IN THE OEDOMETER CURVE THE COMPRESSION INDEX WAS UP TO 30 TIMES GREATER THAN IN THE INITIAL PORTION BEING A MAXIMUM OF 3.0 TO 3.5. THE CRIB WAS FOUND ON A SAND AND GRAVEL MATTRESS KEYED INTO THE LAKE BOTTOM. THE RESULTING NET STRESS INCREASE ON THE CLAY BEING SLIGHTLY WITHIN THE INFERRABLE RANGE OF APPEARING PRECONSOLIDATION ESTABLISHED ON BY LABORATORY TESTS. PERFORMANCE READINGS ON THE CRIB FOR A PERIOD OF ABOUT A YEAR AFTER CONSTRUCTION HAVE SUBSTANTIATED THE FIELD EXISTENCE OF AN APPARENT PRECONSOLIDATION OF ABOUT THE ORDER OF MAGNITUDE PREDICTED BY LABORATORY TESTS. /CGRA/

Bretzinski, LS Canadian Geotechnical Journal

ACKNOWLEDGMENT: Canadian Good Roads Association

2A 230572
ARROW PROJECT COFFERDAM

Gadsby, JW Bares, FA Canadian Geotechnical Journal

ACKNOWLEDGMENT: Canadian Good Roads Association

2A 231002
ASPHALT MEMBRANES IN EXPRESSWAY CONSTRUCTION ENVELOPE-TYPE ASPHALT MEMBRANES PROVIDED EXCELLENT STABILIZATION OF PLASTIC EARTH FILLS FOR BRIDGE ABUTMENTS IN URBAN EXPRESSWAY CONSTRUCTION IN HOUSTON. TEST FILLS WERE OBSERVED OVER A 14-YEAR PERIOD WITH EXCELLENT FINDINGS. THE OBSERVATIONS INCLUDE DETAILED CONSTRUCTION RECORDS OF MOISTURE-DENSITY CONDITIONS, FOLLOWED BY ANNUAL CONTINUOUS CORE-DRILLING OF FILLS AND TESTING OF CORES FOR MOISTURE CONTENT, DENSITY, AND TRIAXIAL COMPRESSION STRENGTH. TEST HOLES PENETRATED THE ENTIRE DEPTH OF FILLS WELL AS THE COMPACTED SUBGRADE BELOW FILLS. FOR COMPARISON, NEARBY SOILS OF THE SAME NATURE AS THE FILLS BUT NOT PROTECTED WITH THE ASPHALT MEMBRANES HAVE BEEN SAMPLED AND SIMILARLY Tested AT INTERVALS AS FOUND CONVENIENT. OTHER OBSERVATIONS INCLUDED THE PHYSICAL APPEARANCE OF SUCH FILLS. LATERAL MOVEMENTS IN FILLS (OR MORE PROPERLY, THE LACK OF SUCH MOVEMENTS), STABILITY OF THE MEMBRANES UNDER EXTREME DRYING CONDITIONS, AND THE APPEARANCE OF THE MEMBRANES WHEN EXPOSED DURING SUBSEQUENT STAGE CONSTRUCTION. ONE OF THE MOST STARTLING CONCLUSIONS FROM THESE PERFORMANCE OBSERVATIONS IS THAT THE MEMBRANE FILLS ARE IN MANY CASES MORE STABLE THAN CONCRETE PAVEMENTS PLACED ON THE FILLS. THE USE OF ASPHALT MEMBRANES IN EARTH FILLS IN EXPRESSWAY CONSTRUCTION IN HOUSTON REPRESENTS A MAJOR USE OF THIS TYPE OF DESIGN. HAVING BEEN USED ON 54 STRUCTURES REQUIRING 104 ASHULT FILLS OF VOLUME OF OVER 400,000 CUBIC YARDS AND TREATED WITH APPROXIMATELY 1,600,000 GALS OF GRADE 0A-55 OIL ASPHALT. SURFACE AND BURIED TYPES OF ASPHALT MEMBRANES HAVE BEEN USED WITH GOOD SUCCESS, AND THESE ARE DISCUSSED BRIEFLY, WITH COMMENTS ON GENERAL PERFORMANCE AND DESIGN CRITERIA. COVERAGE OF 1 GAL PER SQ YD OF GRADE 0A-55 OIL ASPHALT WAS FOUND TO BE SUFFICIENT TO MAINTAIN A CONTINUOUS MEMBRANE EVEN UNDER MOST ADVERSE CONDITIONS AND TO MAINTAIN ESSENTIALLY CONSTANT MOISTURE CONTENT, DENSITY, AND COMPRESSION STRENGTH IN THE FILLS THEY ENVOLVE. /AUTHOR/

Leclerc, RV Western Construction

Harris, FA Highway Research Record, Hwy Res Board

2A 231044
CEMENT-TREATED BASES
CEMENT-TREATED BASE /BTC/ CONSTRUCTION IN WASHINGTON STATE USES MOSTLY MANUFACTURED OR PROCESSED AGGREGATE PLANT-MIX CONTROL OF AGGREGATE GRADING REQUIREMENTS IS OBTAINED USING SPECIFICATIONS FOR GRADING REQUIREMENTS FOR ROAD MIX AGGREGATES. FIELD INVESTIGATIONS ESTABLISHED THAT COMPRESSIVE STRENGTH OF THE CTB WAS HEAVILY DEPENDENT UPON ITS DENSITY. ALTHOUGH BATCH PLANTS ARE PERMITTED, MIXING IS GENERALLY ACCOMPLISHED IN CONTINUOUS TYPE PUG MULLS HAVING A CAPACITY IN THE ORDER OF 400 TONS PER HOUR. SPECIFICATIONS REQUIRE THAT THE CEMENT FLOW BE UNIFORM AND ACCURATE AND, AT ANY MOMENT, NOT LESS THAN 90 PERCENT OF THE DESIGN OR PLANNED AMOUNT. THIS SPECIFICATION REQUIREMENT IS MOST DIFFICULT TO OBTAIN. EXPERIENCE SHOWED THAT A CEMENT-TREATED BASE SECTION COULD NOT BE EXPECTED TO LAST WHEN IT HAD TO SERVE ON A FLOODED SUBBASE WHERE WATER WAS TRAPPED IN THE ROADWAY SECTION. THIS LED TO THE DISCOVERY OF THE NEED FOR EXTREMELY HIGH PERMEABILITY IN SHOULDER MATERIAL TO ALLOY LATERAL DRAINAGE OF WATER WHICH WOULD ACCUMULATE BENEATH PAVEMENTS. BENKELMAN BEAM DEFLECTIONS TAKEN ON SUCH SECTIONS SHOWED THAT CTB WOULD DEFLECT IN EXCESS OF 0.012 IN. UNDER A 15,000 POUND AXLE LOAD WOULD BE SUBJECT TO EARLY DISTRESS. EXPERIENCE HAS SHOWN THAT CEMENT CONTENTS BELOW 4 PERCENT SHOULD NOT BE RECOMMENDED.
2A 231046
EARTHWORKS AND PAVEMENTS FOR THE NEW INTERNATIONAl AIRPORT FOR KUALA LUMPUR

THE SELECTION OF THE CONSTRUCTION TYPE USED FOR THE NEW INTERNATIONAL AIRPORT FOR KUALA LUMPUR IS ELUCIDATED. DESCRIBED ARE THREE IMPORTANT ASPECTS OF THE CONSTRUCTION, namely the earthworks and compaction, construction of the stabilized soil working bases and evaluation of the strength of the completed pavements.

Skepper, HG Rook, H Ting, WH Inst Civil Engineers Proc London /UK/.

2A 231048
THE VENEMO ASPHALT-FACED ROCK-FILL DAM


AUTHOR/.

Kjernsli, B Torblaa, I Norwegian Geotechnical Institute Publ

2A 231051
MICHIGANS EXPERIENCE WITH NUCLEAR GAGES FOR MEASURING SOIL COMPACTNESS

MICHIGANS RESEARCH IN NUCLEAR METHODS FOR HIGHWAY FOUNDATION COMPACTION CONTROL IS DESCRIBED FROM ITS INCEPTION IN 1952 THROUGH A MAJOR FIELD EXPERIMENT IN 1955-66 DURING FREEWAY CONSTRUCTION. THE EQUIPMENT USED IS DISCUSSED AS WELL AS GAGE CALIBRATION PROCEDURES, TRAINING OF INSPECTION PERSONNEL, FIELD TESTING PROCEDURES, AND SAFETY PRECAUTIONS. THE NUCLEAR METHOD HAS PROVED SUITABLE FOR FIELD USE, IN WHICH IT SAVES TIME AND REDUCES OPERATOR FATIGUE. SPECIAL STUDIES, IN ADDITION TO DEVELOPMENT OF THE MICHIGAN COMBINATION DENSITY-MOISTURE GAGE, ARE OUTLINED, INCLUDING EVALUATION OF OTHER EQUIPMENT AND USE OF STATISTICAL CONTROL METHODS.

AUTHOR/.

Mainfort, RC Michigan Dept State Highways

2A 231060
A THREE DIMENSIONAL PRESSURE CELL

THE DESIGN AND CONSTRUCTION OF A PRESSURE CELL WHICH WILL ENABLE THE DIRECT STRESSES IN THREE PERPENDICULAR DIRECTIONS TO BE MEASURED AT ANY POINT WITHIN THE SOIL MASS IS DESCRIBED. IF THE STRESSES IN THREE PERPENDICULAR DIRECTIONS ARE MEASURED, THEN THE RESULTS CAN BE USED TO PROVE THE ACCURACY OF THE BOUSINESS EXPRESSIONS. POISSONS RATIO FOR THE SOIL MASS CAN ALSO BE DETERMINED. THE RESULTS OBTAINED FROM WITHIN THE SOIL MASS CAN ALSO GIVE IMMEDIATE VALUES FOR THE COEFFICIENT OF EARTH PRESSURE WHEN THE SOIL IS IN THE AT REST STATE. THE CELL DESCRIBED IS ROBUST AND EXTREMELY SENSITIVE. THE COST OF THE CELL IS RELATIVELY SMALL AND SMALLS CAN BE READILY MANUFACTURED IN THE LABORATORY. PROVIDED THAT THE CELLS ARE USED IN CIRCUMSTANCES WHERE THE DENSITIES ARE RELATIVELY HIGH AND PRESSURES RESTRICTED TO WITHIN THE ELASTIC RANGE THE CELLS GIVE GOOD, CONSISTENT RESULTS.

AUTHOR/.

Mackey, RD Civil Eng Public Works Review /UK/.

ACKNOWLEDGMENT: Highway Res Abstracts Hwy Res Board

2A 231063
FACTORS INFLUENCING THE FIELD STABILITY OF SOIL-AGGREGATE MIXTURES

ADEQUATE STABILITY IS A MAJOR REQUIREMENT FOR SOIL-AGGREGATE MIXTURES TO BE SATISFACTORYLY USED IN PAVEMENTS. PROPER MIXTURE DESIGN REQUIRES A KNOWLEDGE OF THE FACTORS THAT INFLUENCE STABILITY. FIELD STABILITIES OF GRAVEL AND CRUSHED OIL AGGREGATE MIXTURES WERE EVALUATED AT 147 VARIOUS TEST SITES. STANDARDS, TECHNIQUES WERE DETERMINED FOR THOSE MIXTURE PROPERTIES WHICH INFLUENCE FIELD STABILITY AS MEASURED BY THE BURGGRAF SHEAR TEST. FIELD MOISTURE CONTENT AND FIELD DENSITY WERE THE MOST IMPORTANT FACTORS. FIELD DENSITY WAS SUBSTANTIALLY AFFECTED BY THE AMOUNT OF MATERIAL PASSING THE NO. 22 SIEVE AND PARTICLE INDEX.

AUTHOR/.

Thompson, MR. Materials Research and Standards

ACKNOWLEDGMENT: Highway Res Abstracts Hwy Res Board

2A 231066

AUTHOR/.

Lake, JR Fraser, CK Burns, J Roads & Road Construction, London /UK/.

ACKNOWLEDGMENT: Highway Res Abstracts Hwy Res Board

2A 231067
SOIL SWELLING TEST

STUDIES ON LATERITES FROM THE PORTUGUESE OVERSEAS PROVINCES WERE CARRIED OUT IN ORDER TO INVESTIGATE HOE FAR THE RECOMMENDED LIMITS CAN BE SAFELY EXCEEDED IN ORDER TO APPLY MATERIALS WHICH OTHERWISE SHOULD NOT BE ACCEPTED FOR ROAD CONSTRUCTION IN FACE OF THE STANDARDS. DUE TO THE REDUCED CHEMICAL ACTIVITY AND CONSEQUENTLY LOW EXPANSIBILITY THE CAL Properties were contemplated. CAL ACTIVITY AND CONSEQUENTLY LOW EXPANSIBILITY WHICH ARE TYPICAL OF THE FINE FRACTIONS OF LATERITIC SOILS, IT WAS Sought TO ASSOCIATE THE CONSISTENCY LIMITS TO A NEW SWELLING PARAMETER RELATED WITH THE CHEMICAL PROPERTIES. THIS WOULD ENABLE TO ASCERTAIN THE NATURE OF THE MATERIAL. A QUICK TEST BASED ON A METHOD FOLLOWED AT ESTACAO AGRONOMICA NACIONAL /NATIONAL AGRONOMIC STATION/ WAS CONDUCTED. STUDIES WERE SUBSEQUENTLY CARRIED OUT IN ORDER TO IMPROVE THIS METHOD WITHOUT IMPAIRING ITS CHARACTERISTICS OF QUICKNESS AND SIMPLICITY. THE STUDY INCLUDED A CRITICAL ANALYSIS OF THE FIRST
CONSTRUCTION MATERIALS


De, CASTRO E
Natl Lab Civil Eng, Lisbon /Port/

ACKNOWLEDGMENT: Highway Res Abstracts Hwy Res Board

2A 231070
HIGHWAY RIDES ON RIVERBED GRAVEL
THE HENDRICKSON BROS. ARE BUILDING ROUTE 81 THROUGH MARATHON, NEW YORK. AMONG THE DIFFICULTIES ENCOUNTERED DURING CONSTRUCTION WAS THE RELATIVELY UNSTABLE NATURE OF THE NATURAL MATERIALS ON THE SITE. SPRING RAINS EARLIER IN THE YEAR REQUIRED ADDITIONAL WORK TO BE DONE IN AREAS FILLED LAST FALL. THE GRAVEL PITS NEAR THE SITE YIELDED A GRAVEL WITH TOO MUCH PLASTICITY, WHICH NECESSITATED DRAG-LINE WORKING THE RIVER BOTTOM. ONLY FROM THIS SOURCE COULD A SUPPLY OF GOOD GRAVEL BE OBTAINED. PROBLEMS WITH UNSTABLE SOIL OCCURRED PARTICULARLY AT THOSE POINTS WHERE A CUT AND FILL MEET. THE WATER ABSORPTIVE SOIL REQUIRED WORK TO BRING IT TO USEABLE CONDITION. AN EXTENSIVE NETWORK OF UNDERGROUND DRAINS HAD TO BE INSTALLED ALONG THE LAST HALF MILE AT THE NORTHERN END OF THE JOB BECAUSE THE LAND THERE WAS QUITE SWAMPY.

Construction

2A 231075
CONSTRUCTION IN MUSKEG: A SUMMARY AND COMPILATION OF CURRENT PRACTICE
THE BASIC APPROACHES TO CONSTRUCTION IN MUSKEG AREAS ARE TO A/ REMOVE THE PEAT OR /3 DESIGN FOR AND UTILIZE THE MUSKEG. THE COMPLETE REMOVAL OF PEAT AND ITS REPLACEMENT BY GOOD FILL TO PROVIDE A SOLID FOUNDATION IS USUALLY EMPLOYED FOR ROADS CROSSING SHALLOW DEPOSITS OR MAIN HIGHWAYS CARRYING HEAVY TRAFFIC. CURRENT PRACTICE IN CANADA AND IN THE NORTHERN U.S. APPEARS TO FAVOR MECHANICAL EXCAVATION, ALTHOUGH DEEP PEAT DEPOSITS ARE TROUBLESOME. IN THIS CASE, GRAVITY DISPLACEMENT METHODS, WITH OR WITHOUT PARTIAL EXCAVATION, ARE OFTEN USED. EXPLOSIVES ARE USED LESS NOW THAN PRIOR TO WORLD WAR II, DUE TO THE UNPREDICTABLE RESULTS. THE USE OF HYDRAULIC STABILIZATION OR JETTING IS ALMOST CONFINED TO THE STATE OF MINNESOTA. ALTHOUGH THE METHOD HAS CONSIDERABLE POTENTIAL WHERE LARGE AMOUNTS OF GRANULAR FILL AND WATER ARE AVAILABLE, STABILITY, SETTLEMENT, AND FROST ACTION MUST BE CONSIDERED WHEN BUILDING ON PEAT WITH FLOATATION METHODS THE BEARING CAPACITY IS UTILIZED AND CONTINUED SETTLEMENTS ARE ACCEPTED THE SAND-DRAIN TECHNIQUE HAS BEEN APPLIED TO STABILIZE SOFT DEPOSITS BUT IT IS NOW QUESTIONABLE. PILE FOUNDATIONS ARE THE LEAST AFFECTED BY PEAT PROPERTIES. DRAINAGE OF A MUSKEG AREA IS USUALLY EXTREMELY DIFFICULT AND OFTEN IMPOSSIBLE EXTRACTS OF SELECTED REFERENCES ON MUSKEG AND PEAT HAVE BEEN GROUPED IN THE APPENDICES. /AUTHOR/

Pihlainen, JA Crel Technical Reports, Army Dept /US/

ACKNOWLEDGMENT: Highway Res Abstracts Hwy Res Board

2A 231078
CRITERIA FOR COMPACTED FILLS
THIS STUDY IS CONCERNED WITH THE PROBLEMS ENCOUNTERED WITH MAN-MADE FILLS UPON WHICH SINGLE-OR MULTI-FAMILY RESIDENTIAL STRUCTURES WILL BE ERECTED, AND THE EFFECTS OF SUCH FILLS ON STRUCTURE FOUNDATIONS, PAVEMENTS AND WALKS, UTILITIES, AND INDIVIDUAL SEWAGE DISPOSAL SYSTEMS. DIVERSE PROBLEMS ARE ASSOCIATED WITH MAN-MADE FILLS, PARTICULARLY WITH FILLS SUPPORTING LIGHT SHALLOW FOUNDATION RESIDENTIAL STRUCTURES. IN THIS REPORT ARE PRESENTED MEANS OF RECOGNIZING PROBLEMS AT A SITE, PROCEDURES FOR IMPROVING THE SITE, AND MINIMUM CRITERIA BY WHICH THE SITE CAN BE EVALUATED FOR ACCEPTANCE. SUPPLEMENTARY INFORMATION IS PROVIDED IN SUPPORT OF THE RECOMMENDATIONS, ENGINEERING CONSIDERATIONS, UNDER FILL CONSTRUCTION, AND EXISTING FILLS. CONSIDERED UNDER SITE INVESTIGATION ARE PRELIMINARY SITE INVESTIGATION, SOIL INVESTIGATION, AND LABORATORY TESTING, UNDER ENGINEERING CONSIDERATIONS, SETTLEMENT SHRINKAGE AND EXPANSION, SLOPE STABILITY, BEARING CAPACITY, DRAINAGE AND EROSION CONTROL, AND SANITARY ENGINEERING ASPECTS, UNDER FILL CONSTRUCTION, SITE PREPARATION, DRAINAGE, FILL MATERIAL, FILL PLACEMENT, AND INSPECTION AND CONTROL, AND UNDER EXISTING FILLS, SITE INVESTIGATION AND ENGINEERING CONSIDERATIONS. /AUTHOR/

National Academy Sciences

ACKNOWLEDGMENT: Highway Res Abstracts Hwy Res Board

2A 231087
SOIL COMPACITION IN HIGHWAY CONSTRUCTION
SOIL COMPACITION HAS BEEN EXTENSIVELY STUDIED IN LABORATORIES, BUT WHEN ACTUALLY APPLIED IN THE FIELD, IT RESULTS IN A MAZE OF CONTRADICTORY SPECIFICATIONS, DIFFERING EQUIPMENT AND GENERAL DISAGREEMENT ON EVERY STEP OF THE PROCESS. FIELD INVESTIGATIONS WERE CONDUCTED TO DETERMINE WHAT THE DESIRABLE PROPERTIES OF COMPACTED SOILS MIGHT BE, TO LEARN WHAT SPECIFICATIONS WILL PRODUCE THESE PROPERTIES, TO FIND OUT HOW TO MEASURE THE ACHIEVEMENT OF THE RESULTS, AND TO FIND THE MOST EFFECTIVE METHODS OF COMPACTION. THE TESTING IS DESCRIBED AND SOME OF THE RESULTS ARE REPORTED. PRELIMINARY RESULTS SUGGEST THAT THERE IS MORE VARIATION THAN IS ALLOWED AND THAT THE SPECIFICATIONS SHOULD BE REVISED TO ALLOW FOR IT.

Selig, ET Frontier, Ill Inst Technol Res Inst

ACKNOWLEDGMENT: Highway Res Abstracts Hwy Res Board

2A 231094
SOIL VIBRATION STUDY
IT HAS BEEN OBSERVED BY HIGHWAY ENGINEERS THAT CRACKS AND BUMPS FORM IN PAVEMENT ADJACENT TO HIGHWAY BRIDGES AND BOX CULVERTS. WHEN A CRACK FORMS, THE DAMAGE IS NOT FELT UNTIL A PERIOD OF TIME AND WEATHER TO A POINT WHERE THE PAVEMENT MUST BE REPAIRED. THE SCOPE OF THIS RESEARCH PROGRAM WAS TO DEVISE A METHOD OF EVALUATING PROBABLE BEHAVIOR OF SOILS ADJACENT TO BRIDGE ABUTMENTS. IN THIS INVESTIGATION DIFFERENT SOIL BLends HAVE BEEN SUBJECTED TO BOTH IMPACT AND VIBRATION TESTS. RESULTS FROM THESE TESTS SHOWED THAT THE DAMAGE FORMED AT THE INTERFACE BETWEEN THE SOIL UNDER DYNAMIC LOADING. IT IS, THEREFORE, ASSUMED THAT THE RESULTS OF THESE TESTS CAN BE EXTENDED TO APPLY TO THE DESIGN AND CONSTRUCTION OF HIGHWAY SUBGRADES AND FILLS ADJACENT TO ABUTMENTS. THE MAGNITUDE OF THE VIBRATION AND IMPACT INDICES, DETERMINED FROM THESE TESTS, INDICATES THE SUSCEPTIBILITY OF THE SOILS TO VOLUME CHANGE UNDER DYNAMIC LOADS. /AUTHOR/
ACKNOWLEDGMENT

Highway Res Abstracts Hwy Res Board

2A 231113
Cement-Treated Bases
The use of cement-treated materials for subbases for concrete pavements is discussed. A cross section of a typical interstate design being used in New Mexico is given. The paper also brings out the inadequacy of thin subbases under concrete pavements. Unfortunately, cement treated subbases were not included in the test road the laboratory tests substantiated by field tests that showed the many advantages of cement treatment are described. In addition to the physical characteristics noted was the added economy, ease of construction and the final analysis of any pavement performance.

Smith, BC
New Mexico University

2A 231121
The Construction of Embankments on Compressible Soils
After explaining the problem of the construction of embankments on poor quality soils, the authors give an account of work undertaken on this subject in the Ponts et Chausées Laboratories. These studies were carried out with a view to both short-term and medium-term efficiency. These were conducted in several stages, starting from modest observations on the behaviour of some embankments on soft soils. In particular, some ideas were formed which guided subsequent investigations. The conclusion was gradually reached that only systematic experiments on experimental embankments could provide real solutions to the problems posed. Such embankments were built on three different sites. At the same time, a study group was formed to widen the scope of the research and to make full use of the results obtained from the experimental embankments. This study group (called GERSC) has been operating since June 1963 and consists of seven engineers from the Laboratoire des Ponts et Chausées. The subjects covered relate to soil reclamation, laboratory studies, methods of calculation, settlement and stability, measuring apparatus, methods of construction, etc. The following methods of study are envisaged: 1) a complete bibliography on the subject; and 2) the exploitation of measurements made on the three experimental embankments and on other embankments built on soft soil. This exploitation may lead to certain lines of research necessary for the interpretation of these measurements.

Kast, R, Bourges, F Bull Liaison Lab. Routiers /France/

2A 231132
Consideration of Bamboo-Reinforced Soil-Cement as Material for Construction with Special Reference to Its Use for Pavements. 3 Parts
A theory was suggested for design of bamboo-reinforced soil-cement beams based on ultimate load theory and bond failure. This was in accord with the test results with suitable modifications. This theory could be extended to beams of different support conditions and slab. It was further shown that elastic theory was not suitable for the design. Tests results showed that the safe design load might be increased by about 4 times for a bamboo-reinforced soil-cement structure over that obtained by elastic analysis. Bamboo-reinforced soil-cement base under thin concrete pavement surfacing was likely to effect a saving in the order of 10 percent over normal plain cement concrete pavement. Laboratory tests on a full size slab designed for 9,000 lb wheel load indicated that ultimate load-carrying capacity in this type of construction for both corner and edge loadings were considerably higher (65 percent higher in the case of corner failure and 35 percent higher in the case of edge failure) than the design load. This reserve strength would adequately cater for anytemperature and subgrade restraint stresses occurring in the pavement.

Mehra, SR, Ghosh, RK Chudda, LR Civil Eng & Public Works Review /UK/. Civil Eng & Public Works Review /UK/, Civil Eng & Public Works Review /UK/

2A 231172
Statistical Control of Dry Density
The paper presents a simplified statistical approach for the control of dry density in road construction. In the proposed sampling scheme a method is outlined whereby engineering decisions can be taken on the number of samples to be tested to satisfy various engineering requirements such as the error in test results and the desired limits of accuracy for a specified probability. Decisions based on the sampling scheme are used, also, to define the requirements for the design, specification and control of dry density in a road layer. By comparing the average density obtained from the specified number of observations with the specification density, a reliable decision can be taken immediately on the acceptance or rejection of the completed layer.

Kuhn, SH Burton, RW Csit Research Report /South Africa/

2A 231177
Soluble Salts in Road Foundations
The formation of blisters in the surfacing of roads has received increasing attention. The occurrence of these blisters can be due to different independent conditions. But, so far, only the development of those caused by soluble salts is fairly well understood. The salts derived from the natural soil and rock in the dry areas of the country and those formed from mine waste in the humid areas (Johannesburg) were investigated. Two case histories are described in detail. The road-building materials as well as the salt precipitates from the blisters were sampled and investigated by chemical analyses, X-ray diffraction and PH determinations. It was found that sodium and magnesium sulphates were at the root of the trouble in these South African cases. Although chlorides are known to have caused similar difficulties in Australia there are no effective remedial measures which can be recommended at present and it is suggested that the pH of the suspect material be checked as the first step in testing. If the pH is less than 6, more detailed determination of the soluble salts are required. Where the use of salin foundation material cannot be prevented, or where the natural soil is a permanent source of salts because of its salinity, the road should be designed so that the salts remain permanently hydrated.

Weinert, HH Clauss, KA Csit Research Reports /South Africa/

2A 231180
Bituminous Stabilization of Sandy Soils
The native materials in the desert regions of India do not lend themselves to road building. In order

2A 231211
DESIGN AND CONSTRUCTION OF EMBANKMENTS ON EXPANSIVE CLAY FOUNDATIONS

BASIC PRINCIPLES GOVERNING THE DESIGN OF EMBANKMENTS ON EXPANSIVE CLAY FOUNDATIONS ARE DISCUSSED, AND METHODS OF STABILITY ANALYSIS ARE OUTLINED INVOLVING TWO STEPS, NAMELY: (1) COMPUTATION OF SWELLING PRESSURES AND VOLUME CHANGE DUE TO SWELLING UNDER GIVEN CONFINING PRESSURES, AND (2) RECURSE TO EFFECTIVE STRESS PARAMETERS, OR TO AN UNDRAINED STRENGTH-WATER CONTENT RELATIONSHIP CORRESPONDING TO THE VOID RATIO AT THE END OF THE SWELLING PROCESS. THE POSSIBILITY OF PROGRESSIVE FAILURE IN HIGHLY PLASTIC SOILS IS DISCUSSED WITH SPECIAL REFERENCE TO EXPANSIVE CLAYS. THE STABILITY OF EXISTING EMBANKMENTS IS REAPPRAISED IN THE LIGHT OF THE ABOVE PRINCIPLES, WITH SPECIFIC EXAMPLES.

2A 231238
PLANNING OF PROJECTS-EARTHWORKS-GERMANY

THE PROPOSED MOTORWAYS IN DENMARK CALL FOR COMPREHENSIVE SOIL SURVEYS FOR THE PAVEMENT DESIGN. IN PLANNING THESE SURVEYS, SYSTEMATIC USE IS BEING MADE OF EXISTING GEOLOGICAL AND GEOLOGICAL-GEOTECHNICAL REPORTS AND MAPS, WHICH HAS BEEN UNDERTAKEN IN ORDER TO ESTABLISH FIRMER SPECIFICATIONS FOR THE USE OF TRANSMISSIBLE SANDS. THE FOLLOWING BROAD CONCLUSIONS CAN BE DRAWN: (1) BITUMINIZED SAND, EITHER WITH OR WITHOUT KANKAR (A SOFT TYPE OF AGGREGATE IN A NODULAR FORM), CONTAINING A HIGH PERCENTAGE OF SILICA AND CALCIUM OXIDE, IS A SUITABLE BUILDING MATERIAL: BECAUSE OF THE ARID CLIMATE WET STABILITY IS NOT A PROBLEM AND DRY STABILITY, ALTHOUGH A PROBLEM, IS BEING HANDLED EFFICIENTLY. (2) KANKAR BASES HAVE BEEN USED AS A CUSHION TO PREVENT THE CRUSHING OF KANKAR Bases. FURTHER EXPERIMENTATION SHOULD BE CARRIED OUT IN ORDER TO ESTABLISH FIRMER SPECIFICATIONS FOR THE USE OF TRANSMISSIBLE SANDS.

2A 231239
PLANNING OF PROJECTS-EARTHWORKS-FRANCE

EXPERIENCE OF SOME 100 MILLION CUBIC METERS OF HIGHWAY AND HIGHWAY EARTHWORKS IN FRANCE INDICATE TWO FUNDAMENTAL FACTORS: (1) RELATIVE TO THE ESTABLISHMENT OF PROJECTS, CONTROL WILL BE HENCEFORTE EXERCISED BY AN ELECTRONIC COMPUTER ASSOCIATED WITH AUTOMATIC DESIGN, AND (2) THE PLANNING AND EXECUTION OF EARTHWORKS ARE CONTROLLED NOW BY A REGULATION OF THE STANDARD BOOK OF SPECIFICATIONS. STANDARDIZATION OF THE PROJECTS AND IMPROVEMENT OF THE QUALITY OF CONTRACTS ARE DISCUSSED. SOIL AND CUT CLASSIFICATIONS IN THE CATEGORIES RELATED TO USE OR NECESSARY EQUIPMENT ARE DESCRIBED. PROBLEMS ON THE COMPACTION OF FILLS, THE STABILITY OF SLOPES, TOLERANCES AND CONTROL ON THE WORKS ARE DISCUSSED. AN EXAMPLE IS GIVEN OF MOTORWAY EARTHWORKS IN DIFFICULT TERRAIN IN DEEP CUT. SELECTED FILL IS CONSIDERED AS A DESIRABLE ELEMENT IN THE UPPER PART OF EARTHWORKS SO AS TO FACILITATE THE CONSTRUCTION OF THE HIGHWAYS.

2A 231246
MEXICAN EXPERIENCE IN GEOMETRIC DESIGN OF EARTHWORKS WITH ELECTRONIC PHOTOGRAMMETRIC PROCEDURE

2A CONSTRUCTION MATERIALS

AERIAL SERVICE DEPARTMENT OF THE MINISTRY OF PUBLIC WORKS HAS BEEN ORGANIZED IS ALSO SHOWN IN THIS CHAPTER. THIS DEPARTMENT, BEYOND BEING CONCERNED WITH THE SPECIFIC SERVICES IN RELATION TO AERIAL PHOTOGRAPHY OF ROUTES, ARRANGES FLIGHTS FOR OFFICIALS IN CHARGE OF SURVEYS AND WORKS UNDER CONSTRUCTION. FINALLY, THE RESULTS ACHIEVED IN THE CONSTRUCTION OF ROADS TO DESIGNS DEVELOPED BY THE ELECTRONIC PHOTOGRAMMETRIC PROCEDURE, WHICH SO FAR HAVE PROVEN VERY SATISFACTORY, ARE ALSO DESCRIBED. /AUTHOR/ SATISFACTORY ARE ALSO DESCRIBED. /AUTHOR/

Garcia, GC Aguilar, SS Perm Intl Assoc Road Congresses Proc


Holden, A Burgers, A Perm Intl Assoc Road Congresses Proc No E-17, 1967

2A 231264 SYMPOSIUM ON PUZZOLANAS, THEIR SURVEY, MANUFACTURE AND UTILIZATION, NEW DELHI, DECEMBER 1964, PROCEEDINGS A THREE-DAY SYMPOSIUM WAS HELD WITH A VIEW OF PUBLICIZING THE WORK OF THE CENTRAL ROAD RESEARCH INSTITUTE ON PUZZOLANAS AND ENCOURAGING DISCUSSION OF WORK DONE BY OTHER COUNTRIES. THIRTY-SEVEN PAPERS WERE PRESENTED DURING THE SYMPOSIUM INCLUDING 11 FROM OTHER COUNTRIES, VIZ., GERMANY, AUSTRIA, RUMANIA, JAPAN, U.K., FRANCE, AND ITALY, DETAILING THEIR EXPERIENCES. THE DISCUSSIONS WERE ORGANIZED UNDER FOUR SESSIONS AS FOLLOWS: (1) PUZZOLANA SURVEY AND FUNDAMENTAL RESEARCH, (2) MANUFACTURE OF PUZZOLANAS AND PUZZOLANIC PRODUCTS AND THEIR GENERAL PROPERTIES, AND (3) UTILIZATION OF PUZZOLANAS AND PUZZOLANIC PRODUCTS WITH SPECIAL REFERENCE TO BUILDINGS AND ROADS. /AUTHOR/

Central Road Research Inst of India 332 pp, 1967

2A 231272 NUCLEAR TESTING CORRELATED AND APPLIED TO COMPACTION CONTROL IN COLORADO A DESCRIPTION IS GIVEN OF THE INVESTIGATION MADE BY THE COLORADO DEPARTMENT OF HIGHWAYS INTO THE FEASIBILITY AND PRACTICABILITY OF USING COMMERCIAL NUCLEAR DEVICES TO PERFORM MOISTURE AND DENSITY TESTS IN THE FIELD ON HIGHWAY CONSTRUCTION MATERIALS. THE CORRELATION FOUND BETWEEN NUCLEAR AND CONVENTIONAL METHODS IS PRESENTED ALONG WITH AN EXPLANATION OF THE EQUIPMENT AND ITS BASIC FUNCTION. ELECTRONIC RELIABILITY IS DISCUSSED AND DATA CONCERNING THE AMOUNT OF PERSONNEL IRRADIATION WHILE WORKING IN CLOSE CONTACT WITH EQUIPMENT CONTAINING ISOTOPES OF CESIUM AND RADIUM-BERYLLIUM ARE GIVEN. THE USE OF A NUCLEAR DEVICE TO CONTROL THE COMPACTION OF EMBANKMENT MATERIAL ON A LARGE PROJECT IN WESTERN COLORADO IS DESCRIBED AND ACCEPTANCE OF THIS NEW CONCEPT OF TESTING BY FIELD PERSONNEL IS RELATED. PRELIMINARY INFORMATION CONCERNING AN ATTEMPT TO CORRELATE THREE DIFFERENT NUCLEAR DEVICES WITH THE CONVENTIONAL Method OF DETERMINING THE DENSITY OF ASPHALTIC CONCRETE SURFACE COURSES IS ALSO PRESENTED. /AUTHOR/

Brown, WR Highway Research Board Bulletin


Croy, FE Crrel Technical Reports, Army Dept /US/


Lambe, TW Am Soc Civil Engr J Soil Mech Div
CONSTRUCTION MATERIALS

2A 231287
GROUNDFREEZING IN CONSTRUCTION
ARTIFICIAL GROUND FREEZING IS A VALUABLE AID, AND AT TIMES MAY BE THE ONLY MEANS POSSIBLE, FOR EXCAVATION. THE SOIL BECOMES STABILIZED TO GIVE SHEAR STRENGTH FOR A RETAINING STRUCTURE AND A WATER STOP. DESIGN INCLUDES STRENGTH AND DEFORMATION OF A VISCOELASTIC MATERIAL IN A STRUCTURE, AND OF HEAT FLOW IN A MATERIAL IN WHICH WATER CHANGES TO ICE CAUSING RADICAL CHANGES IN THERMAL PARAMETERS. EXAMPLES SHOW HOW THE RHEOLOGICAL PARAMETERS OF STRAIN, TEMPERATURE, STRESS AND TIME FOR TYPICAL SOILS ARE RELATED. TECHNIQUES AND DESIGN DATA ARE GIVEN FOR THE STRUCTURAL DESIGN OF A CYLINDRICAL COFFERDAM, THERMAL PARAMETERS AND TECHNIQUES, WITH ASSUMPTIONS AND CONSEQUENT EQUATIONS FOR DESIGN, ARE PROVIDED WITH EXAMPLES OF TWO TYPICAL SOILS, STRAIGHT AND CURVED WALLS, FOR COMPUTING TIME OF FREEZING, TEMPERATURES, ENERGY AND REFRIGERATION-LOAD FROM WHICH COST ESTIMATES MAY BE MADE FOR A PARTICULAR JOB. CONSTRUCTION PRACTICES ARE DISCUSSED, WITH SPECIAL ATTENTION TO THE HAZARDS OF THE GROUND FREEZING TECHNIQUE.

Sanger, FJ Am Soc Civil Engr J Soil Mech Div

2A 231306
CONSTRUCTION PROBLEMS EXPERIENCED WITH LOESS SOILS
THE PHYSICAL PROPERTIES AND STRUCTURAL MAKEUP OF LOESS SOILS ARE BRIEFLY DESCRIBED, PRINCIPALLY WITH REFERENCE TO THE MANNER IN WHICH THEY CONtribute TO THE BEHAVIOR OF LOESS IN VARIOUS TYPES OF CONSTRUCTION WORK. THE INTERNAL STRUCTURE, STRATIFICATION AND SLOPE FACE PROBLEMS ARE DISCUSSED. CONSTRUCTION PROBLEMS OF LOESS IN THE CENTRAL NEBRASKA PROJECT ARE DESCRIBED. THIS PROJECT REPRESENTED A FAIRLY LARGE-SCALE PROJECT AND DEMONSTRATED THAT LOESS SOIL COULD SAFELY BE USED IN CONSTRUCTION WORK AS AN EMBANKMENT MATERIAL OR IN SITU AS A FOUNDATION MATERIAL FOR EARTH DAMS AND HYDRAULIC STRUCTURES. THE POLICY OF COMPACTING THE SOIL IN ALL DAMS WET OF OPTIMUM IS BELIEVED TO BE THE PRINCIPAL REASON THAT ALL STRUCTURES SAFELY WITHSTOOD THE RATHER SEVERE DIFFERENTIAL SETTLEMENTS THAT OCCURRED. THE SATISFACTORY BEHAVIOR OF THE STEEP BACK SLOPES USED ALONG THE POWER CANAL TO DATE (APPROXIMATELY 30 YEARS) IS AMPLE EVIDENCE THAT STEEP SLOPES SHOULD BE USED IN LOESS SOILS.

Turnbull, WJ Highway Research Record, Hwy Res Board

2A 231314
LIME STABILIZATION IN PUNJAB
EXPERIENCE GAINED FROM THE LABORATORY AND FIELD WORK ON SOIL STABILIZATION WITH LIME FOR THE CONSTRUCTION OF DURABLE ROADS PARTICULARLY IN WATER LOGGED AREAS IS REPORTED AS INDICATED AT THE END OF ANNEXURE II OF THIS REPORT. MORE THAN 2 MILLION SQUARE METERS = 50 KMS. OR 300 MILES OF 12 INCHES WIDE ROAD LENGTH HAS BEEN CONSTRUCTED DURING THE LAST 7 YEARS (SINCE 1960). THIS TECHNIQUE HAS BEEN USED THROUGHOUT THE STATE OF PUNJAB COMPRISING AN AREA OF ABOUT 47,500 SQUARE MILES (121,000 SQUARE KILOMETERS) WHICH HAS BEEN DIVIDED INTO STATES OF NEW PUNJAB, HARYANA AND A PART OF HIMACHAL PRASHAD AND CHANDIGARH UNION TERRITORY) WITH VARYING SOIL CONDITIONS AND SUB-BASE THICKNESSES. AS WOULD BE SEEN FROM THE NAMES OF ROADS AND DIVISIONS GIVEN IN ANNEXURE III, ALMOST ALL TYPES OF SOILS AVAILABLE IN THE STATE RESPONDED FAVORABLY TO THE LIME TREATMENT AND THE ROADS BUILT HAVE BEHAVED VERY SATISFATORILY UNDER NORMAL AND HEAVY TRAFFIC SINCE THEIR CONSTRUCTION, IN SPITE OF SEVERAL FLOODS AND HEAVY RAINS. COMMERCIAL QUALITY OF WHITE LIME WITH A PURITY OF 80% TO 90%, GENERALY AVAILABLE IN THE STATE, WAS USED FOR THIS PURPOSE. DRIVER

Uppal, IS Bdr Research Laboratory

2A 231312
ASPHALT MEMBRANES AND EXPANSIVE SOILS
EXPANSIVE SOIL PROBLEMS IN HIGHWAY CONSTRUCTION IN COLORADO ARE DESCRIBED. COLORADO HAS LARGE AREAS WHERE EXPANSIVE SOILS PREDOMINATE INCLUDING: (1) SECTIONS WHERE MANCOS SHALE AND PIERRRE SHALE ARE PREVALENT, (2) A LARGE BAND OF CLAYS NAMED THE LARAMIE FORMATION, (3) A DENVER FORMATION, AND (4) CREEK VALLEYS CONTAINING COMPARATIVELY RECENT DEPOSITS OF PLASTIC, FINE-GRANIE MATERIALS. DISTRESS FROM SWELLING SOILS IS EVIDENT IN MANY COSTLY WAYS AND IS PARTICULARLY OBVIOUS IN PORTLAND CEMENT CONCRETE PAVING. RESEARCH FOR THE INTERSTATE 70 CONSTRUCTION PROJECT INDICATED THAT ASPHALT MEMBRANE IS ONE OF THE BETTER SOLUTIONS TO EXPANSION PROBLEMS IN MANCOS SHALE CUTS. INVESTIGATION HAS SHOWN THAT 2 1/2 YEARS AFTER PLACEMENT THE ASPHALT MEMBRANE ON THE PROJECT IS IN EXCELLENT CONDITION. IT IS STILL PLIABLE, UNIFORM IN CHARACTE, AND SHOWS NO SIGNS OF MOVEMENT OR CRACKING. TENTATIVE CONCLUSIONS INDICATE THAT SOME MECHANISM IS AT WORK WHICH CAUSES FREE WATER TO BE ACCUMULATED OR GENERATED IN THE GRANULAR MATERIALS UNDER ASPHALT PAVEMENTS, EVEN IN DESERT AREAS WHERE THERE IS NO WATER TABLE. AIR PERMEABLE GRANULAR SUBBASE AND BASES ARE APPARENTLY RESPONSIBLE FOR HYDROGENESIS. THIS SUGGESTS THAT DENSE-GRADED ASPHALT BASES MAY ACT AS VAPOR BARRIERS WHEN PLACED DIRECTLY ON THE SUBGRADE. IT HAS BEEN FOUND THAT WATER WAS NOT ACCUMULATED UNDER ASPHALT PAVEMENTS WHERE ASPHALT STABILIZED BASE WAS PLACED DIRECTLY ON THE SUBGRADE. SPECIFICATIONS FOR CATALYTIICALLY-BLOWN ASPHALT ARE PRESENTED. THE PURPOSE OF THE MEMBRANE IS TO PREVENT INTRUSION OF MOISTURE INTO THE SUBGRADE AND TO KEEP THE EXPANSIVE CLAYS IN EQUILIBRIUM.

Merten, FK Brakey, BA Asphalt Institute Information Series

2A 231326
SUBGRADE MOISTURE CONDITIONS UNDER AN EXPERIMENTAL PAVEMENT
THE PAPER DEALS WITH ONE PHASE OF A PROGRAM TO OBTAIN MOISTURE HISTORIES OF SUBGRADES AND SPECIFICALLY COVERS THE FIRST STEP OF THIS PHASE WHICH INVESTIGATES THE SUBGRADE CONDITION UNDER AN EXPERIMENTAL PAVEMENT OF PORTLAND-CEMENT CONCRETE. THIS STEP HAS TWO PURPOSES: (1) TO ATTEMPT TO EVALUATE THE EFFECTS OF DESIGN VARIABLES ON SUBGRADE MOISTURE HISTORIES, AND (2) TO AID IN THE EVALUATION OF THE DESIGN VARIATIONS AS THEY AFFECT THE PAVEMENT PERFORMANCE. THIS FIRST REPORT ENCOMPASSES ONLY THAT PART OF THE COMPLETE INVESTIGATION WHICH DEALS WITH THE RESULTS OBTAINED FROM THE MEASUREMENT OF SUBGRADE MOISTURE CONTENT BY MEANS OF ELECTRICAL RESISTANCE MOISTURE CELLS. THE EXPERIMENTAL PAVEMENT INCLUDES VARIABLES OF (1) COARSE AGGREGATE (LIMESTONE OR CHERT GRAVEL), (2) BASE TREATMENT (ROLLED STONE, DENSE DESIGN, OR SAND GRAVEL, OPEN DESIGN, OR NO BASE), AND (3) SUBGRADE TREATMENT (OILED EARTH TREATMENT OR PLAIN EARTH, NO TREATMENT). THESE VARIABLES WERE COMBINED INTO 12 COMPARABLE SECTIONS. THESE SECTIONS VARY FROM 0.2 MILE TO 0.5 MILE IN LENGTH WITH THE TOTAL EXPERIMENTAL PROJECT APPROXIMATELY 5 MILES LONG. THE MOISTURE CELLS, INSTALLATIONS, INSTRUMENTATIONS, AND
CONSTRUCTION MATERIALS

CALIBRATION PROCEDURES ARE DESCRIBED. CONSTRUCTION NOTES AND VALIDATING FIELD MOISTURE CHECKS ARE INCLUDED IN THE APPENDIXES ALONG WITH TOPOGRAPHY NOTES AND THE LOG OF THE SUBGRADE SOIL HORIZONS. DATA OBTAINED FROM 96 MOISTURE CELLS HAVE BEEN AVERAGED IN VARIOUS COMBINATIONS TO COMPARE THE EFFECT OF DIFFERENCES IN CELL LOCATION WITH RESPECT TO PAVEMENT COVER, SINCE THE COVER CHANGES THE DEGREE OF EXPOSURE TO THE POSSIBLE MEANS MOISTURE ENTRANCE FROM ABOVE. THESE DATA HAVE ALSO BEEN ARRANGED TO SHOW DIFFERENCES CAUSED BY THE VARIATIONS IN CONSTRUCTION FEATURES AND TO SHOW THE VARIATIONS IN MOISTURE CONTENT AMONG THE 12 COMPAREABLE SECTIONS. THE EFFECTS OF THE OILED- EARTH SUBGRADE TREATMENT ARE OF ESPECIAL INTEREST, ALONG WITH THE COMMENTARY CONCERNING POSSIBLE UNDESIRABLE RESULTS OF POOR CONSTRUCTION OF THE OILED- EARTH TREATMENT. THE INFLUENCE OF DROUGHT ON SUBGRADE-MOISTURE CONDITIONS IS APPARENT, AND POSSIBLE REASONS FOR THE VARIATIONS IN THE EFFECTS OF THIS INFLUENCE ARE DISCUSSED. THIS REPORT IS IN THE NATURE OF A PROGRESS REPORT AND THEREFORE DOES NOT ATTEMPT TO PRESENT FINAL CONCLUSIONS. /AUTHOR/

Guinnee, JW Thomas. CE Highway Research Board Bulletin

2A 231371
FOUNDATIONS OF BRIDGES AND OTHER STRUCTURES

THESE REFERENCES ON FOUNDATIONS OF BRIDGES AND OTHER STRUCTURES INCLUDE SELECTIONS ON APPLICATION OF ELASTICITY AND PLASTICITY THEORIES TO FOUNDATION PROBLEMS, SOIL MECHANICS AND FOUNDATION ENGINEERING, CEMENT GROUTING OF FOUNDATIONS, STRAIN GAGE OPERATIONS UNDER WATER, EARTH PRESSURE MEASUREMENTS, BEARING CAPACITY OF DOUNATIONS, FOUNDATION VIBRATIONS, APPROXIMATIONS FOR BEAMS ON ELASTIC FOUNDATIONS, STRESSES UNDER A FOUNDATION, FOUNDATION MOVEMENTS, PILE FOUNDATIONS AND PILE STRUCTURES, EFFICIENCIES OF PILE GROUPS, BEARING CAPACITY OF PILES, PILE LOAD TESTS, PREDETERMINING PILE LENGTHS, PRESSURE DISTRIBUTION ALONG FRICTION PILES, SKIN FRICTION OF FOUNDATION PILE, PILE DRIVING BY ELECTROOSMOSIS AND BY VIBRATION STRESSES IN PILES DURING DRIVING, DRIVING CHARACTERISTICS OF PILES IN SOIL, EXPERIENCES WITH PRESTRESSED CONCRETE PILES, STEEL H-D PILES, SHEET PILE, TIMBRE PILES, SOIL MODULUS FOR LATERALLY LOADED PILES, STABILITY OF FOUNDATION PILE AGAINST BUCKLING UNDER AXIAL LOAD, PILE HEAVE AND REDRIVING, FREEZING FACILITIES SINKING, DEFLECTION AND STRENGTH OF ANCHORED BULKHEADS, SEALING A COFFERDAM, CAISSON FOUNDATIONS BIELLED CAISSONS ANCHOR WALLS, BRIDGE PIERS BUILT IN CELLULAR COFFERDAMS, ENGINEERING SEISMOLOGY, LATERAL FORCES OF EARTHQUAKE AND WIND, SCOUR AT BRIDGES, SUBSOIL CORROSION OF STEEL, SOIL CONDITIONS AND SAMPLING, TESTS OF CYLINDRICAL SHELLS, SUBWAY CONSTRUCTION, SOIL COMPACTION BY VIBROFLOTATION AND BY EXPLOSIVES, BUILDING CODE REQUIREMENTS FOR EXCAVATIONS AND FOUNDATIONS, CONSTRUCTION OF CUT-OFF WALLS, UNDERWATER CONCRETING, AND SETTLEMENT OF STRUCTURES.

Highway Research Information Service

2A 231372
THE STRUCTURE OF CLAY AND ITS IMPORTANCE IN FOUNDATION ENGINEERING

THE TERMS STRESS, DEFORMATION AND RUPTURE AS APPLIED TO SOILS ARE DISCUSSED. THE SAME PRINCIPLES WHICH IN COMMON DAILY USAGE OF THE TERMS APPLY TO THE GROUND ON WHICH THE STRUCTURE IS BUILT. THE STRENGTHS AND STRESS-STRAIN RELATIONSHIP OF CONSTRUCTION MATERIALS, AS WELL AS STRESS DISTRIBUTION IN INDIVIDUAL MEMBERS OF A PARTICULAR STRUC- TURE MUST BE KNOWN; IT IS ALSO NECESSARY TO KNOW THE SAME FACTORS FOR THE SOIL UNDERNEATH TO DETERMINE THE SAFETY AGAINST RUPTURE AND SETTLEMENT OF THE STRUCTURE DUE TO COMPRESSION AND DEFORMATION OF THE SOIL. TEST METHODS ARE REVIEWED FOR DETERMINING COMBINATION OF LOADS, DETERMINING RUPTURE LOAD, FOUNDATION MOVEMENTS, PILE SUPPORTS AND PILE STRUCTURES, EFFICIENCIES OF PILE GROUPS, BEARING CAPACITY OF PILES, PILE LOAD TESTS, PREDETERMINING PILE LENGTHS, PRESSURE DISTRIBUTION ALONG FRICTION PILES, SKIN FRICTION OF FOUNDATION PILE, PILE DRIVING BY ELECTROOSMOSIS AND BY VIBRATION STRESSES IN PILES DURING DRIVING, DRIVING CHARACTERISTICS OF PILES IN SOIL, EXPERIENCES WITH PRESTRESSED CONCRETE PILES, STEEL H-D PILES, SHEET PILE, TIMBRE PILES, SOIL MODULUS FOR LATERALLY LOADED PILES, STABILITY OF FOUNDATION PILE AGAINST BUCKLING UNDER AXIAL LOAD, PILE HEAVE AND REDRIVING, FREEZING FACILITIES SINKING, DEFLECTION AND STRENGTH OF ANCHORED BULKHEADS, SEALING A COFFERDAM, CAISSON FOUNDATIONS BIELLED CAISSONS ANCHOR WALLS, BRIDGE PIERS BUILT IN CELLULAR COFFERDAMS, ENGINEERING SEISMOLOGY, LATERAL FORCES OF EARTHQUAKE AND WIND, SCOUR AT BRIDGES, SUBSOIL CORROSION OF STEEL, SOIL CONDITIONS AND SAMPLING, TESTS OF CYLINDRICAL SHELLS, SUBWAY CONSTRUCTION, SOIL COMPACTION BY VIBROFLOTATION AND BY EXPLOSIVES, BUILDING CODE REQUIREMENTS FOR EXCAVATIONS AND FOUNDATIONS, CONSTRUCTION OF CUT-OFF WALLS, UNDERWATER CONCRETING, AND SETTLEMENT OF STRUCTURES.

Casagrande, A Boston Society Civil Engineers Journal

2A 231377
NEW YORK'S PIER 57 FOUND ON TWO 27,000-TON REINFORCED CONCRETE BOXES

UNIQUE PIER CONSTRUCTION IS BEING CONDUCTED IN NEW YORK. THE PIER PROPER WILL STAND ON TWO HUGE REINFORCED CONCRETE BOXES WHOSE LOAD WILL BE CARRIED LARGELY BY BUOYANCY. A THIRD BOX WILL SUPPORT THE BULKHEAD. SAND PILES DRIVEN INTO THE RIVER BOTTOM WILL BE CONSOLIDATED UNDER THE SUBSOIL. PRESTRESSED CONCRETE STRINGERS WILL CARRY THE HEAVY LOADS IMPOSED ON THE MAIN PIER FLOOR BY SHIP CARGOES. BECAUSE OF LIMITED SPACE AT THE PIER SITE, THE BOXES ARE BEING BUILT 38 MILES UP THE HUDSON, AND WILL BE FLOATED DOWN TO THEIR FINAL DESTINATION. THE SHIPPING TERMINAL WILL PROVIDE A PIER WITH A TWO-STORY SHED 120 FT WIDE HAVING 15-FT APRON ON EACH SIDE. THE MAIN DECK CONSISTS OF PRECAST, Prestressed concrete stringers, spaning about 20 FT, with a poured concrete topping and wearing surface. THE SECOND DECK AND ROOF ARE OF REINFORCED CONCRETE. THE COMPLETED PIER WILL REST ON VERTICAL SAND PILES AND SAND MAT. TO PRESERVE STABILITY OF SOIL AT SITE, OLD WOODEN PILES WERE LEFT IN PLACE, BUT WERE CUT OFF AT BELOW BOTTOM ELEVATION OF THE PIER. REINFORCED CONCRETE SLAB 4 IN. THICK SERVICES AS BOTTOM FORM FOR TWO PIER BOXES. THE SLAB IS TREATED WITH RESINOUS CURING COMPOUND TO IMPROVE CURING AND PREVENT ADHESION TO CONCRETE BOXES. BUTT- WELDED REINFORCING BARS ARE USED AS CONCRETE REINFORCING.

Buckley, JM Verpilo, EEA Civil Engineering Asce

2A 231391
USE OF SODIUM CHLORIDE IN ROAD STABILIZATION

THE EFFECTS OF SODIUM CHLORIDE ON ROAD SURFACES ARRIVES FROM PROPERTIES IT IMPARTS TO PROPERLY PROPORTIONED SOIL MIXTURES THROUGH WATER RETENTION, CRYSTALLIZATION, INCREASE IN SURFACE TENSION AND PHYSICAL- CHEMICAL CHANGES IN THE CLAY COMPONENT. THE SODIUM CHLORIDE IN A STABILIZED MIXTURE ACTS TO CONSERVE ITS WATER CONTENT, CRYSTALLIZATION OF PRECIPITATED CHLORIDE WITHIN THE PORES OF THE COMPACTED MASS AS EAY AND ITS MEASUREMENT PROCEEDS CONtributes TO ITS STRENGTH AND STABILITY, THE MELTING OF THE VOID MINIMIZES THE CONTRACTION THUS REDUCING SHRINKAGE CRACKING. SODIUM CHLORIDE HAS
THE PROPERTY OF CHANGING THE ELECTRIC FIELDS AROUND THE COLLOIDAL CLAY PARTICLES TO PRODUCE FLOCCULATION SO THAT THE TREATED CLAY BECOMES MORE COHESIVE AND THE SOIL MIXTURES MORE DENSE UNDER PRESSURE AND LESS PERMEABLE. IT IS BELIEVED THAT THE HIGH DENSITIES OF ROAD SURFACES TREATED WITH SODIUM CHLORIDE ARE NOT DUE TO THE ELECTRICAL CHARGES ON THE COLLOIDAL CLAY MINERALS, BUT IN PART TO THE ELECTROLYTIC ACTION AND INCREASE OF SURFACE TENSION WHICH REDUCE THE THICKNESS OF MOISTURE FILMS, THUS Creating GREATER COHESION. THE FOLLOWING EFFECTS OF SODIUM CHLORIDE ON STABILIZED ROAD MATERIALS ARE OBSERVED: (1) NO APPRECIABLE EFFECT IS OBSERVED ON THE PLASTICITY INDEX, BUT THE CRUDE MAT TAKES A STICKY TEXTURE COMPARABLE TO INCREASED PLASTICITY, (2) THE SHRINKAGE LIMIT OF CLAY IS INCREASED AND THE SHRINKAGE LIMIT INCREASED THUS Bringing THESE VALUES CLOSER TOGETHER, (4) MOISTURE CONTENT IS CONSERVED, (5) MOISTURE RETENTION PROPERTIES OF SODIUM CHLORIDE INCREASE AND MAINTAIN COMPACT AND SURFACE TENSION IN STABILIZED MIXTURES, (6) WELL COMPA CTED AND SEASONED SODIUM CHLORIDE TREATED STABILIZED ROAD MATERIALS RESIST THE FREE PASSAGE OF EXCESS MOISTURE EITHER UP OR DOWN IN THE STABILIZED MAT, AND (7) CRYSTALLIZATION OF THE SODIUM CHLORIDE SOLUTION FORMS A DENSE HARD MAT WITH THE STABILIZED MIXTURE. PREPARATION OF THE SUBGRADE IS DISCUSSED IN THE CONSTRUCTION OF A STABILIZED ROAD LASTING EON YEARS UNDERLYING THE PRESSURE NECESSARY TO COMPENSATE FOR UNAVOIDABLE LAT NAL DISPLACEMENT AND LOSS BETWEEN DREDGER CUT AND FILL, AND (3) PROBABLE RATE OF SUBSIDENCE AND AGE NECESSARY TO COMPENSATE FOR UNAVOIDABLE LAT NAL DISPLACEMENT DURING FILL CONSTRUCTION.

Looker, CD Spencer, WT Kushing, JW Allen, H Highway Research Board Proceedings

2A 231394

EMBANKMENTS AND EARTH SLOPES

THESE REFERENCES ON EMBANKMENTS AND EARTH SLOPES INCLUDE SELECTIONS ON TREATMENT OF SOFT FOUNDATIONS FOR HIGHWAY EMBANKMENTS, HYDRAULIC FILL SETTLEMENT, USE OF EXPLOSIVES FOR SETTLING HIGHWAY FILLS, MUCK DISPLACEMENT, ELECTRO-OSMOTIC STABILIZATION OF SOILS, VERTICAL SAND DRAINS FOR STABILIZATION, CLASSIFICATION OF ORGANIC SOILS, EFFECT OF INTERNAL HYDROSTATIC PRESSURE ON SOIL SHEARING STRENGTH, EQUIPMENT FOR TESTING THE STABILITY AND STRENGTH OF SOIL SUBGRADE AND SOIL FOUNDATIONS, DESIGN OF ENGINEERING WORKS ON ORGANIC TERRAIN, AND SOME EFFECTS OF SOIL, WATER AND CLIMATE UPON CONSTRUCTION, LIFE AND MAINTENANCE OF HIGHWAYS.

Highway Research Information Service

2A 231417

STUDIES OF FILL CONSTRUCTION OVER MUD FLATS INCLUDING A DESCRIPTION OF EXPERIMENTAL CONSTRUCTION USING VERTICAL SAND DRAINS TO HASTEN STABILIZATION


Winterkorn, HF Highway Research Board Bulletin

2A 231435

PRINCIPLES OF SOIL STABILIZATION IN ROAD CONSTRUCTION

CONTENTS: SOIL STABILIZATION AS AN ENGINEERING SCIENCE PHYSICAL AND PHYSICO-CHEMICAL SOIL CHARACTERISTICS AS BASIS OF SOIL STABILIZATION DESIGN METHODS
CONSTRUCTION MATERIALS

FOR FOUNDATIONS STABILIZATION OF GRANULAR AND COHESIVE SOILS PRINCIPLES AND PRACTICES OF SOIL STABILIZATION WITH BITUMEN, Tar, CEMENT AND OTHER MATERIALS TIME STABILIZATION-PRINCIPLES AND PRACTICAL EXECUTION: MOISTURE CONTENT OF SOIL

Winterkorn, HF. Aichhorn, W. 
Road Research Society, Austria

2A 231439
CALCIUM CHLORIDE SURFACE-CONSOLIDATED ROADS
A DESCRIPTION IS PRESENTED OF THE CONSTRUCTION AND MAINTENANCE METHODS NECESSARY TO OBTAIN A SURFACE CONSOLIDATED ROAD. THE ROAD IS DENOTED BY MANY DIFFERENT TERMS INCLUDING PARTIAL STABILIZATION. SEMI-STABILIZATION. ACCELERATED TRAFFIC BOUND. MAINTENANCE WITH CALCIUM CHLORIDE. SURFACE COMPACTION. AND SURFACE CONSOLIDATION. NECESSARY CONSTRUCTION OPERATIONS ARE DESCRIBED WHEN ROADS' LACK BINDER. AGGREGATE. MOISTURE AND WATER CONTENTS ARE DECIDED. THE ADVANTAGES OF THIS TYPE OF SURFACE CONSOLIDATION ARE: (1) A VARIETY OF LOCAL SURFACING MATERIALS AVAILABLE IN MOST REGIONS CAN BE UTILIZED, (2) SPECIAL TECHNICAL KNOWLEDGE IS NOT REQUIRED IN THE SELECTION OF THESE MATERIALS, (3) THE COST IS LOW, AND (4) THIS ROAD TYPE FITS WELL INTO A STAGE CONSTRUCTION PROGRAM. /AUTHOR/

Eittman, JH. Halfpast, FPG. DISCUSSER. Var, AUKEN WT DISCUSSER. Highway Research Board Proceedings

2A 231451
GRANULAR STABILIZED BASE CONSTRUCTION OF ACCESS AND RELOCATION ROADS BY TENNESSEE VALLEY AUTHORITY
THE EXPERIENCE OF THE TENNESSEE VALLEY AUTHORITY IN THE CONSTRUCTION OF GRANULAR STABILIZED BASE COARSE IS OUTLINED. THE AUTHORITY HAS CONSTRUCTED APPROXIMATELY 178 MILES OF GRANULAR STABILIZED BASE COURSE, OF WHICH 47.5 MILES HAVE BEEN ACCESS ROADS AND 80.7 MILES RELOCATIONS. CALCIUM CHLORIDE HAS BEEN USED IN THE PROPORTION OF ONE LBR. PER SQ. YD. PER 3-IN. COMPACTED LAYER. IT HAS BEEN FOUND EFFECTIVE IN INCREASING COMPACTED DENSITY, HOLDING MOISTURE AND INCREASING BONDS. THE MAINTENANCE COST ON THE COMPLETED SURFACE HAS BEEN EXTREMELY LOW AND HAS AVERAGED LESS THAN $100 PER MILE PER YEAR. THE PERFORMANCE OF THE CRUSHED STONE STABILIZED BASE HAS BEEN CONSIDERABLY BETTER THAN THAT OF THE GRAVEL BASE. STABILIZED GRANULAR BASE COURSES WITH LIGHT BITUMINOUS SURFACES WERE USED TO PROVIDE ACCESS TO 14 DAMS. THE TRAFFIC ON THESE ACCESS ROADS HAS AVERAGED FROM 1,000 TO 1,500 VEHICLES PER DAY FOR PERIODS FROM 2 YEARS TO 5 YEARS. STABILIZED GRANULAR BASE AND LIGHT BITUMINOUS SURFACING HAVE ALSO BEEN USED BY THE AUTHORITY ON BOTH STATE AND COUNTY HIGHWAY RELOCATIONS ON ROADS CONSTRUCTED TO REPLACE EXISTING ROADS THAT WERE FLOODED BY THE VARIOUS RESERVOIRS. THICKNESSES ARE DISCUSSED OF THE STABILIZED BASES. COSTS OF THE STABILIZED BASE CONSTRUCTION ARE DESCRIBED.

Webster, FW. Kellogg, FH. Highway Research Board Proceedings

2A 231462
PROGRESS IN SOIL-CEMENT CONSTRUCTION
A SYMPOSIUM OF PAPERS FROM SIX HIGHWAY DEPARTMENTS (SOUTH CAROLINA. NORTH CAROLINA. MISSISSIPPI, OHIO, MARYLAND, AND OKLAHOMA) COVERS CONSTRUCTION PROCEDURES, SOIL SAMPLING, SOIL CLASSIFICATION, CONSTRUCTION CONTROL, SUBGRADE CONTROL AND COSTS OF SOIL-CEMENT

Highway Research Board Proceedings

2A 231469
SYMPOSIUM ON SOIL-CEMENT IN ROAD CONSTRUCTION
THE GENERAL PROPERTIES AND ADVANTAGES OF SOIL-CEMENT ARE DISCUSSED. INCLUDING A REVIEW OF EXPERIENCES IN THE UNITED STATES. INDIVIDUAL PAPERS BY ALBERTO LANNE. JUAN GARCIA BALADO. AND VICTOR CARRI ARE ABSTRACTED.

Portland Cement Institute, Argentina

ACKNOWLEDGMENT: Highway Research Board Bibliography

2A 231473
CEMENT-TREATED SUBBASES FOR CONCRETE PAVEMENTS
DETAILED INFORMATION ON CEMENT-TREATED SUBBASE FOR HIGHWAY AND AIRFIELD PAVEMENTS IS PRESENTED. INCLUDED ARE DATA ON DESIGN. CONSTRUCTION AND PERFORMANCE OF EXISTING PROJECTS. A BRIEF SUMMARY OF RESEARCH IN PROGRESS OF THE PCA LABORATORY AND RECOMMENDATIONS FOR USE OF CEMENT-TREATED SUBBASES ON FUTURE PROJECTS.


ACKNOWLEDGMENT: Highway Research Board Bibliography

2A 231478
LABORATORY INVESTIGATION OF SOIL-CEMENT MIXTURES FOR SUBGRADE TREATMENTS IN KANSAS
THE INVESTIGATIONS OF THE EFFECT OF CEMENT ON THE PHYSICAL TEST CONSTANTS OF A SOIL ARE DESCRIED AND THE RESULTS OBTAINED DURING THE INVESTIGATION ARE PRESENTED. PHOTOS SHOWING THE EQUIPMENT USED DURING SOIL-CEMENT-STABILIZED ROAD CONSTRUCTION ARE GIVEN.

Caton, MD. Highway Research Board Proceedings

2A 231487
FUNDAMENTALS OF SOIL STABILIZATION ON STREET AND ROAD CONSTRUCTION

ACKNOWLEDGMENT: Highway Research Board Bibliography
CONSTRUCTION MATERIALS

2A 231498
SOIL STABILIZATION TESTS USED IN GREAT BRITAIN
REASONS FOR ADOPTING CRUSHING TESTS, BOTH FOR DETERMINING THE SUITABILITY OF A SOIL FOR STABILIZATION WITH CEMENT AND FOR CHECKING THE QUALITY OF THE PROCESSED SOIL IN THE FIELD ARE DISCUSSED AND ITS APPLICATION TO THE CONSTRUCTION OF TWO EXPERIMENTAL STABILIZED ROADS IS DESCRIBED.

Webb, SB / Int'l Conf Soil Mech & Fdn Eng Proc
Acknowledgment: Highway Research Board Bibliography

2A 231502
CEMENT STABILIZED BASE IN HIGHWAY CONSTRUCTION
GENERAL INDICATIONS ARE GIVEN ON THE DESIGN OF SOIL-CEMENT BASES. IT IS SUGGESTED THAT IN INDIA LOWER COMPRESSIVE STRENGTH VALUES ARE PERMISSIBLE THAN IN GREAT BRITAIN OR THE UNITED STATES, BUT IT IS IMPORTANT THAT TESTS ON SAMPLES SHOULD BE CARRIED OUT UNDER CONDITIONS OF VAPOR PRESSURE, TEMPERATURE AND HUMIDITY SIMILAR TO THOSE EXISTING ON THE CONSTRUCTION SITE. THE USE OF A SPECIAL CEMENT CONTAINING FINELY DIVIDED LIME IS SUGGESTED FOR THE STABILIZATION OF BLACK COTTON SOILS.

Bhata, HS / Indian Concrete Journal, Road Abstracts /UK/
Acknowledgment: Highway Research Board Bibliography

2A 231505
METHODS FOR DETERMINING THE MOST ECONOMICAL CEMENT CONTENT FOR CEMENT-TREATED SUBBASES AND SUBGRADE IN HIGHWAY CONSTRUCTION
THE ADVANTAGES OF CEMENT-TREATED SUBBASES AND THE METHODS CURRENTLY USED TO DETERMINE CEMENT REQUIREMENTS FOR CEMENT-TREATED SUBBASES AND SUBGRADES ARE DESCRIBED.

Turcott, LW / Southeast Assoc St Hwy Officials Proc Sept. 1958, 106
Acknowledgment: Highway Research Board Bibliography

2A 231523
ROAD CONSTRUCTION TEST TRACK BUILT
SECTIONS OF THE TEST TRACK INCLUDED GRAVEL STABILIZED WITH CEMENT, AND A SAND-CLAY MIXTURE STABILIZED WITH CEMENT.

Santon, TE / California Highways & Public Works
Acknowledgment: Highway Research Board Bibliography

2A 231528
STUDIES OF SOIL-AGGREGATE BASE-COURSE MIXTURES--FOR ROAD CONSTRUCTION PURPOSES
THE RESULTS OF LABORATORY STUDIES ARE PRESENTED TO DETERMINE BY MEANS OF COMPRESSION AND CAPILLARY-WATER ABSORPTION TESTS THE EFFECTS OF VARIABLE GRADATION, MOISTURE CONTENT AND ADMIXTURES UPON THE STRENGTH AND STABILITY OF SOIL-AGGREGATE BASE-COURSE MIXTURES. THE STRENGTH OF CEMENT-STABILIZED MIXTURES INCREASED AS THEIR DENSITY AND CEMENT CONTENT INCREASED. A COMBINATION OF PORTLAND CEMENT (1-4%) WITH 1% RCL ASPHALT IMPROVED BOTH THE STRENGTH AND RESISTANCE TO CAPILLARY WATER ABSORPTION.

Garnett, JB / Beland, CE
Roads and Bridges
Acknowledgment: Highway Research Board Bibliography

2A 231540
USE OF STABILIZED SOIL IN ENGINEERING CONSTRUCTION: SECTION 2. RESISTANCE OF CEMENT-SOIL MIXTURE TO ACTION OF WATER, SECTION 3. COMpressive STRENGTH OF CEMENT-SOIL MIXTURES
THE EFFECT ON THE RESISTANCE OF COMPACTED SOIL MIXTURES TO WATER BY THE ADDITION OF PORTLAND CEMENT WAS STUDIED. THE CEMENT INCREASED THE RESISTANCE TO SOAKING, TO WETTING AND DRYING AND TO EROSION OF A WATER JET. COMPRESSIVE STRENGTHS WERE ALSO INCREASED SO AS TO COMPARE FAVORABLY WITH THAT OF LOCALLY BURNT BRICK FOR USE IN BUILDING CONSTRUCTION.

Mehta, SR / Uppal, HL / Indian Roads Congress Journal
Acknowledgment: Highway Research Board Bibliography

2A 231544
USE OF STABILIZED SOIL IN ENGINEERING CONSTRUCTION
DATA ARE GIVEN ON THE THERMAL EXPANSION AND THERMAL CONDUCTIVITY PROPERTIES OF SOIL-CEMENT MIXTURES MADE OF FOUR SOIL TYPES. DATA ON THE EFFECT OF CEMENT CONTENT AND DENSITY ARE INCLUDED.

Mehta, SR / Uppal, HL / Indian Roads Congress Journal
Acknowledgment: Highway Research Board Bibliography

2A 231545
ENGINEERING PROPERTIES OF SOILS--SOIL-CEMENT STABILIZATION
THE MAIN STUDIES UNDERTAKEN WERE: (1) QUANTITY OF CEMENT NEEDED FOR SOIL-CEMENT STABILIZATION, (2) INVESTIGATION OF THE SUITABLE SIZE-GRADING FOR EASILY COMPACTABLE (PLASTIC) SOIL-CEMENT MIX, AND (3) STRENGTH DEVELOPED BY THE DIFFERENT STABILIZERS. SHRINKAGE, PERMEABILITY, DURABILITY AND STRENGTH DATA ARE GIVEN. CHEAP SUBSTITUTES FOR CEMENT WERE INVESTIGATED, SUCH AS BRIQUETS PREPARED WITH 5% CEMENT, 4% LIME WITH 3% MOLASSES, 4% CHALK WITH 2% RESIN AND 3% LIME WITH 6% SODIUM SILICATE. TESTED AFTER 3, 7, 28 DAYS, SOIL STABILIZED WITH 5% CEMENT MAY BE CONVENIENTLY USED FOR HYDRAULIC CONSTRUCTION.

Hunda, CL / Dhawan, CL / Bahri, JC / Indian Concrete Journal
Acknowledgment: Highway Research Board Bibliography

2A 231552
SOIL-CEMENT INVESTIGATION IN ENGLAND--RECENT PROGRESS IN SOIL-CEMENT FOR ROAD CONSTRUCTION
THE ROAD RESEARCH LABORATORY (GREAT BRITAIN) IS INVESTIGATING THE PRACTICABILITY OF CONSTRUCTING SOIL-CEMENT ROADS OF A THICKNESS LESS THAN THAT OF GRANULAR BASE ROADS. EXPERIMENTS SHOWED THAT PAVEMENT INCORPORATING A SOIL-CEMENT LAYER USUALLY HAS FLexURAL STRENGTH AT 7 DAYS OF 30-40 LB PER SQ IN.--NOT ENOUGH TO PREVENT CRACKING ALTHOUGH CRACKS WILL BE FINE AND WILL HAVE LITTLE EFFECT ON STABILIZED LAYER IF COMPRESSIVE STRENGTH DOES NOT EXCEED 250 LB PER SQ IN. SOIL-CEMENT SHOULD BE COVERED WITH AN IMPERVIOUS SURFACE TO PREVENT SOFTENING BY WATER.

Surveyor and Municipal Engineer / UK / Public Works
Acknowledgment: Highway Research Board Bibliography

2A 231580
ON THE EXECUTION OF SOIL-CEMENT BASE CONSTRUCTION IN OSAKA CITY
THE PLATE BEARING VALUE, K, WAS MEASURED AFTER ONE AND SEVEN DAYS THE CEMENT CONTENTS OF SAMPLES FROM THE TOP, MIDDLE, AND BOTTOM LAYERS WERE MEASURED AFTER EACH PASS OF THE MIXER AND VARIATIONS

Acknowledgment: Highway Research Board Bibliography
CONSTRUCTION MATERIALS

ARE SHOWN OF CEMENT CONTENT AFTER EACH PASS OF THE ROTARY MIXER. CEMENT CONTENTS IN THE SOIL-CEMENT SAMPLES WERE MEASURED USING THE SPECIFIC GRAVITY OF THE SOIL-CEMENT SOLUTIONS RATHER THAN THE MORE DIFFICULT ASTM METHOD. THREE PASSES OF THE ROTARY MIXER WERE REQUIRED TO PRODUCE UNIFORM MIXTURES.

Mitsui, S; Kawamura, S; Shiotsami, K. Semento Gijutsu Nenpo /Japan/, Japan Cement Engineering Assoc

ACKNOWLEDGMENT: Highway Research Board Bibliography

2A 231584
CONSTRUCTION OF ROAD PAVEMENTS FROM BLAST FURNACE SLAG
AN ILLUSTRATED ACCOUNT IS GIVEN OF AN EXPERIMENTAL ROAD CONSTRUCTION PROJECT IN HUNGARY WHERE BLAST-FURNACE SLAG WAS USED AS AGGREGATE FOR EACH COURSE OF THE PAVEMENT. THE SLAG BASE WAS STABILIZED WITH CEMENT, AND A BITUMINOUS WEARING SURFACE WITH SLAG AGGREGATE WAS PROVIDED.

Bakonyi, F. Melyepitestudomanyi Szemle /Hungary/, Road Abstracts /UK/

ACKNOWLEDGMENT: Highway Research Board Bibliography

2A 231588
DESIGN OF SOIL-CEMENT BASE COURSES FOR MODERN HIGHWAY CONSTRUCTION
COMPRESSIVE STRENGTH, WET-DRY AND FREEZE-THAW RESISTANCE, MODULUS OF RUPTURE AND LOAD-CARRYING CAPACITY DATA ARE GIVEN FOR SOIL-CEMENT MIXTURES MADE OF THREE DIFFERENT SOIL TYPES.

Hall, DJ. Utah State University

ACKNOWLEDGMENT: Highway Research Board Bibliography

2A 231589
SOIL STABILIZATION: CEMENT-TREATED SOIL MIXTURES. FLEXIBLE-PAVEMENT DESIGN WITH CEMENT-TREATED BASES HIGHWAY ENGINEERING HANDBOOK
SECTION 21-7 TO 21-85 INCLUSIVE COVERS ALL PHASES OF CEMENT-TREATED SOIL MIXTURES INCLUDING TYPES AND PROPER TIES, SAMPLING, LABORATORY TESTING, CONSTRUCTION, FIELD CONTROL TESTING AND FIELD PERFORMANCE. SECTION 25-46 COVERS STRUCTURAL DESIGN OF CEMENT-TREATED BASES.

Johnson, AW; Mcgraw Hill Book Company

ACKNOWLEDGMENT: Highway Research Board Bibliography

2A 231591
EFFECT OF WATER CONTENT ON THE COMPRESSIVE STRENGTH AND DENSITY OF VARIOUS AGGREGATE-CEMENT MIXES FOR HIGHWAY CEMENT-TREATED BASES
A STUDY WAS MADE TO DETERMINE THE EFFECT OF WATER AND CEMENT CONTENT ON THE COMPRESSIVE STRENGTH AND DENSITY OF LABORATORY TEST SPECIMENS OF CEMENT-TREATED BASES USED FOR HIGHWAY CONSTRUCTION IN THE STATE OF WASHINGTON. RESULTS SHOWED THAT THE COARSEST OF THREE GRADATIONS USED FOR THE TESTS PRODUCED DENSER MIXES AND REQUIRED THE LEAST AMOUNT OF WATER TO ACHIEVE THESE CONDITIONS. COMPACTION CONTROL BECAME MORE CRITICAL AT HIGHER CEMENT CONTENTS AND COMPRESSIVE STRENGTH FELL OFF MORE RAPIDLY ON THE WET SIDE OF OPTIMUM THAN ON THE DRY SIDE.

Maytin, IL. Washington State Institute Technology

ACKNOWLEDGMENT: Highway Research Board Bibliography

2A 231596
ROAD AND RUNWAY CONSTRUCTION IN SOIL STABILIZED BY BITUMEN-CEMENT
A METHOD HAS BEEN DEVELOPED OF STABILIZING SOIL BY THE ADDITION OF CEMENT AND BITUMEN EMULSION. LABORATORY STUDIES SUGGEST THAT SOIL STABILIZED WITH CEMENT AND BITUMEN EMULSION WILL CONFORM MORE READILY TO INEQUALITIES IN THE SUBBASE THAN SOIL STABILIZED WITH CEMENT ALONE.

James, RL. Road Abstracts /UK/, Contractors' Record

ACKNOWLEDGMENT: Highway Research Board Bibliography

2A 231598
PECTOSOL-CEMENT PROCESS FOR SOIL STABILIZATION
THE PROCESS FOR MAKING ROADS CHEAPLY AND QUICKLY IN UNDEVELOPED TERRITORIES OVERSEAS, EVOLVED BY A.S.P. CHEMICAL CO., MAKES USE OF CERTAIN VEGETABLE MATERIALS NORMALLY WASTED, SUCH AS SISAL 'FLESH,' GROUNDNUT HUSKS AND PALM KERNEL HUSKS. LABORATORY TESTS GAVE SATISFACTORY RESULTS WITH MIXTURE OF 1-1/2 PARTS CEMENT TO 100 PARTS SOIL AND STABILIZER TOGETHER.

Engineering /UK/, Engineer, London /UK/, Engineering Index

ACKNOWLEDGMENT: Highway Research Board Bibliography

2A 231601
USE OF STABILIZED SOIL IN ENGINEERING CONSTRUCTION. SECT. 4, SHRINKAGE OF COMPACTED SOILS

Mehra, SR; Uppal, HL. Indian Roads Congress Journal

ACKNOWLEDGMENT: Highway Research Board Bibliography
CONSTRUCTION MATERIALS

ACKNOWLEDGMENT: Highway Research Board Bibliography

2A 231602
A SUMMARY REPORT ON SOIL STABILIZATION BY THE USE OF CHEMICAL ADMIXTURES

THE RESULTS OF LABORATORY AND FIELD INVESTIGATIONS OF THE SOIL STABILIZING PROPERTIES ON NUMEROUS CHEMICALS ARE PRESENTED WITH RESPECT TO THEIR APPLICABILITY FOR ROAD AND AIRPORT CONSTRUCTION. LABORATORY TESTING PROCEDURES ARE DESCRIBED WHICH WERE DEVELOPED FOR EVALUATING THE VARIOUS CHEMICAL SOIL TREATMENTS STUDIED. CEMENT PROVED TO BE THE MOST GENERALLY SATISFACTORY STABILIZING AGENT INVESTIGATED. THE EFFECTIVENESS OF A NUMBER OF ADMIXTURES WITH SOIL-CEMENT ARE ALSO GIVEN. THE ADMIXTURES INCLUDED WERE: (1) BENEFICIAL-AROCOLOR 1271 AND 4065, MCNTAR NO 3, PICCOLYTE 125, PICCOUMARON XX-100, GOODRITEN 50, STYMER SOLUTION, CRD 198, CRD 113, CRD 155, RESIN 321, STABINOL SANTO RESIN, STEROL LF87, CALCIUM STEARATE, MAGNESIUM STEARATE, SODIUM SILICATE, CHLOROSULFONIC ACID, (2) NO IMPORTANT EFFECT: AROCLOR 1171 AND 5900, TRANSPHALT 100, MODIFIED STYRENE 250/315 PORTLAND CEMENT GAVE RESULTS SUITABLE FOR ENGLISH CONDITIONS, A HIGHER PERCENTAGE OF CEMENT WOULD BE REQUIRED FOR FRANCE.

Mainfort, RC
Civil Aeronautics Administration /US/, Roads & Engineering Construction

ACKNOWLEDGMENT: Highway Research Board Bibliography

2A 231605
STABILIZING WEAK AND DEFECTIVE BASES WITH HYDRATED LIME

EXPERIENCES WITH LIME AND LIME-CEMENT STABILIZED ROADS WERE REPORTED UNDER VARIOUS DEGREES OF USAGE AND WEATHER CONDITIONS. SOIL CONSTANTS AND GRADATION WERE GIVEN OF TRIAL MIXES AFTER ADMIXING LIME INCLUDING THE EFFECT OF HYDRATED LIME ON PLASTICITY INDEX.

Fuller, MG
Dabney, GW
Roads and Streets, Engineering Index

ACKNOWLEDGMENT: Highway Research Board Bibliography

2A 231609
SOIL STABILIZATION FOR HIGHWAYS
THE EFFECT OF POLYVINYL ALCOHOL AND VARIOUS DESPERANTS ON THE BEHAVIOR OF SOIL-CEMENT MIXTURES WAS INVESTIGATED WITH A VIEW TO FINDING A LOW-COST RESIN OR PLASTIC WHICH WILL IMPROVE THE PROPERTIES OF SOIL-CEMENT MIXTURES.

Mass Inst Tech Dept Pub Wks Jn Hwy Res, Road Abstracts /UK/

ACKNOWLEDGMENT: Highway Research Board Bibliography

2A 231610
CONSTRUCTION OF SOIL-CEMENT DRAINS
THE TYPE OF SOIL AND THE CEMENT CONTENT TO BE USED IN THE CONSTRUCTION OF SOIL-CEMENT DRAINS FOR RURAL AND SUBURBAN AREAS HAVE BEEN STUDIED BY SUBJECTING SOIL-CEMENT BLOCKS TO PROLONGED ACTION OF ACIDS AND ALKALIS. RESULTS SHOWED THAT 5% OR MORE OF LIME CONTENT HAD A SIGNIFICANT EFFECT ON THE CHEMICAL COMPOSITION OF ACIDIC SOILS AND ALKALIS (SANDY SOILS BEING MORE RESISTANT THAN SILTY SOILS). AND OF SODIUM CHLORIDE AND SODIUM SULFATE SOLUTIONS. AN EXPERIMENTAL DRAIN CONSTRUCTED WITH PRECAST SOIL-CEMENT BLOCKS IN 1932 WAS STILL GIVING EXCELLENT PERFORMANCE AFTER 2-1/2 YEARS.

Mehra, SR
Chadda, LR
Indian Concrete Journal, Road Abstracts /UK/

ACKNOWLEDGMENT: Highway Research Board Bibliography

2A 231622
SOIL STABILIZATION WITH CEMENT
THE USE OF SOIL-CEMENT FOR ROADS IS DESCRIBED WITH PARTICULAR ATTENTION TO WORK CARRIED OUT AT THE ROAD RESEARCH LABORATORY, HARMONDSWORTH. ITS APPLICATION TO FRENCH CONDITIONS IS DISCUSSED. IT IS THOUGHT THAT THE USE OF TRASH WITH THE CEMENT MIGHT CONSIDERABLY REDUCE STABILIZATION COSTS IN FRANCE Owing to the high cost of cement, the use of small quantities of cement for improving soil strength may be preferable to the larger quantities required for soil-cement. AN APPENDIX DESCRIBES TESTS ON THE USE OF CEMENT FOR STABILIZING CHALK. RESULTS INDICATED THAT ALTHOUGH AN ADDITION OF 250/315 PORTLAND CEMENT GAVE RESULTS SUITABLE FOR ENGLISH CONDITIONS, A HIGHER PERCENTAGE OF CEMENT WOULD BE REQUIRED FOR FRANCE.

Peltier, R
Road Abstracts /UK/
Routes, Paris /France/

ACKNOWLEDGMENT: Highway Research Board Bibliography

2A 231637
INFLUENCE OF ADDITIONS OF LIME AND CEMENT ON ROAD-BUILDING PROPERTIES OF CLAY SOILS
AN ADDITION OF 4% OF SLAKED LIME RENDERED THE SOIL LESS PERMEABLE, INCREASED ITS BEARING POWER AND PREVENTED DRYING-SHRINKAGE. CEMENT WAS NOT EFFECTIVE.

Volkov, MI
Kudrin, BR
Chemical Abstracts Journal Karkhov Highway Inst

ACKNOWLEDGMENT: Highway Research Board Bibliography

2A 231638
EXPERIMENTS ON STABILIZED GRAVEL-CLAY SURFACES
(IN FRENCH)
RESULTS ARE GIVEN OF LABORATORY AND FIELD STUDIES OF STABILIZED GRAVEL-CLAY ROADS, DEMONSTRATING THEIR EFFICIENT PERFORMANCE AND LOW COST. TESTS ARE CONDUCTED USING PORTLAND CEMENT, CALCIUM CHLORIDE AND BITUMEN.

Mayer, A
Ann Inst Tech Batiment Trav Publ /Fr/

ACKNOWLEDGMENT: Highway Research Board Bibliography

2A 231642
MODIFICATION OF A GUMBOTHIN SOIL BY LIME AND PORTLAND CEMENT ADMIXTURES
THE RESULTS ARE REPORTED OF A LABORATORY STUDY ON THE EFFECT OF VARIOUS PERCENTAGES OF LIME AND PORTLAND CEMENT UPON THE ENGINEERING PROPERTIES OF A HEAVY, STICKY, GUMBO SOIL WHICH IS RATHER FREQUENTLY ENCOUNTERED IN HIGHWAY CONSTRUCTION IN SOUTHWEST IOWA. VARIOUS PERCENTAGES OF UNSLAKED LIME AND PORTLAND CEMENT WERE ADDED TO THE SOIL IN THE DRY STATE AND THE INFLUENCE OF THESE ADMIXTURES WAS OBSERVED BY COMPAREING THE RESULTS OF CERTAIN TESTS OF THE MIXTURES WITH THE TEST RESULTS ON THE UNTREATED SOIL. THE PROPERTIES CHOOSEN FOR THESE COMPARISONS WERE THE DENSITY, PLASTIC LIMIT, SHRINKAGE INDEX, SHRINKAGE RATIO, LINEAR SHRINKAGE, VOLUMETRIC CHANGE, STANDARD AASHO DENSITY, OPTIMUM MOISTURE CONTENT, AND THE CBR WITH SOIL MODIFIED TO STANDARD AASHO DENSITY.

Spangler, MG
Patel, OH
Highway Research Board Proceedings
REFERENCES

The following topics were presented: processing of soils with tar and cement for road base construction.

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CONSTRUCTION MATERIALS

2A 231649

Modifying Tennessee Cherts with Portland Cement. Studies and practices in the stabilization of cherts are covered. A number of tests were employed to determine the efficiency of various admixtures when combined with poor soils. The percentages of admixtures involved were usually 1, 2, and 4% on the basis of weight for the Portland cement, hydrated lime, lime-flyash, calcium acrylate, and calcium chloride, and 1/2, 1, and 2% (residue basis) for the cut-back asphalt, emulsified asphalt and road tar.

Results of these tests are summarized for two chert samples.

Whitehurst, EA. American Road Builders Assoc. Tech. Bull

Acknowledgment: Highway Research Board Bibliography

2A 231651

An investigation to determine the economy and practicability of using various type soils treated with Portland cement or other admixtures for highway construction. Results of compressive strengths of various soils untreated and treated with the addition of Portland cement and other stabilized materials are given. The development of test procedures suitable for evaluating compressive strengths is also described.

Mcgee, JD. Paquette, RJ. Georgia Inst Technol Eng Exper Station

Acknowledgment: Highway Research Board Bibliography

2A 231657

Road soil base bound with cement. The construction in Kansas in 1936 of a 12-in. soil-cement base for concrete pavement is described. The base was built in two 6-in. lifts using farm equipment. The need for the development of heavy-duty road equipment for this type of work is indicated.

Allen, H. Engineering News-record

Acknowledgment: Highway Research Board Bibliography

2A 231658

Construction of experimental stabilized soil-cement highway. A detailed discussion is presented of equipment and procedure in constructing first stabilized soil-cement highway in Illinois in Winnebago County, September 1936.

Erickson, RO. Illinois Univ Eng Exp Sta Circulars. Engineering Index

Acknowledgment: Highway Research Board Bibliography

2A 231662

Strictly handmade, soil-cement roadbuilding, Sian-Lanchow highway (China). An account is given of cement stabilization of 18.6 miles of the old Sian-Lanchow highway built entirely by hand labor. The entire paving project will be 472 miles consisting of two 10-ft lanes and a 6-in. roadbed.

Chen, F. Engineering News-record

Acknowledgment: Highway Research Board Bibliography

2A 231664

Earth roads in South. The following topics were presented: processing of soils with tar and cement for road base construction in South Carolina, road soil distribution, pioneering with cement, tools for tar processing, and typical sections of stabilized earth, including tar and cement processed soil roads.

Hill, CS. Engineering News-record, Engineering Index

Acknowledgment: Highway Research Board Bibliography

2A 231665

Base stabilization with Portland cement. (Nodaway County, Mo.) A detailed and fully illustrated account is given of stabilization of soil with cement over a stretch of 4-1/2 miles in Missouri. The design specified a uniformly compacted soil-cement-stabilized roadway thickness of 6 in., 22 ft. in width. The specified cement content was 9% by vol. of compacted roadway.

Lancaster, CM. Roads and Streets

Acknowledgment: Highway Research Board Bibliography

2A 231666

Single machine methods and control operations. Construction procedures used in 1939 on the first soil-cement road built by the Ohio Department of Highways are described. A 'single pass' mixing machine was used.

Litehiser, RR. Brooks, HE. Highway Research Board Proceedings

Acknowledgment: Highway Research Board Bibliography

2A 231668

Caliche-cement stabilization. Construction is reported on a project which consisted of removing the asphalt top from a caliche base, stabilizing the caliche for a depth of 6 in. with 8% cement by volume, and surfacing it with approximately 3/4 in. of cut-back asphalt concrete for a width of 20 feet.

Texas State Department of Highways & Public Transp

Acknowledgment: Highway Research Board Bibliography

2A 231673

Soil-cement for army airports and runways. Runway construction of many airports exclusively controlled by military authorities is covered. Use has been made of over 8,500,000 sq. yd. of soil-cement to meet design problems presented at several of these airports.

Catton, MD. Military Engineer, Engineering Index

Acknowledgment: Highway Research Board Bibliography

2A 231674

Soil-cement use on airports. Runways, taxiways, parking aprons and dispersal revetments are constructed of low-cost soil-cement as means of reducing fragmentation effect of high explosive detonations which might occur in case of enemy attack on airports.

Miller, LW. Western Construction News

Acknowledgment: Highway Research Board Bibliography

2A 231685

Problems of soil stabilization and the scientific control of concrete for road works. A detailed account is given of the closely controlled construction of concrete and cement-stabilized hoggin roads and foundation slabs for

Acknowledgment: Highway Research Board Bibliography

2A 231685

Problems of soil stabilization and the scientific control of concrete for road works. A detailed account is given of the closely controlled construction of concrete and cement-stabilized hoggin roads and foundation slabs for
CONSTRUCTION MATERIALS

PRE-FABRICATED HOUSES ON A HOUSING SITE AT LUDON. METHODS OF CARRYING OUT AND INTERPRETING TESTS ON AGGREGATES, CONCRETE, AND STABILIZED HOGGIN ARE DESCRIBED, AND A LIST IS GIVEN OF EQUIPMENT FOR A FIELD LABORATORY.

Gauntlett, HD J Inst Munic Engrs /UK/, Road Abstracts /UK/
Acknowledgment: Highway Research Board Bibliography

2A 231688
SUB-BASE CONSTRUCTION OF JERSEY MARINE ROAD
THE ONLY MATERIAL AVAILABLE WAS WIND-BLOWN SAND, WHICH WAS STABILIZED WITH CEMENT AND CONSOLIDATED WITH 1-1/4 IN. SURCHARGE INTO 4-IN. THICK SUBBASE. COMPACTION WAS PERFORMED WITH HOLMAN SUBGRADE TYPE COMPACTOR FOLLOWED BY HOLMAN FINISHER. THE FINISHED SUBBASE WAS CURED FOR 3 TO 7 DAYS THEN SPRAYED WITH 55% BITUMEN EMULSION AT THE RATE OF 6 SQ. YDS. PER GALLON.

Rocks & Road Construction, London /UK/, Engineering Index
Acknowledgment: Highway Research Board Bibliography

2A 231694
A TYPICAL OHIO SOIL-CEMENT PROJECT
THE PROJECT INCLUDED CONSTRUCTION OF 101 MILES OF 6-INCH SOIL-CEMENT BASE. THE OHIO HIGHWAY DEPARTMENT'S STANDARD INVESTIGATIONS ARE DISCUSSED.

Marshall, H American Road Builders Assoc Tech Bull
Acknowledgment: Highway Research Board Bibliography

2A 231695
SOIL-CEMENT ROAD CONSTRUCTION WITH PARTICULAR REFERENCE TO MIX-IN-PLACE METHODS
THE PRINCIPLES OF SOIL-CEMENT STABILIZATION ARE EXPLAINED WITH A DETAILED ACCOUNT OF MIX-IN-PLACE METHODS AND EQUIPMENT USED ON A HOUSING ESTATE. RECOMMENDATIONS ARE MADE ON SOIL SAMPLING AND TESTING, MIXING METHODS, CONTROLS ON THE SITE, AND PLANT REQUIREMENTS FOR THE RESPECTIVE STAGES OF CONSTRUCTION.

Phillips, N J Inst Munic Engrs /UK/, Road Abstracts /UK/
Acknowledgment: Highway Research Board Bibliography

2A 231696
MECHANICAL CONSTRUCTION OF STABILIZED SOIL ROAD SURFACINGS (IN CZECHOSLOVAKIA)
THE FOLLOWING ITEMS ARE DISCUSSED: NEW METHODS OF CONSTRUCTION OF BASES AND SURFACES AND THEIR ECONOMY; DEVELOPMENT OF SOIL STABILIZATION IN THE UNITED STATES; AGRICULTURAL AND OTHER SPECIAL EQUIPMENT AND MACHINERY; DESCRIPTION OF SOIL-CEMENT PAVEMENT ON FULL-SCALE EXPERIMENTAL ROAD SECTION IN KATISKOVICE, CZECHOSLOVAKIA.

Pospislil, F Engineering Index
Acknowledgment: Highway Research Board Bibliography

2A 231707
SOIL STABILIZATION IN GERMANY. EXTENSIVE DEVELOPMENT AND MACHINERY
INFORMATION OBTAINED DURING THE AUTHOR'S VISIT TO GERMANY IN 1953 SUBSTANTIATES THE CLAIM MADE IN GERMAN TECHNICAL PRESS THAT AT LEAST 100 MILLION SQ. METERS OF SOIL-CEMENT CONSTRUCTION HAD BEEN LAYED BY GERMANS ON AIRFIELDS DURING THE PERIOD 1938 TO 1945. MACHINES USED INCLUDED STRABAF, VOEUGLE, AND SONTHOVEN MIX-IN-PLACE MACHINES, REISER TRAVEL-MIX TYPE, BUNGARTZ ROTARY TILLERS, STABIL-BAU HOOD AND ROTOR ATTACHMENT. ROAD MATERIALS WERE EMPLOYED.

Clare, KE Foulkes, RA Engineering /UK/, Engineering Index
Acknowledgment: Highway Research Board Bibliography

2A 231708
GERMAN SOIL STABILIZATION

Acknowledgment: Highway Research Board Bibliography

2A 231709
SOIL STABILIZATION IN GREAT BRITAIN
DETAILS PERTAINING TO SOIL-CEMENT STABILIZATION ARE GIVEN ON THE DESIGN, TESTING AND CONSTRUCTION OF EXPERIMENTAL FORWARD AIRFIELDS. GENERAL, HARDSTANDS AND ROADS BUILT BY THE ARMY ARE ALSO DESCRIBED. THE LOW COST OF SOIL-CEMENT FOR HOUSING PROJECTS, STREET AND COUNTY ROADS IS DISCUSSED AND THE SAVINGS OVER ALTERNATE TYPES OF PAVING ARE GIVEN.

Foulkes, RA Symp Soil Stabilization /Australia/ pp 15-23, Jan. 1954
Acknowledgment: Highway Research Board Bibliography

2A 231722
USE OF SOIL-CEMENT IN ROAD CONSTRUCTIONS (IN SPANISH)

Carri, V Portland Cement Institute /Argentina/
Acknowledgment: Highway Research Board Bibliography

2A 231730
SOIL-CEMENT CONSTRUCTION IN NORTH DAKOTA
ALTHOUGH TECHNIQUES AND EQUIPMENT DIFFER, DEPENDING ON JOB CONDITIONS AND SOIL TYPE, SOIL-CEMENT PROCESSING FOLLOWS FOUR BASIC STEPS: INITIAL PREPARATION, SPREADING CEMENT, MIXING, AND COMPACTING. THE TWO STATE PROJECTS COMPLETED IN 1955 AND 1956 ADOPTED, TOGETHER THEY COMPRIS 684,173 SQ. YD. OF SOIL-CEMENT. COST PER SQ. YD. WAS $1.66, WHICH INCLUDES 6-IN. SOIL-CEMENT BASE AND 24-IN. BITUMINOUS SURFACE.

Mccormick, JL American Road Builders Assoc Tech Bull
Acknowledgment: Highway Research Board Bibliography
CONSTRUCTION MATERIALS

A HEAVY-DUTY AIRFIELD PAVEMENT EMBODying SOIL STABILIZATION & DISCUSSION

THE PAPER DESCRIBES THE USE OF CEMENT-STABILIZED SOILS IN A HEAVY-DUTY AIRFIELD PAVEMENT AT A SITE WHERE THE SUBSOIL WAS ALMOST ENTIRELY GRANULAR. THE CONSTRUCTION AND TESTING OF THE PAVEMENT AND THE INTERPRETATION OF THE TEST RESULTS IN ASSESSING ITS CAPACITY TO SUPPORT THE PLANNED AIRCRAFT LOADS ARE DESCRIBED. IT IS SUGGESTED THAT A PAVEMENT IN WHICH CEMENT-STABILIZED SOIL IS USED AS A CONSTRUCTION MATERIAL PERFORMS MORE LIKE A FLEXIBLE THAN A RIGID-TYPE PAVEMENT BUT THAT FOR THE SAME STRENGTH, A REDUCED THICKNESS OF PAVEMENT CAN BE USED COMPARED WITH THAT NEEDED FOR PURELY FLEXIBLE-TYPE MATERIALS. AT THE SITE DISCUSSED, THE FACTOR BY WHICH THE NORMAL CBR DESIGN DEPTHS ARE MULTIPLIED IS 0.7. THE FINAL TESTING OF EACH LAYER OF THE PAVEMENT BY REPEATEDLY APPLYING AT THE SAME POINT STATIC LOADS OF VARYING MAGNITUDE THROUGH 18-IN. DIAMETER PLATES AS WELL AS BY ROLLING WITH WHEEL LOADS OF 30,000 LB. IS DESCRIBED AND RESULTS ARE PRESENTED IN DETAIL.

Martin, FR Inst Civil Engineers Proc London /UK/, Inst Civil Engineers Proc London /UK/

ACKNOWLEDGMENT: Highway Research Board Bibliography

SOIL-CEMENT STABILIZED PAVEMENT

THE CONSTRUCTION OF A 12-INCH SOIL-CEMENT BASE ON STATE HIGHWAY 16, FIVE MILES SOUTH OF LISMORE IN THE SHIRE OF GUNDAJMBA, AUSTRALIA, IS DESCRIBED. THE SOIL-CEMENT BASE WAS BUILT IN TWO 6-IN. LAYERS.

Constructional Review Australia/, Indian Concrete Journal

ACKNOWLEDGMENT: Highway Research Board Bibliography

THE PERFORMANCE OF AN EXPERIMENTAL CEMENT-STABILIZED CHERT BASE

INVESTIGATIONS SHOW THAT MANY SUBSTANDARD MATERIALS, PRINCIPALLY CHERT AND GRAVEL FOUND IN MIDDLE AND WEST TENNESSEE, COULD BE ADEQUATELY USED FOR HIGHWAY BASE CONSTRUCTION IF STABILIZED WITH VERY LOW QUANTITIES OF PORTLAND CEMENT, ABOUT 4% BY WEIGHT.

Whitetarth, EA Goodwin, WA
Tennessee University

ACKNOWLEDGMENT: Highway Research Board Bibliography

CEMENT-TREATED SUBBASE FOR INTERSTATE 30 PAVEMENT AT GREENVILLE, TEXAS

THE REPORT CONTAINS A DESCRIPTION OF THE CONSTRUCTION OF A SUBBASE UNDER CONCRETE PAVEMENT OF INTERSTATE 30 EXTENDING 14.8 MILES FROM GREENVILLE TO DALLAS, TEXAS.

Cravens, JW American Road Builders Assoc Tech Bull

ACKNOWLEDGMENT: Highway Research Board Bibliography

ORANGE COUNTY EXPERIENCES WITH SOIL-CEMENT USE

THE REPORT DESCRIBES THE INITIATION, ABOUT THREE YEARS AGO, OF A PROGRAM OF SOIL-CEMENT ROAD CONSTRUCTION TO KEEP PACE WITH THE EXPLOSIVE GROWTH OF ORANGE COUNTY, CALIFORNIA.

Koch, AS American Road Builders Assoc Tech Bull

ACKNOWLEDGMENT: Highway Research Board Bibliography

COST ESTIMATE FORM FOR SOIL-CEMENT CONSTRUCTION

ESTIMATES ARE OF PARTICULAR VALUE WHEN CURRENT LOCAL BID PRICES ARE NOT AVAILABLE. TO PROVIDE FURTHER ASSISTANCE AND TO SHOW THE USE OF THE FORM, TWO SAMPLE APPROXIMATE COST ESTIMATES FOR ASSUMED SOIL-CEMENT PROJECTS FOLLOW THESE FORM SHEETS. ONE IS FOR A MIXED-IN-PLACE PROJECT AND THE OTHER FOR A STATIONARY MIXING PLANT JOB.

Portland Cement Assoc Soil Cement Serv

ACKNOWLEDGMENT: Highway Research Board Bibliography

SUMMARIES OF SOIL-CEMENT CONSTRUCTION TO JAN. 1, 1960

DETAILED TABLES ARE GIVEN FOR SOIL-CEMENT YARDAGE STATISTICS FOR 1959 BY YEAR AND TYPE, TYPE AND STATE, AND YEAR AND STATE FROM 1935-1959.

Portland Cement Assoc Soil Cement Serv

ACKNOWLEDGMENT: Highway Research Board Bibliography

A FULL-SCALE SPECIFICATION TRIAL OF A CEMENT-BOUND GRANULAR BASE ON A11 AT HIGH ROAD, SALWAY HILL, WOODFORD, ESSEX

THE SPECIFICATIONS AND CONSTRUCTION OF A SOIL-CEMENT FOR A HEAVILY-TRAFFICKED ROAD ARE DESCRIBED. THE DESIGN WAS 8 IN. OF SOIL-CEMENT, 2 IN. ROLLED ASPHALT SURFACE, AND A GROUND SUB-BASE DESIGNED TO A THICKNESS BASED ON THE CBR OF THE SUBGRADE.

Broad, BA
Road Research Laboratory /UK/

ACKNOWLEDGMENT: Highway Research Board Bibliography

SUGGESTED SPECIFICATIONS FOR SOIL-CEMENT BASE COST

THE SPECIFICATIONS PROVIDES SUGGESTED SPECIFICATIONS FOR ENGINEERS, ARCHITECTS, CONSULTANTS, CONTRACTORS AND DEVELOPERS INTERESTED IN CONSTRUCTING SOIL-CEMENT ROADS, STREETS, AIRPORTS, PARKING AREAS AND OTHER USES.

Portland Cement Association

ACKNOWLEDGMENT: Portland Cement Association

SOIL-CEMENT INSPECTOR'S MANUAL

FIELD INSPECTION OF SOIL-CEMENT CONSTRUCTION INVOLVES THE CONTROL OF FOUR BASIC FACTORS: CEMENT CONTENT, MOISTURE CONTENT, COMPACTION AND CURING.

Portland Cement Association

ACKNOWLEDGMENT: Portland Cement Association

STUDIES MADE FOR CONSTRUCTION OF COLOMBIAN HIGHWAY, 'LA YE-PLANETA RICA' STABILIZATION WITH PORTLAND CEMENT OF MATERIALS FROM BURROW PITS OF TREMENTINA, BELLAVISTA Y LIBERIA WAS STUDIED. BASE OF SOIL-CEMENT WAS USED IN HIGHWAY CONSTRUCTION, UTILIZING CLAYEY AND SILTY SAND DEPOSITS FOUND ALONG HIGHWAY. IN DESIGN, TEST FOLLOWED METHODS OF ASTM WITH SOME VARIATIONS, FREEZING TEST WAS DISCARDED BECAUSE OF TROPICAL CLIMATE AND ONLY 6 CYCLES OF WETTING AND DRYING WERE USED BUT EFFECT OF ABRASION WAS INCREASED WHILE BRUSHING. PLASTICITY REDUCTION OF SOIL STRID WITH PORTLAND CEMENT WAS STUDIED.
CONSTRUCTION MATERIALS

Aueja, J
Pan Am Hwy Congress, Proc

ACKNOWLEDGMENT: Portland Cement Association

2A 231775
THE USE OF GRANULAR SLAG SAND AND FLY ASH IN ROAD CONSTRUCTION BY THE SOIL-CEMENT TECHNIQUE
A MIXTURE OF 50% GRANULAR SLAG, 44% FLY ASH AND 6% SLAG CEMENT HAS BEEN SUCCESSFULLY USED ON ROADS IN FRANCE. THE STABILIZED MATERIAL MIXED IN THE SAME WAY AS SOIL-CEMENT WAS LAID ON A FOUNDATION OF CLAYEY SHALE AND GIVEN A SURFACE DRESSING OF BITUMEN EMULSION AND CHIPPINGS. RESULTS ARE GIVEN OF TESTS ON SAMPLES MADE IN THE LAB AND ON CORES TAKEN FROM THE ROAD.

Chapelle, IA Road Abstracts /UK/

ACKNOWLEDGMENT: Portland Cement Association

2A 231782
THE INFLUENCE OF SOIL CHARACTERISTICS IN SOIL-CEMENT MIXTURES
THE OPTIMUM PROBABLE PERCENTAGE OF PORTLAND CEMENT REQUIRED FOR SOIL-CEMENT MIXTURES IS DETERMINED. THE STUDY IS BASED ON LOCAL MATERIAL USED IN ROAD CONSTRUCTION IN THE PROVINCE OF BUENOS AIRES. PROCEDURES DEVELOPED AT THE ROAD RESEARCH LABORATORY, HARMONDSWORTH, WERE USED FOR TEST ON CLAYEY SOILS.

Doloresio, AH Ocampo, OR Road Abstracts /UK/

ACKNOWLEDGMENT: Portland Cement Association

2A 231783
EFFECT OF WATER AND COMPACTION ON THE STRENGTH OF SOIL-CEMENT MIXES
THE EFFECT ON THE STRENGTH OF SOIL-CEMENT IS ESTABLISHED FOR TWO TYPES OF TYPICAL SOILS, NAMELY, A SAND AND A SILT WITH CEMENT CONTENTS OF 8 TO 14 AND 6 TO 12%, RESPECTIVE OF 2 FACTORS: MOISTURE CONTENT AND DEGREE OF COMPACTION. THESE CAN VARY AS A FUNCTION OF JOB CONDITIONS SUCH AS CAPACITY OF COMPACTING EQUIPMENT OR MOISTURE. THIS STUDY WAS INTENDED TO PROVIDE INFORMATION TO ENGINEERS IN CHARGE OF SOIL-CEMENT PAVEMENT CONSTRUCTION. WHO, KNOWING THE EFFECT OF THESE FACTORS, COULD BETTER DEFINE THE MEASURES TO BE TAKEN IN COUNTERACTING OR MINIMIZING THEIR ACTION.

Dutro, P Clos, R Int'l Conf Soil Mech & Fd & Eng Proc Nat Belgian Roads Congress, Pca Foreign Literature Study

ACKNOWLEDGMENT: Portland Cement Association

2A 231786
USES AND PROSPECTS OF THE SOIL-CEMENT STABILIZATION FOR HIGHWAY CONSTRUCTION
THE MAIN TYPES OF SOILS STABILIZED WITH CEMENT ARE EXAMINED: FIRST CLEAN OR SILTY SANDS, AS WELL AS SANDS TREATED IN SITU, THEN SOILS WITH FRIABLE COMPONENTS, PLASTIC AND LEAN GRAVELS. THE BEHAVIOR OF SAND-CEMENTS IN FOUNDATIONS AND GRAVEL-CEMENTS IN HIGHWAY BASE COURSES IS PRESENTED WITH EMPHASIS ON RIGIDITY AND CRACKING SAFETY. AN EXPERIMENTAL STRETCH WAS INVESTIGATED IN FRANCE IN 1960 AND THE RESULTS OBTAINED BY STRENGTHENING THE ROADWAY BY MEANS OF LEAN GRAVELS WITH SLIGHT BATCHING OF CEMENT ARE DESCRIBED. STUDY SHOWS THE POSSIBILITY OF MAKING ECONOMIC STRENGTHENING WITH GRAVEL-CEMENTS WITHOUT TRAFFIC INTERRUPTION.

Godin, P Ann Inst Tech Bâtiment Trav Publ /Fr/, Am Concrete Inst Journal & Proceedings

ACKNOWLEDGMENT: Portland Cement Association

2A 231791
THE USE OF SODIUM SILICATE AS ADDITIVE TO SOILS STABILIZED WITH CEMENT
SOILS FROM CLUJ REGION ARE STABILIZED AND SUITABLE FOR CONSTRUCTION PURPOSES. THE COMPOSITION OF THESE SOILS IS: SILICATE OXIDE 65.5, ALUMINUM OXIDE 16.6, FERRIC OXIDE 4.5, MAGNESIUM OXIDE 1.6, CALCIUM OXIDE 0.9, POTASSIUM OXIDE 3.2, SODIUM OXIDE 0.8, AND WEIGHT LOSS 7.00%. TO SOILS WITH 8-10% MOISTURE WAS ADDED AN ADDITION OF 2% OF WATER. THE ADDITION OF 2% SODIUM SILICATE TO A SOIL-8% CEMENT MIXTURE GAVE SIMILAR RESULTS AS A SOIL-12% CEMENT MIXTURE (FREE OF SODIUM SILICATE) AND THE ADDITIONS OF 6-7 1. SODIUM SILICATE REDUCES BY 80KG. THE REQUIRED AMOUNT OF CEMENT TO STABILIZE THE SOIL. THE ADDITION OF SODIUM SILICATE ALSO IMPROVES THE SPEED OF HARDENING.

Hossu, T Marusici, D Pop, V Rev Matls Constr & Trav Publics /Fr/, Chemical Abstracts

ACKNOWLEDGMENT: Portland Cement Association

2A 231806
CONTROL OF CEMENT-STABILIZED BASES METHODS USED IN VARIOUS COUNTRIES FOR CONTROLLING SOILS AND CONSTRUCTION MATERIAL BEFORE, DURING, AND AFTER CONSTRUCTION ARE REVIEWED.

Kirk, JM Norsk Vegtidsskrift /Norway/, Road Abstracts /UK/

ACKNOWLEDGMENT: Portland Cement Association

2A 231807
THE UNPROCESSED LAYER IN IN-SITU SOIL CEMENT STABILIZATION FOR PAVEMENT CONSTRUCTION

Kolbasszewski, J Tucker, DA Civ Eng & Public Works Review /UK/

ACKNOWLEDGMENT: Portland Cement Association

2A 231816
THE EFFECT OF WATER CONTENT ON THE COMPRESSIVE STRENGTH AND DENSITY OF VARIOUS AGGREGATE-CEMENT MIXES FOR HIGHWAY CEMENT TREATED BASES
A STUDY WAS MADE TO DETERMINE THE EFFECT OF WATER AND CEMENT CONTENT ON THE COMPRESSIVE STRENGTH AND DENSITY OF LABORATORY TEST SPECIMENS OF CT BASES USED FOR HIGHWAY CONSTRUCTION IN WASHINGTON STATE. RESULTS SHOWED THAT THE COARSEST OF 3 GRADATIONS USED FOR THE TESTS PRODUCED THE DENSEST MIXES AND REQUIRED THE LEAST AMOUNT OF WATER TO ACHIEVE THESE CONDITIONS. COMPACTION CONTROL BECAME MORE CRITICAL AT HIGHER CEMENT CONTENTS AND COMPRESSIVE STRENGTH FELL OFF MORE RAPIDLY ON THE WET SIDE OF OPTIMUM THAN ON THE DRY SIDE.

...
FOUNDATION, (2) BRUSHWOOD AND GRAVEL CONSTRUCTION, AND (3) REINFORCED CONCRETE SLAB. MANY CONCRETE ROADS IN COUNTY LONDONERRY WHICH WERE CONSTRUCTED OVER PEAT ARE STILL IN RELATIVELY GOOD CONDITION AFTER MORE THAN 35 YEARS. IT IS SUGGESTED THAT WITH MODERN PLANT AND TECHNIQUES CONCRETE SLAB CONSTRUCTION MAY PROVE TO BE AN ECONOMIC METHOD OF RECONSTRUCTING ROADS OVER PEAT. SOME OBSERVATIONS ARE MADE ON THE MAINTENANCE PROBLEMS WHICH ARISE WITH THIS TYPE OF ROAD. /RRL/A/

Warnock, TA Inst Hwy Engineers Journal, London /UK/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 231900 PROBLEMS OF ROADS ON PEAT AND ORGANIC SUBSOILS WHEN A ROAD IS CONSTRUCTED ON SOFT SUBSOILS SUCH AS PEAT THREE TYPES OF SETTLEMENT TAKE PLACE, (1) ELASTIC OR INSTANTANEOUS, (2) CONSOLIDATION, AND (3) CREEP. TWO LATTER TYPES ARE TIME-DEPENDENT. CONSOLIDATION SETTLEMENT STRENGTHENS THE GROUND, WHEREAS CREEP DOES NOT, AND MAY HAVE A DAMAGING EFFECT ON THE SOIL STRUCTURE. IT IS ESSENTIAL TO DISTINGUISH BETWEEN THE THREE TYPES AND TO BE ABLE TO FORECAST THE MAGNITUDE AND RATE OF EACH TYPE. REFERENCE IS MADE TO A RECENT PUBLICATION WHICH SUGGESTS A METHOD OF MAKING THIS FORECAST. THE RELATIVE INFLUENCE OF THE VARIOUS TYPES OF SETTLEMENT IS INDICATED BY THE OBSERVED BEHAVIOUR OF EXISTING ROADS UNDER VARYING CONDITIONS SUCH AS THICKNESS OF PAVEMENT AND SOFT SUBSOIL, DRAINAGE AND AIR-DRIEDYING. VARIOUS CONSTRUCTION EXPEDIENTS SUCH AS PRECONSOLIDATION, LIGHT-WEIGHT FILL, WATERPROOF SHEETING AND PIPES OR PILES FOR ACCELERATING DRAINAGE ARE DESCRIBED. THE ADVANTAGES OF CONCRETE SLAB CONSTRUCTION ARE ALSO DISCUSSED. /RRL/A/

Hamranan, ET Inst Hwy Engineers Journal, London /UK/

ACKNOWLEDGMENT: Road Research Laboratory /UK/


Qureshi, TH; Ud-din, N; Ali, H West Pakistan Government /Pakistan/, West Pakistan Road Res Inst /Pakistan/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 231918 COMPACTION IN EARTHWORKS AND ROAD CONSTRUCTION /IN GERMAN/ THE SUCCESS OF EACH COMPACTING OPERATION DEPENDS PARTICULARLY ON THE TYPE OF COMPACTING PROCESS EMPLOYED IN RELATION TO THE MATERIAL TO BE COMPACTED AND THE DEGREE OF CARE INVOLVED. THE AUTHOR DESCRIBES THE COMPACTING OPERATION (REDUCTION OF THE POROSITY OF THE MATERIAL), COMPACTING APPARATUS AND ITS EFFICIENCY, COMPACTING OF SOILS (PLACE-MENT MOISTURE CONTENT, THICKNESS OF INDIVIDUAL FILLING COURSES, COMPACTING TEST), FROST BLANKET COURSE (GRANULOMETRIC GRADATION), BACKFILLING OF STRUCTURES (MATERIAL COMPOSITION, COMPACTING EFFECTIVENESS), SOIL STABILIZATION AND FILLING AND COMPACTING OF CABLE TROUGHING (BACKFILLING OF PIPES, TOP COVERING, FURTHER COMPACTION FROM THE SURFACE). VALUES GAINED FROM EXPERIENCE IN RELATION TO SOIL TYPES ARE INCLUDED. /FG/G/RRL/

Klinger, B Tiefbau /Germany/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 231919 EXPERIENCES AND OBSERVATIONS DURING THE CONSTRUCTION OF BITUMINOUS SURFACINGS /IN GERMAN/ PRESENT DAY REQUIREMENTS OF SUBGRADE AND SUBSOIL ARE DISCUSSED WITH REGARD TO CONSTRUCTION AND BEARING CAPACITY. THE IMPORTANCE OF STANDARDIZATION OF CONSTRUCTION, DETAILED SOIL INVESTIGATIONS, SUITABLE MATERIALS, EVEN COMPOSITION AND COMPACTION ARE STRESSED. THE ADVISABILITY OF INTERMEDIATE CONSTRUCTION OF GRAVEL AND CRUSHED STONE BASES TO AVOID LATER SURFACE DAMAGE IS OUTLINED. REVISION OF RELEVANT SPECIFICATIONS WITH RESPECT TO BINDER, FILLER, POROSITY AND GRADING, AND THE IMPROVEMENT OF TEST METHODS ARE RECOMMENDED. IT IS STRESSED THAT SURFACE DAMAGE CAUSED BY TRAFFIC LOADING, STEEL-STUDED TIRES, DEicing SALTS ETC. CAN BE AVOIDED BY CAREFUL SELECTION AND PREPARATION OF MATERIAL AND GOOD PLACEMENT TECHNIQUES. /FG/RRL/

Zichner, G Strassenbauotechnik, Cologne /Ger/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 231920 THE ADDITION OF SALTS TO THE SOIL DURING EARTH ROAD CONSTRUCTION /IN GERMAN/ THE EFFECTS OF ADDING HYDROSCOPIC SALTS (CALCIUM CHLORIDE, MAGNESIUM CHLORIDE) AND IN SOME INSTANCES SODIUM CHLORIDE TO SOIL ARE OUTLINED. MOISTURE CONTENT IS KEPT AT THE OPTIMUM LEVEL FOR SUBSEQUENT COMPACTION BY TRAFFIC. DUST ON THE ROAD SURFACE IS GREATLY REDUCED, AND TRACKS MADE BY VEHICLE WHEELS PENETRATE LESS DEEPLY. THE ADDITION OF THE SALTS ALSO LOWERS THE FREEZING POINT OF THE SOIL. THUS AVOIDING MUCH FROST DAMAGE. TESTS WERE CARRIED OUT ON 6 ROADS WITH VARYING TYPES OF SOILS. IT WAS FOUND THAT THE SALTS WERE WASHED OUT AFTER 6 MONTHS TO A YEAR, AND HAD TO BE REAPPLIED. /FG/RRL/

Hofmann, U Schembra, FW Bruecke Und Strasse /Germany/

ACKNOWLEDGMENT: Road Research Laboratory /UK/


Kraemer, P Strassen Und Tiefbau /Germany/

ACKNOWLEDGMENT: Road Research Laboratory /UK/
2A CONSTRUCTION MATERIALS

2A 231925
SOIL STABILIZATION WITH LIME IN EARTHWORKS AND ROAD CONSTRUCTION /IN GERMAN/
THIS BOOK CONTAINS THE FOLLOWING REPORTS, WHICH ARE MAINLY REPRINTS FROM VARIOUS JOURNALS: KUONEN, V., AND R. HIRT, RESULTS OF RESEARCH INTO THE EFFECT OF LIME IN SOIL STABILIZATION; BRAND, W., POSSIBILITIES AND LIMITS OF USING LIME TO STABILIZE COHESIVE SOILS; KLEMPERT, B., CODES OF PRACTICE AND THEIR APPLICATION IN RURAL ROAD CONSTRUCTION IN NORDRHEIN-WESTFALEN, BEHR, U., OBSERVATIONS OF MOISTURE CONTENT IN THE SUBGRADE AND SUBSOIL OF A MOTORWAY; AND KNOLL, B., AND F. STEINMANN, SOIL STABILIZATION WITH LIME IN EARTHWORKS-A NEW, PARTICULARLY EFFICIENT METHOD. THE DEPARTMENT OF FOUNDATIONS OF THE BUNDESANSTALT FUR STRASSEN- WISSEN REFERENCES TO THE IMPROVEMENT AND STABILIZATION OF COHESIVE SOILS WITH LIME IN EARTHWORKS FOR ROAD CONSTRUCTION. THERE IS A BIBLIOGRAPHY ON GENERAL PRINCIPLES, THEIR PRACTICAL APPLICATION IN ROAD AND RAIL CONSTRUCTION AND EARTHWORKS, AND THE VALID CODES OF PRACTICE AND SPECIFICATIONS. TWO INDEXED RECORDS OF SOIL STABILIZATION AND IMPROVEMENT OF COHESIVE SOILS WITH LIME conclude the book. /FG/RRL/

Bundesverband Kalkindustrie /Germany/ 24 pp, 1966

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 231943
ECONOMICAL ROAD CONSTRUCTION IN MARSHY AREAS /IN GERMAN/

Simon, P Strassenbauten Werk, Cologne /Germany/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 231948
NEW TYPE OF GROUTING WORK IN FRANCE AND SWITZERLAND (IN GERMAN)

Tiefbau /Germany/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 231952
COARSE GRAVEL ROADBASES-POSSIBILITIES OF USE /IN GERMAN/
IN THE GERMAN DEMOCRATIC REPUBLIC MORE THAN 2 MILLION TONS OF COARSE GRAVEL ARE USED ANNUALLY IN ROAD CONSTRUCTION, AND YET THERE IS NO STANDARD FOR COARSE GRAVEL ROADBASES. IN ORDER TO REMEDY THIS THE FOLLOWING FACTS ARE ESTABLISHED: (1) THE MAXIMUM GRAIN SIZE OF THE COARSE GRAVEL ACCORDING TO THE PLACEMENT THICKNESS IS 35,5/56 FOR 15CM. COARSE GRAVEL; 35,5/90 FOR 20CM. AND 56,125 FOR 25CM. (EACH SIZE MEASURED IN MM.). (2) AFTER COMPACTION AND FILLING THE VOIDS CONTENT OF THE COARSE GRAVEL ROADBASE SHOULD BE AT MOST 17%. (3) THE COARSE GRAVEL MUST HAVE A GOOD GRAIN CONSTRUCTION, AND MUST BE BROKEN FROM A GOOD, TOUGH ROCK. (4) PLACEMENT SHOULD BE MADE ON WELL-COMPACTED SUBSOIL OR ON A FROST-BLANKET COURSE. (5) BEFORE THE DRY FINE SAND IS VIBRATED THE COARSE GRAVEL MUST BE FIRMLY COMPACTED. (6) AS WELL AS VIBRATORY COMPACTION EQUIPMENT A STATIC ROLLER IS NECESSARY TO PRESS DOWN THE COARSE GRAVEL AND MAKE THE JOINTS FIRM, AND (7) THE POSSIBILITY OF COMBINING THE CONSTRUCTIVE ADVANTAGES OF A BONDED ROADBASE WITH THOSE OF THE COARSE GRAVEL ROADBASE IS OFFERED BY THE COARSE GRAVEL FILLED WITH BITUMINOUS SLURRY. /FG/RRL/

Milde, F Strassen und Gewerbe, Berlin /Germany/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 231953
SIGNIFICANCE AND PROBLEMS OF SOIL COMPACTION IN ROAD CONSTRUCTION (IN GERMAN)
WATER CONTENT AND COMPACTION EFFORT DETERMINE THE EFFECT OF THE COMPACTION. LESSER WATER CONTENTS AND GREATER COMPACTION EFFORTS RESULT IN HIGHER DRY DENSITIES. NO- Cohesive SOILS ARE COMPACTED BY VIBRATORY MACHINES; THEIR EFFICIENCY IS AT ITS GREATEST AT ABOUT 15 CM. DEEP, BUT NIL ON THE SURFACE FOR THE COMPACTION OF GRAVELLY SAND WITHIN A 20-50 CM. THICK FROST BLANKET COURSE ON A YIELDING BASE LIGHTER MACHINES ARE BETTER THAN HEAVY ONES, WHILE FOR ROCK FILLING EXTREMELY HIGH COMPACTION FORCES ARE NECESSARY. /FG/RRL/

Floss, R Strassenbau, Dusseldorf /Germany/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 231958
REINFORCED SOIL-CEMENT (IN RUSSIAN)
AN INVESTIGATION INTO THE PROPERTIES OF REINFORCED SOIL-CEMENT SUBJECT TO SHORT-TERM LOADING, AND ITS APPLICATION TO ROAD CONSTRUCTION IS PRESENTED. THE EFFICIENCY OF THE REINFORCEMENT WAS TESTED ON SOIL-CEMENT SAMPLES MADE WITH LOESS SILT FROM THE REGION OF VOLGOGRAD, WHICH HAD A LIQUID LIMIT EQUAL TO 31.8 AND 18.1 PER CENT. THE TESTS SHOW THAT, EVEN WITH A LOW PERCENTAGE OF REINFORCEMENT, THE BEARING CAPACITY OF SOIL-CEMENT CAN BE DOUBLED, BECAUSE SOIL-CEMENT HAS A HIGH RESISTANCE TO CRACK-
CONSTRUCTION MATERIALS

2A 232004
GENERAL REPORTS PRESENTED BY THE USSR AT THE SECOND CONFERENCE ON ROAD CONSTRUCTION PROBLEMS HELD BY SOCIALIST COUNTRIES IN WARSAW, IN 1966 (IN RUSSIAN)
THIS PUBLICATION CONTAINS THE FOLLOWING REPORTS: (1) METHODS OF SOIL STABILIZATION BY THE COMBINED ACTION OF BINDERS AND CHEMICAL ACTIVATORS, (2) CONSTRUCTION METHODS FOR ASPHALTIC CONCRETE SURFACINGS AND WORK MECHANIZATION, (3) CONSTRUCTION OF ROADS WITH ROUGH SURFACINGS AND COMPOSITION OF NON-SKID LAYERS APPLIED DURING ROAD MAINTENANCE, AND (4) CONSTRUCTION TECHNOLOGY FOR PRESTRESSED CONCRETE SURFACINGS. /LCPC/RRL/
Soborovskaya, IS Netsai, VL Avtomobil Nye Dorogi /Ussr/
ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 232022
TREATMENT OF SILT WITH A THICK LAYER OF QUICKLIME /IN FRENCH/
The in-situ treatment is described of wet silty sand with a single thick layer of quicklime for improving the subgrade of a road under construction. The mixing machine used is an American REX deep mix which can treat a layer of silty sand approximately 40 cm thick (measured after compaction). Details are given of the preliminary studies, equipment used, work progress and observations made during construction. There remains to define specifications for the pulverizing of soil after mixing to distinguish the treatment of subgrades from that of embankments, and to improve present compaction methods. /LCPC/A/RRL/
Moreville, P Bull Liaison Labs Rouers /France/
ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 232031
A STUDY ON MOISTURE MOVEMENT IN ALLUVIAL SOILS UNDER ROADS SURFACES FOR ECONOMICAL DESIGN OF PAVEMENTS
Most of the areas in northern India have high water tables which range from 4 to 9 ft during the year. In the absence of any authentic information about the maximum moisture contents attained by the subgrades, the design of road pavements in such areas is carried out for saturated conditions. This will adversely affect the cost of construction if, in actual practice, the subgrade is not saturated. The paper deals with a field study on the moisture content attained by the subgrades at different times of the year both under surfaced and unsurfaced pavements. The results indicate that under sealed surface there is a tendency for the subgrade moisture content to change with time. The maximum moisture contents attained are well below saturation under the surfaced area. Results further indicate that the evaporation effect travels to a distance of about 4 ft. /RL/CA/
Uppal, HL Australian Road Research Board Pune
ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 232040
USE OF A MATERIAL FORMED BY FERRIC OXIDES IN THE PAVEMENT OF A ROAD: COMPARATIVE STUDY WITH THE OTHER SOLUTIONS
In the south-east of Angola, ferric oxide deposits occur over extensive regions of Kalahari sand. Its formation and chemical composition are studied.
CONCLUSIONS ARE GIVEN ON ITS POSSIBLE USE AS A ROAD MATERIAL BASED ON RESULTS OF GEOTECHNICAL TESTS AND FROM EXPERIENCE OBTAINED FROM EXISTING PAVEMENTS. VARIOUS TYPES OF PAVEMENTS ARE STUDIED AND AN ANALYSIS OF CONSTRUCTION COSTS IS MADE. CONCLUSIONS ARE PRESENTED AS TO THE BEST SOLUTIONS. /RRL/

Dasilva, CAF Guimaraes, JM Martins, AA Soil Mech & Fdn Eng Proc /South Africa/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 232044
PROBLEMS IN THE USE AND TESTING OF CEMENT-STABILIZED SOILS /IN GERMAN/
THE AUTHOR DISCUSSES CEMENT-STABILIZED SOIL AS A CONSTRUCTION ELEMENT IN ROADS CARRYING HEAVY TRAFFIC, WITH PARTICULAR REFERENCE TO ITS COMPRESSIVE STRENGTH; OTHER USES OF CEMENT STABILIZED SOILS IN OTHER COUNTRIES (U.S.A., GREAT BRITAIN, HOLLAND AND SWITZERLAND), AND FINALLY THE USE OF CEMENT-STABILIZED SOILS IN AGRICULTURAL ROAD CONSTRUCTION. A NEW VERSION OF THE RECOMMENDATIONS (OF THE PROVISIONAL NOTE) FOR THE STABILIZATION OF SOIL WITH CEMENT IS RECOMMENDED. /FG/RRL/

Buchholz, H Strasse Und Autobahn /Germany/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 232050
THE PROBLEM OF FROST PROTECTION IN ROAD CONSTRUCTION /IN GERMAN/
THE UNRELIABILITY OF METHODS USED TO ELIMINATE FLUCTUATIONS IN STRENGTH AND BEARING CAPACITY OF ROADS DUE TO THE ACTION OF FROST IS ESTABLISHED. IT IS SUGGESTED THAT EFFORTS SHOULD BE MADE TO IMPROVE THE DURABILITY OF THE ROAD AGGREGATE RATHER THAN TO INCORPORATE SPECIAL FROST BLANKET COURSES DURING CONSTRUCTION. THIS WOULD BE PARTICULARLY USEFUL IN AREAS WHERE SAND AND GRAVEL IS EXPENSIVE AND DIFFICULT TO OBTAIN. /FG/RRL/

Keil, K Bruecke Und Strasse /Germany/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 232051
THE PRINCIPLES AND OBJECT OF SOIL STABILIZATION IN ROAD CONSTRUCTION (IN GERMAN)
THE SIGNIFICANCE OF ACTIVE AND PASSIVE SOIL STABILIZATION IN ROAD CONSTRUCTION IS OUTLINED, AND SOIL MECHANICS PRINCIPLES, SUCH AS SOIL AS A THREE-PHASE SYSTEM, GRAIN DISTRIBUTION, INFLUENCE OF WATER AND SIGNIFICANCE OF COMPACTION ARE DISCUSSED. PARTICULAR REFERENCE IS MADE TO SOIL STABILIZATION WITH CEMENT AND THE DEPENDENCE OF THE STRENGTH OF THE STABILIZED SOIL ON THE CEMENT CONTENT AND GRAIN DISTRIBUTION, AND THE IMPORTANCE OF MIXING PROCESSES AND COMPACTION IS STRESSED. MOISTURE CONTENT AND EVAPORATION IN CEMENT STABILIZED SOILS ARE ALSO DISCUSSED. /FG/RRL/

Aichhorn, W Oesterreichische Ingenieur /Aust/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 232053
MIXED-IN-PLACE OR PLANT-MIXED METHOD FOR SOIL STABILIZATION FOR LOW-COST ROAD CONSTRUCTION? (IN GERMAN)
THE ECONOMICS OF THE MIXED-IN-PLACE METHOD AND THE PLANT- MIXED METHOD ARE COMPARED. IT IS SHOWN THAT THE MIXED-IN-PLACE METHOD IS LESS COSTLY FOR THE STABILIZATION OF SOILS ON OR IN THE REGION OF THE CONSTRUCTION SITE, AND THEREFORE THIS METHOD IS RECOMMENDED FOR LOW-COST ROAD CONSTRUCTION WHERE WORK IS CARRIED OUT MAINLY WITH LOCAL MATERIALS IN SMALL CONTRACT SECTIONS. IT IS CONCLUDED THAT THE MIXED-IN-PLACE METHOD IS USUALLY CHEAPER FOR SOIL STABILIZATION PROVIDED THAT SUITABLE CONSTRUCTION MACHINERY IS USED. /FG/RRL/

Fauth, C Strasse, Berlin /Germany/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 232054
USE OF CEMENT-BOUND MATERIALS IN THE CONSTRUCTION OF HIGHWAY EMBANKMENTS /IN GERMAN/
THE ADMIXTURE OF CEMENT TO SILTY SAND SOILS TO OBTAIN WATERPROOF STABILIZATION BY REDUCING THE WATER ABSORPTION CAPACITY SHORTLY AFTER THE BEGINNING OF HARDENING, AND THUS PREVENTING DAMAGE BY RAINFALL IS DISCUSSED. FURTHER LABORATORY TESTS ARE RECOMMENDED IN ORDER TO CLARIFY LONG TERM WATER RESISTANCE, FROST ACTION, STRENGTH DEVELOPMENT AND LIMIT VALUES FOR BINDER PROPORTIONING. /FG/RRL/

Vogt, K Betonstrassen /Switzerland/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 232055
CEMENT-BOUND ROAD BASES IN EUROPE /IN GERMAN/
SOIL STABILIZATION WITH CEMENT IS DISCUSSED. VARIOUS ARTICLES ON CEMENT STABILIZATION BY SPECIALISTS IN THE FIELDS OF ROAD ADMINISTRATION AND CONSTRUCTION ARE INCLUDED. VOGT, K: SOIL STABILIZATION WITH CEMENT IN SWITZERLAND; SLUIS, F, A. VAN DER: THE USE OF CEMENT-BOUND ROAD FOUNDATIONS IN THE NETHERLANDS; SHARP, D. R., AND BLAKE, L. S.: CEMENT-BOUND ROAD BASES AND SUB-BASES IN GREAT BRITAIN; BONNOT, J: CEMENT-BOUND ROAD BASES IN FRANCE; SCHEIBLAUER, J: EXPERIENCES IN SOIL STABILIZATION WITH CEMENT; AND SOMMER, H: CEMENT-BOUND LAYERS IN WEST EUROPEAN ROAD CONSTRUCTION. /FG/RRL/

Betonstrassen /Switzerland/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 232063
BITUMEN-STABILIZATION OF SANDY SOILS WITH THE UZF 70 (IN GERMAN)
THE USE OF A SINGLE-PASS SOIL MIXER, UZF 70, TO STABILIZE SANDY SOIL DURING THE CONSTRUCTION OF AN EXPERIMENTAL ROAD IS DESCRIBED. THE PROPORTION OF BINDER NECESSARY (7-11 PERCENT WEIGHT OF CUT-BACK BITUMEN EMULSION) AND THE WATER CONTENT WERE DETERMINED BY COMPUTER AND CONTROlLED BY SUITABILITY TESTS. THE 15-18-CM THICK STABILIZED LAYER WAS PRODUCED WITH MAXIMUM EFFICIENCY. THE COMPACTION WAS CARRIED OUT WITH STATIC ROLLERS, AND RUBBER-TIRED ROLLERS ARE RECOMMENDED. QUALITY TESTS SHOWED THAT COMpressive STRENGTHS OF 120 KP/CM SQUARED AND MARSHALL STABILITIES OF MORE THAN 400 KP HAD BEEN OBTAINED. THE SECTION WAS ABLE TO BE USED BY THE CONSTRUCTION SITE TRANSPORT AFTER 24 HRS. /FG/RRL/

Konnenmund, W Strasse, Berlin /Germany/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 232065
RURAL ROAD CONSTRUCTION IN STYRIA /IN GERMAN/
PRELIMINARY INVESTIGATIONS INTO THE SUITABILITY OF CLAY-OR WATER-SATURATED LAOMS FOR LIME STABILIZ-
CONSTRUCTION MATERIALS

2A 232080
SOIL STABILIZATION ON A NATIONAL ROAD CONSTRUCTION SITE IN TESSIN /IN GERMAN/
THE FILLING OF A 20 M HIGH ROAD EMBANKMENT WHICH WAS REQUIRED TO HAVE OPTIMUM BEARING CAPACITY AND DENSITY IS DESCRIBED. BECAUSE OF THE LIMITED TIME AVAILABLE, WORK HAD TO BE CARRIED OUT IN WINTER ON THE IN-SITU CLAYEY-SILTY GRAVEL MIXED WITH ERRATIC ROCKS. DESPITE THE FACT THAT THE GRAVEL WAS TOO WET TO BE COMPACTED PROPERLY, THE ADMIXTURE OF QUICK-LIME FOR THE PURPOSE OF STABILIZATION BROUGHT ABOUT ALTERATIONS IN THE STRUCTURE AND ALSO DECREASED THE NATURAL MOISTURE CONTENT, THUS ENABLING CONSTRUCTION PROGRAM TO BE DEVELOPED EVEN WHEN THERE WAS HEAVY FROST. IT WAS NOTED THAT DOUBLE THE AMOUNT OF LIME WAS REQUIRED WHEN THERE WAS FOG OR WHEN TEMPERATURES WERE VERY LOW. /FG/RRL/

Bossh, J

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 232085
SOIL STABILIZATION WITH BITUMEN /IN GERMAN/
AN EXPLANATION IS GIVEN OF THE STANDARD LEAFLET SNV 640 506-"SOIL STABILIZATION WITH BITUMINOUS BINDER IN RELATION TO THE PERTINENT SECTIONS OF THE BASIC STANDARD SNV 640 500-" SOIL STABILIZATION-GENERAL." BITUMEN STABILIZATION Undertaken in Switzerland is surveyed and compared with the hot mix method normally used for surfacing construction. Special reference is made to the various types of soil and binder. Data are given on the use of bitumen-stabilized soil in road construction. The suitability testing of the construction materials, establishment of binder contents, choice of layer thicknesses and working methods and equipment are described. /VSS/FG/RRL/

Bissegger, E
Strasse Und Verkehr /Switzerland/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 232086
SOIL STABILIZATION WITH CEMENT AND LIME /IN GERMAN/
A DESCRIPTION IS GIVEN OF (1) THE BINDERS AND THEIR ACTION IN THE SOIL; (2) THE EFFECTS OF SOIL MECHANICS PROPERTIES SUCH AS MOISTURE CONTENT, Cohesion, Frost Resistance and Water Resistance; (3) Construction Methods and Curing; (4) The Equipment Required by Various Construction Methods; (5) The Testing of Properties of Stabilized Soil; Stabilization enables otherwise unsuitable materials to be used and savings on high-quality gravel to be made. /VSS/FG/RRL/

Vogt, K
Hoch Und Tiefbau, Zurich /Switz/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 232090
CEMENT STABILIZATION OF LOGGING ROADS
THE MANUFACTURE OF PULP AND PAPER IS THE LEADING INDUSTRY IN CANADA. IT IS ALSO THE LARGEST USER OF TRANSPORTATION. THERE IS ALSO A GROWING TREND IN THE INDUSTRY TO INCREASE THE PROPORTION OF PULPWOOD TRANSPORTED BY ROAD. THIS ARTICLE REVEALS FINDINGS THAT SOIL CEMENT ROADS COULD IN EFFECT SAVE THE INDUSTRY UPWARDS OF 2 CENTS PER CORD-MILE. TO CARRY THE HEAVIER LOADS AT INCREASED SPEEDS, ROAD BASES MUST BE MADE STRONGER, AND SURFACES SMOOTHER. A SOIL CEMENT BASED ROAD PROVIDES GREATER ROAD BEARING CAPACITY, LESS BASED DEFOCTION IN SUBGRADE PRESSURES, CONSIDERABLE STRENGTH GAIN WITH AGE, SPEED OF CONSTRUCTION, AND LOWER COST FOR THE SURFACE COAT. /CGRA/RRL/

Temple, D
Pulp and Paper Magazine /Canada/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 232099
A STUDY OF GRAVEL AND OTHER SOIL: AGGREGATE MIXTURES FOR THEIR SUITABILITY IN ROAD CONSTRUCTION
ARTIFICIALLY PRODUCED GRAVEL OBTAINED BY MIXING CERTAIN PROPORTIONS OF SOFT AGGREGATES, LIKE BURNED BRICK BALLAST, WITH A PROPERLY GRADED SOIL HAS BEEN USED RECENTLY FOR ROAD CONSTRUCTION IN THE PUNJAB. THIS SPECIFICATION HAS BEEN FOUND UNSATISFACTORY IN AREAS WHICH ARE LIABLE TO WATERLOGGING AND FLOODING. THE OBJECT IS TO INVESTIGATE THE SUITABILITY OF MIXTURE WITH SOIL OF OTHER AGGREGATES SUCH AS KANKER, STONE METAL, SHINGLE AND OTHER SUCH WATER-RESISTANT MATERIAL. THIS WAS UNDERTAKEN TO EVOLVE AN ECONOMIC SPECIFICATION TO REPLACE THE CONVENTIONAL BRICK OR STONE BOULDER SOILING OR EVEN STONE METAL WEARING COURSE IT POSSIBLE. /RRL/

Uppal, IS
Singh, R
Indian Roads Congress Road Res Bull

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 232123
FOUNDATION DESIGN AND CONSTRUCTION
THIS IS A MANUAL ON FOUNDATION CONSTRUCTION FOR DESIGNERS AND CONSTRUCTION ENGINEERS, FIRST PUBLISHED IN 1963. IT CONTAINS CHAPTERS ON THE FOLLOWING SUBJECTS: SITE INVESTIGATIONS AND SOIL MECHANICS, THE GENERAL PRINCIPLES OF FOUNDATION DESIGN, FOUNDATION DESIGN IN RELATION TO GROUND MOVEMENTS, SPREAD FOUNDATIONS, BUOYANCY RAFTS AND BASEMENTS (BOX FOUNDATIONS), PIER AND CAISSON PILES AND PILE GROUPS, PILED FOUNDATIONS, STRUCTURAL DESIGN AND CONSTRUCTION METHODS, FOUNDATIONS CONSTRUCTION, COTTREDAMS, THE CONTROL OF GROUNDWATER IN EXCAVATIONS SHORING AND UNDERPINNING, PROTECTION OF FOUNDATION STRUCTURES AGAINST ATTACK BY SOIL AND GROUND WATER. /RRL/

Tomlinson, MJ
Pitman, Sir Isaac & Sons Ltd /England/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 232139
PROBLEMS IN THE USE OF IRON-RICH LATERITES IN THE ROADWAY STRUCTURES S. E. THAILAND AND SOIL SURVEY WORK FOR A COASTAL HIGHWAY IN S. E. THAILAND REVEALED AN EXTENSIVE AREA IN WHICH LATERITE AND LATERITIC SOIL PREDOMINATE. THE DEVELOPMENT OBSERVED IS CHARACTERISTIC OF THE LATERITES OF THAILAND IN GENERAL. FOR PROJECT PURPOSES, DIFFERENTIATION OF THE TERMS "LATERITIC SOIL" AND "LATERITE"
CONSTRUCTION MATERIALS

Was considered necessary. Detrimental engineering properties of the lateritic granular materials encountered, are their potentiality for degrading under mechanical stress, and their plasticity. These properties are primarily responsible for unsatisfactory performance of existing roads in the area where lateritic granular materials are used in the pavement structure. In an effort to bring the materials within project requirements, stabilization techniques were studied in the laboratory. Of the four techniques tried, only cement treatment and blending with non-lateritic uniform sand appeared satisfactory. /RRL/A/

Wiginton, WB Asian Conf Soil Mech & Fdn E Proc /Isu/

Acknowledgment: Road Research Laboratory /UK/

2A 232147

The use of slag-treated materials in the Domont bypass /in French/

The problems of design, application and construction time resulting from the very low quality of excavated soils and the unexpectedly high level of the water-table during the construction of the Domont-p oncels bypass are outlined. Granulated slag was used for treating the sub-base (fine sand) and base course (0/25 slag). Details of the materials, production, application and control methods used for each layer are given. The cost of the materials utilized is quoted. /LCP(A)/RRL/

Compere, C Lefort, M Coutant, R Bull Liaison Labs Routiers /France/

Acknowledgment: Road Research Laboratory /UK/

2A 232170

Depth failure of bridge abutments /in Russian/

Four cases of depth failure of bridge abutment foundations caused by the construction of access embankments seven to ten meters high are studied. In one case, the bridge bearings and end spans completely collapsed. Observations showed that this was due to insufficient preliminary soil investigation and erroneous interpretation of the results. Errors in the estimation of the soil mechanics characteristics, and errors in evaluating the stresses on the infrastructure of the bridge solutions adopted in each case are described. To prevent similar failures, the following recommendations are put forward: the river bank should not be subjected to the loading of a high embankment even if this means constructing an extra span; the bridge bearings should rest on the top of the bank and not half-way up the slope. Emphasis is laid on strict control of the stability of the bank after the construction of an access embankment. /LPC/RRL/

Luga, AA Izdatelstvo Transporti, Moscow /USSR/

Acknowledgment: Road Research Laboratory /UK/

2A 232193

Fife motorway crosses intensive mining area

Constructional details are given of the section of the M90 which continues the interchanging to Perth motorway through Fife into Kinross-shire and is built above mineral workings. Special mention is made of methods used for consolidating below ground cavities at a number of bridge sites. /RRL/

Contract Journal /UK/

Acknowledgment: Road Research Laboratory /UK/

2A 232222

Toronto Subway extension cuts across river valley

The problems caused by a high water table underlying silty flood plain soils are being overcome on a 2300 ft section of Toronto's Subway. The job calls for excavation of silty fill to an average depth of 35 ft plus construction of the concrete subway tube sections. Two parallel lines of soldier piles were driven, between which heavy timber lagging was fitted for shoring purposes. Soils encountered were generally dense fine sand glacial till. To cope with the drainage problem caused by the high water table, a de-watering system was installed. This system is effective at much greater depths than with conventional pumps. Because of the high water table, the tunnel will have a tendency to float. Concrete ballast is being added to prevent this. /CGRA/RRL/

Rooke, W Heavy Construction News /Canada/

Acknowledgment: Road Research Laboratory /UK/

2A 232229

Mechanical properties of peaty ground for foundation of embankment

Results obtained from a test fill on soft peaty ground during the construction of the Tokyo-Nagoya Motorway are described. The test fill was undertaken to permit examination of the sliding failure of embankments on differently treated foundations. The two phases of the study were: (1) the sliding failure test of embankments on untreated peat foundations and those treated with special sand compaction piles (composes piles), and (2) the long-term observation of the behavior of peat foundations treated with ordinary sand piles and with sand compaction piles. /RRL/

Yamamoto, M Hoshi, T Japan Road Association

Acknowledgment: Road Research Laboratory /UK/

2A 232233

Cement-stabilized chalk for road construction

Laboratory and field tests are aimed at determining the suitability of cement-stabilized soft chalk as a base or sub-base material to obtain information on performance and durability under traffic. Two major problems exposed by these tests are: (1) the need to remove flints which are likely to damage the blades of mixers, and (2) the selection of the moisture content for the stabilized chalk mixture. Experimental sections on the A30 at Cockford Down, Hampshire, constructed with a stabilized chalk sub-base, have performed satisfactorily. /RRL/

Pocock, RG Surveyor and Municipal Engineer /UK/

Acknowledgment: Road Research Laboratory /UK/

2A 232244

The phenomenon of aggregation in the stabilization of soils with cement

The physico-chemical changes caused by the stabilization of a black cotton soil and an alluvial clay with Portland cement are described. In both soils, the addition of cement leads to an aggregation of clay fractions transforming them into coarser particles and thereby improving the mechanical gradation of the soil, and rendering it suitable for use in road construction. /RRL/

Chadda, LR Indian Concrete Journal

Acknowledgment: Transport & Road Research Lab /UK/
CONSTRUCTION MATERIALS 2A

2A 232267
SOIL STABILIZATION WITH LIGNITE FLY-ASH FROM THE KONIN-BASSIN /IN POLISH/
LABORATORY AND IN-SITU TESTS ON EXPERIMENTAL ROADS HAVE SHOWN THAT LIGNITE FLY-ASH FROM THE KONIN BASSIN IN POLAND IS PARTICULARLY SUITABLE FOR IMPROVING THE PHYSICAL AND MECHANICAL PROPERTIES OF SOIL USED IN ROAD CONSTRUCTION BECAUSE OF ITS HIGH SULPHATE AND TRIOXIDE CONTENT WHICH CAN REACH UP TO 12 PERCENT. THE BEST RESULTS WERE OBTAINED WHEN A MAXIMUM OF 15 PERCENT ASH WAS ADDED TO THE SOIL. THE ADDITION OF CEMENT TO THE ASH (AND IN THE CASE OF SANDY SOIL, OF SODIUM HYDROXIDE TO THE ASH) INCREASES THE RESISTANCE OF THE SOIL TO FROST. /LPC/RRL/

Paszewski, J
Praze Cobirdt, Warsaw /Poland/
ACKNOWLEDGMENT, Road Research Laboratory /UK/

2A 232272
THE USE OF SOIL IN THE CONSTRUCTION OF SURFACINGS AND STABILIZED ROAD LAYERS /IN RUSSIAN/
THIS MONOGRAPH DESCRIBES THE EXPERIENCE ACQUIRED BY THE UKRAINIAN INSTITUTE FOR ROAD RESEARCH IN THE CONSTRUCTION OF SURFACED AND NON-SURFACED ROADS WITH STABILIZED LAYERS. IT DEALS WITH SURFACINGS AND STABILIZED LAYERS TREATED WITH ORGANIC BINDERS AND MINERAL BINDERS. DETAILS ARE GIVEN OF THE MIXED TREATMENT OF SOIL AND COMPACTED SOIL SURFACINGS COVERED WITH A PROTECTIVE LAYER. MAINTENANCE AND REPAIR ARE ALSO DISCUSSED. /LPC/TRRL/

Knyazyuk, KA
Avtootranslait /Ussr/ 1961, 92 pp, Figs, 38 Tab, Photos, 19 Ref
ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

2A 232202
USE OF A "NON-WOVEN TEXTILE" IN THE CONSTRUCTION OF AN ENBANKMENT OF PEAT /IN FRENCH/

Devaux, P Guillicoud, G Bull Liaison Labs Routiers /France/ No. 53, July 1971, pp 41-4, 2 Fig, 5 Phot, 3 Ref
ACKNOWLEDGMENT, Transport & Road Research Lab /UK/

2A 232309
HUNGARIAN EXPERIENCE IN SOIL STABILIZATION IN ROAD CONSTRUCTION /IN SERBO-CROAT/
THE PRINCIPLES USED IN HUNGARY FOR THE STABILIZATION OF SOIL WITH CEMENT, BITUMEN, LIME, AND FLY-ASH IN ROAD CONSTRUCTION ARE OUTLINED. /TRRL/

Laszlo, G
Puti Saobradaj /Yugoslavia/ No. 6, 1971, 1 Fig, 1 Tab, 5 Phot
ACKNOWLEDGMENT, Transport & Road Research Lab /UK/

2A 232310
GRANULAR IMPROVED SUBGRADES, SUB-BASES AND ROADBASES /IN SPANISH/

Navacerrada, G
Mat, Maq Y Met Para La Constr /Spain/ No. 63, June 1969, pp 439-52, 4 Fig
ACKNOWLEDGMENT, Transport & Road Research Lab /UK/

2A 232314
GENERAL STUDY OF SOIL COMPACTION AND BITUMINOUS MIXTURES /IN SPANISH/
The report discusses the influence of compaction on the mechanical behavior of road construction materials and shows that the density obtained has a direct effect on the subsequent bearing capacity. A study is presented of the problem of obtaining on the construction site the optimum degree of compaction determined in the laboratory. The use of a number of parameters specific to each type of material and each construction site facilitates the approximate evaluation of the energy required to achieve that optimum compaction. /TRRL/

Francesco, C Vialidad /Argentina/ No. 49, Oct. 1969, pp 17-51, 33 Fig, 5 Tab, 10 Ref
ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

2A 232339
LATERAL SUPPORT OF DEEP EXCAVATIONS

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 232350
ARTIFICIAL SOIL FREEZING METHOD FOR SUBWAY CONSTRUCTION
DETAILS OF THE SOIL FREEZING METHOD FOR TUNNEL CONSTRUCTION ARE OUTLINED, TOGETHER WITH A DISCUSSION OF ITS ADVANTAGES AND DISADVANTAGES. THE MAIN
CONSTRUCTION MATERIALS

Problems associated with the soil freezing method, ground water flow and volume change due to frost heave, are discussed together with the high cost of the method. The paper summarizes construction projects in Japan, in which the soil freezing method was used, and provides a detailed account of one major application of the method to tunnel construction under Kanasugi Bridge in Tokyo. /RRL/

Endo, K
Civil Engineering /Japan/

Acknowledgment: Road Research Laboratory /UK/

2A232356

Highways earthworks feature

Six authors review aspects of the design and practice of earthworks, soil mechanics, recent earthworks projects, and earthmoving methods. Titles and authors are as follows: Earthworks on motorways from the viewpoint of the design engineer, E.J. Arrowsmith. Earthworks and the specialist contractor, D. Hampton. Earthmoving problems on contracts C6 and C7, Midland links motorways, K.A. Steuart. Site investigation or look below before you build, J.C. Finnegar. Sizing hauling equipment to get maximum productivity, R.C. GesSEL. Selection of correct tire tread for earthmover operations, B. Mckinley. /TRRL/

Highways and Traffic Engineering /UK/ Vol. 39 No. 1736/7, Apr. 1971, pp 18-37, Figs, Photos

Acknowledgment: Transport & Road Research Lab /UK/

2A23373

Lime-stabilized soil—a relevant method for road construction in Norway? /in Norwegian/

The different aspects of lime as a soil stabilizing factor are reviewed together with its effects. Apart from immediate improvement in the workability of the stabilized clay, there is some evidence that the lime has a long-term improving effect on the clay below the stabilized layer. It was observed that roads, where lime had been applied to stabilize the subsoil, seem to be less susceptible to damage from frost action than similar roads in the same area where lime has not been applied. The main reason for using lime for stabilizing the subsoil is to allow construction work to continue under adverse weather conditions. /RRL/

Gunleikrud, T
Bygg /Norway/ Vol. 19 No. 3, Apr. 1971, pp 30-3, 5 Fig, 9 Phot, 6 Ref

Acknowledgment: Transport & Road Research Lab /UK/

2A23374

Motorways not subject to settlement /in Dutch/

Soil conditions in the Western part of the Netherlands give rise to road construction problems because of the rather unstable sub-soil. In view of the ever-growing need for motorways, the question arises of how far it is economically feasible to use a construction entirely founded on piles, which in fact forms a continuous viaduct. This problem is the subject of a research project based on an existing route. Its northern section is approximately 24 km (15 M) long. The design of this section is based on an industrial construction method: precast elements are used on a large scale and the rate of construction should be 10 km (6 1/2 M) per year. The budget for this project has shown that this method forms an attractive alternative to the traditional road construction method, founded on soil. The advantages of motorways not subjected to settlement are discussed; no repair of damage caused by settlement, no problem of obtaining large quantities of sand, possibility of maintaining the existing water balance in the area where the road is being built. Problems concerning the appearance of this type of construction as well as possible traffic engineer ing aspects of such a solution are outlined and discussed. /RRL/

Bruggeling, AS Hartmann, JA
Cement, Amsterdam /Neth/

Acknowledgment: Transport & Road Research Lab /UK/

2A23379

Use of lime-stabilized moorum in the scientific construction of an airfield with a view to effecting economy

The construction of an airfield at Khajuraho, according to specifications proposed by the central road research, New Delhi, is described: locally available moorum, stabilized with lime in the lower layers was used for almost 2/3 of the pavement thickness. This method of construction resulted in considerable savings in cost, compared with conventional methods. /RRL/

Uppal, HL Wason, OP
Indian Roads Congress Road Res Bull No. 14, 1970, pp 101-18, 4 Fig, 4 Tab

Acknowledgment: Transport & Road Research Lab /UK/

2A23387

Highway materials, Chapter 8; soil stabilization

Included in this chapter are the following: (1) Portland cement stabilization (descriptive terms, and the stabilization process); (2) lime stabilization (stabilization materials, the stabilization process, and use in highway construction); (3) bituminous stabilization (sand bitumens and soil bitumen). /TRRL/

Krebs, RD Walker, RD
Mcgraw Hill Book Company 1971, pp 224-44, 2 Fig, 3 Tab, 30 Ref

Acknowledgment: Transport & Road Research Lab /UK/

2A23399

Bituminous stabilization of Wyoming heat-altered shale

Wyoming has future highway projects that will pass through areas lacking first-class aggregates, but containing a quantity of unproven heat-altered shale aggregate. Considering the possible transportation savings if the shale were to be used, research was undertaken to explore the possibility of improving the utility of asphalt as a stabilizer for heat-altered shale by the use of trace quantities of chemical additives known to react with asphalt, or with soil-mineral surfaces. Resulting Marshall design control methods (ASTM D 1559-57) and effective weathering tests were used to evaluate the materials used. Various asphalts and/or additives were well above the minimum design criteria for roads receiving heavy traffic, thus constructing roads of heat-altered shale would be justified. /Author/

Slotta, LS
Highway Research Board Bulletin

2A23401

A study of occurrence of potholes and washboards on soil-aggregate roads

Results are presented of a study aimed at determining some of the circumstances associated with the occurrence of potholes and washboards on
CONSTRUCTION MATERIALS


Huang, EY Highway Research Board Bulletin

2A23416

CALIFORNIA EXPERIENCE IN CONSTRUCTION OF HIGHWAYS ACROSS MARSH DEPOSITS EMBANKMENTS HAVE BEEN CONSTRUCTED ACROSS MARSH DEPOSITS IN CALIFORNIA BY SEVERAL DIFFERENT METHODS INCLUDING ROAD CHEWING, Use OF BERM, REMOVAL OF SOFT COMPRESSIBLE MATERIAL BY STIRRING OR DREDGING, DISPLACEMENT OF THE WEAK SOIL BY THE EMBANKMENT, AND INSTALLATION OF VERTICAL SAND DRAINS. EXAMPLES OF EACH TYPE OF SIGN ARE CITED WITH PLOTS OF OBSERVED SETTLEMENT. THE IMPORTANCE OF ADEQUATE EXPLORATION, TESTING AND ANALYSIS IS EMPHASIZED. THE UNCERTAINTIES AND LIMITATIONS OF THE APPLICATION OF THEORETICAL SOIL-MECHANICS PRINCIPLES ARE POINTED OUT. USE OF FIELD PERMEABILITIES IS PROPOSED FOR CALCULATING RATES OF SETTLEMENT, AND A METHOD OF MEASURING IN-PLACE PERMEABILITY IS DESCRIBED. CONVENTIONAL METHODS OF PREDICTING SETTLEMENT, DERIVED FROM THE THEORY OF CONSOLIDATION, ARE NOT ALWAYS RELIABLE WHEN APPLIED TO FIBROUS PEAT. EXAMPLES ARE PRESENTED OF EMBANKMENT CONSTRUCTION ACROSS PEAT BEDS, WITH COMPARISONS OF THEORETICAL AND OBSERVED SETTLEMENT. NO ONE METHOD OF CONSTRUCTION ACROSS MARSH DEPOSITS IS SUITABLE OR ECONOMICAL FOR ALL CONDITIONS. AFTER THOROUGH EXPLORATION AND TESTING, THE STABILITY AND SETTLEMENT CAN BE ESTIMATED FOR DIFFERENT DESIGNS BY APPLYING THE PRINCIPLES OF SOIL MECHANICS. THE CHOICE OF DESIGN USUALLY WILL BE BASED ON COST COMPARISONS, TAKING INTO ACCOUNT THE ADEQUACY OF SERVICE TO THE HIGHWAY USER. [AUTHOR/]

Root, AW Highway Research Board Bulletin

2A23428

LIME STABILIZATION USING PRECONDITIONED SOILS THE SCOPE OF THIS INVESTIGATION WAS TO STUDY THE DEVELOPMENT OF A NEW METHOD OF BASE CONSTRUCTION USING LIME STABILIZATION WITH A DIFFERENT CONCEPT THAN THE CONVENTIONALLY ACCEPTED ONES. IN THIS CONSTRUCTION METHOD, A FIRST APPLICATION OF LIME IS USED TO CONDITION THE SOIL CONSTITUENTS, A SECOND, TO STABILIZE THE CONDITIONED MATERIAL. THIS NEW METHOD WAS ADOPTED AFTER A STUDY OF DIFFERENT SOIL-LIME PROJECTS AND THEIR LABORATORY TESTS. THE MAIN OBJECTIVE WAS TO CONSIDER THE OCCURRENCE OF SECONDARY REACTIONS, WHICH STARTS AFTER THIS PERIOD AND CONTINUES INDEFINITELY. ALSO, AN INVESTIGATION OF MOISTURE-DENSITY RELATIONS OF SOILS POINTED OUT THE EFFECTIVENESS OF CONDITIONING BEFORE STABILIZATION. CONDITIONED MATERIAL PRODUCED HIGHER DENSITIES AT LOWER MOISTURE CONTENTS AFTER STABILIZATION. [AUTHOR/]

Taylor, WH Arman, A Highway Research Board Bulletin

2A23430

IMPROVEMENT OF LIME STABILIZATION OF MONTMORILLONITIC CLAY SOILS WITH CHEMICAL ADDITIVES OVER THE PAST DECADE, RESEARCH HAS SHOWN THAT LIME PRODUCES BENEFICIAL RESULTS WITH CLAYEY MATERIALS. ALTHOUGH THE UNCONFINED COMPRRESSIVE STRENGTHS OF CLAYEY SOIL-LIME MIXTURES ARE RELATIVELY LOW, THE INVESTIGATION REPORTED IN THIS PAPER SHOWS THAT LIME IN COMBINATION WITH SMALL QUANTITIES OF AN INEXPENSIVE INORGANIC CHEMICAL MAY BE THE ANSWER TO AN ECONOMICAL STABILIZATION OF CLAYEY SOILS FOR HIGHWAY USAGE. THREE IOWA SOILS RANGING IN CLAY CONTENT FROM 35 TO 74 PERCENT WERE STUDIED IN COMBINATION WITH VARYING AMOUNTS OF BOTH HYDROTHERMAL AND HYDRATED DOLOMITIC LIMES AND THREE INORGANIC CHEMICALS-SODIUM PHOSPHATE, SODIUM CARBONATE, AND SODIUM HYDROXIDE. ADDITIONS OF 1 TO 3 PERCENT OF SODIUM HYDROXIDE DOUBLED THE STRENGTH OF SOIL-LIME MIXTURES. ADDITIONS OF SODIUM PHOSPHATE TO SOIL-LIME MIXTURES ACTUALLY DECREASED THE STRENGTH, AND ADDITIONS OF SODIUM CARBONATE GAVE INCONSISTENT RESULTS. IT APPEARS THAT SODIUM HYDROXIDE CAN BE SUCCESSFULLY USED IN SOIL-LIME. A STUDY OF THE EFFECTS OF CURING TEMPERATURE AND THE FREEZE- AND THAW RESISTANCE OF THE SOIL-LIME AND SOIL-LIME-CHEMICAL MIXTURES IS ALSO REPORTED. [AUTHOR/]

Davidson, DW Mateos, M Barnes, HF Highway Research Board Bulletin

2A23451

IMPACT OF STABILIZATION OF LOSSES WITH QUICKLIME ON HIGHWAY CONSTRUCTION THE POSSIBILITIES OF IMPROVING THE PROPERTIES OF HIGHLY WATER-SENSITIVE LOESS THROUGH THE ADDITION OF QUICKLIME (CAO) ARE DISCUSSED. RESULTS OF LABORATORY TESTS ARE GIVEN TO SHOW THE INFLUENCE OF THE MECHANICAL AND PHYSICAL PROPERTIES OF THE SOIL THROUGH THE ADDITION OF LIME. THESE INCLUDE THE MODIFICATION OF GRAIN SIZE DISTRIBUTION (COAGULATION), MODIFICATION OF PLASTICITY, CHANGE IN COMPACTION CHARACTERISTICS, AND INFLUENCING OF WATER ADSORPTION CAPACITY AND DEPENDENT STRENGTH PROPERTIES. ADDITION OF 3 PERCENT BY WEIGHT OF CAO IMPROVES THE SOIL SO THAT A NEW AND BETTER CONSTRUCTION MATERIAL RESULTS. IMPROVEMENTS IN CONSTRUCTION PROGRESS RESULT BY USING LIME STABILIZATION. CONSTRUCTION WORK AS A RULE WOULD HAVE BEEN STOPPED IN RAINY PERIODS OF RAIN. BUILDING ACTIVITIES CAN BE CONTINUED DURING SUCH PERIODS WHEN LIME IS USED. THE COST OF LIME STABILIZATION IS ONLY A FRACTION OF THE LOSSES WHICH RESULT FROM SUCH DELAY. USE OF LIME STABILIZATION HAS RESULTED IN AN INCREASE OF QUALITY, BUILDING PROGRESS, AND EFFICIENCY IN THE CASE OF THE ROAD CONSTRUCTION WORK Done ON THE SECTION OF THE NORTHEM-HANNOVER. [AUTHOR/]

Brand, W Schoenberg, W Highway Research Board Bulletin

2A23458

REPORT OF COMMITTEE ON SOIL CEMENT ROADS A REPORT WAS MADE TO THE COMMITTEE BY THE SEVERAL STATES WHICH REVIEW THE MAINTENANCE COSTS AND
CONSTRUCTION MATERIALS


Redl, CR Highway Research Board Bulletin

2A 232499
ECONOMIC ASPECTS OF VERTICAL SAND DRAINS
THE HIGHWAY ENGINEER HAS A NUMBER OF METHODS TO CONSIDER AS A SOLUTION TO THE PROBLEM OF CROSSING MARSHLAND WITH ROAD CONSTRUCTION. HIS CHOICE OF METHOD WILL DEPEND ON ENGINEERING ASPECTS AND ECONOMIC CONSIDERATIONS. IT IS ASSUMED THAT THE COST OF BRIDGE STRUCTURES WILL GENERALLY EXCEED VARIOUS TYPES OF FILL CONSTRUCTION HENCE, DISCUSSION IS RESTRICTED TO ECONOMIC CONSIDERATION OF MUD-EXCAVATION, SURCHARGED-MUD, AND SAND-DRAIN METHODS. RELATIONSHIPS ARE DEVELOPED WHICH INDICATE THE CONSTRUCTION COST DIFFERENTIALS INVOLVED IN CONSIDERING MUD EXCAVATION AND THE SAND-DRAIN METHOD. THE PROPER CONSIDERATION OF THE SURCHARGED-MUD METHOD AS A SOLUTION TO THE PROBLEM IS DISCUSSED. SOURCES OF INFORMATION RELATED TO THESE PROBLEMS ARE NUMEROUS AND THE AUTHOR IS CONSCIOUS THAT ECONOMIC STUDIES ARE GIVEN CAREFUL ATTENTION BY ALL HIGHWAY DEPARTMENTS. HOWEVER, WORK TO DATE HAS SHOWN THAT THE ECONOMIC CONSIDERATIONS ARE A FUNCTION OF MANY PARAMETERS. THE EXACT INTERRELATIONSHIPS OF WHICH THE ENGINEER CAN ONLY ESTIMATE. FORMULATION, HOWEVER, PERMITS SOME COMPOUNDING WHICH MAKES THE OTHER PARAMETERS STAND OUT PROMINENTLY. TO AS A SORT DIFFERENTIAL INVOLVING COSTS RELATED TO TIME AND MAINTENANCE ARE DISCUSSED. /AUTHOR/

Bogey, W.C. Highway Research Board Bulletin

2A 232511
DEVELOPMENT OF APPROPRIATE METHODS FOR EVALUATING THE EFFECTIVENESS OF STABILIZING AGENTS
A SUMMARY IS PRESENTED OF A STUDY TO IMPROVE EXISTING METHODS OR DEVELOP NEW METHODS FOR MEASURING THE PERFORMANCE UNDER INSERVICE CONDITIONS OF STABILIZED MATERIALS USED IN DESIGN AND CONSTRUCTION OF HIGHWAYS. TYPE I PORTLAND CEMENT WAS SELECTED AS A NONVISCIOUS STABILIZING AGENT FOR ONE PART OF THE INVESTIGATION, AND A PENETRATION-GRADE ASPHALT AS A REPRESENTATIVE VISCIOUS STABILIZING AGENT FOR THE OTHER PART OF THE STUDY. LABORATORY EXPERIMENTS WERE CONDUCTED ON SEVEN SOILS TO EVALUATE VARIOUS APPROACHES TO THE MEASUREMENT OF THE CHARACTERISTICS OF STABILIZED MATERIALS. FOLLOWED BY A LIMITED AMOUNT OF TEST TRACK STUDY FOR THE PURPOSE OR CORRELATING LABORATORY RESULTS WITH BEHAVIOR OF MODEL ELEMENTS. THE PROGRAM WAS DESIGNED TO EVALUATE AND DEVELOP TEST PROCEDURES WHICH WILL PRODUCE DEFINITIVE DATA FOR A WIDE RANGE OF MATERIALS HAVING SIMILAR CHARACTERISTICS. FINDINGS FROM THE STUDY ON NONVISCIOUS-STABILIZED MATERIALS INDICATE THAT: (1) MINOR VARIATIONS IN THE RELATIVE DENSITY OF THE MATERIALS WILL HAVE A SIGNIFICANT INFLUENCE ON MANY OF THE PHYSICAL PROPERTIES OF THESE MATERIALS, (2) FINE GRAINED SOILS SHOW LARGE VOLUME CHANGE CHARACTERISTICS BOTH WHEN FROZEN AND THAWED IN THE PRESENCE OF FREE WATER AND UNDER LOW OR HIGH LOADING CONDITIONS, (3) SOME MATERIALS LOSE SIGNIFICANT STRENGTH WHEN SUBJECTED TO FREEZE-THAW CYCLES EVEN THOUGH THESE MATERIALS SHOWED LITTLE OR NO LOSS DURING THE STANDARD FREEZE-THAW DURABILITY TEST, AND (4) THE FLEXURAL STRENGTH OF NON-VISCIOUS MATERIALS CAN BE ESTIMATED FROM THE COMpressive STRENGTH TEST, BUT A RELATIVELY LARGE NUMBER OF TESTS ARE NEEDED TO OBTAIN A REALISTIC ESTIMATE. CREEP STRAIN TEST RESULTS WERE COVERTED FROM THE TIME DOMAIN TO THE FREQUENCY DOMAIN BY THE USE OF FOURIER TRANSFORM. THIS PERMITTED A DETERMINATION OF THE DYNAMIC RESPONSE OF THESE MATERIALS UNDER LOAD FOR THE ENTIRE FREQUENCY RANGE WITH ONLY A SINGLE TEST. MINOR VARIATIONS IN THE TEMPERATURE AT THE TIME OF THE TEST CAUSED SUBSTANTIAL CHANGES IN THE STIFFNESS OF THE MIXTURES.

Barenberg, EJ Highway Research Board Nchtsp Reports

2A 232515
A STUDY OF SPLIT TUBE AND OREGON PILE TEST BLOW COUNTS VS. FRICTION PILE RESISTANCE
AN ATTEMPT IS MADE TO CORRELATE CONSTRUCTION PILE DRIVING RESISTANCE WITH: (1) THE DRIVING RESISTANCE OF TWO STANDARD DIESEL HAMMER FORMULAS: MODIFIED WHERE DIESEL HAMMERS ARE USED. A STATISTICAL EVALUATION IS MADE FROM THE DATA OBTAINED DURING THE PAST SEVERAL YEARS. THE CORRELATION DEVELOPED IS BELIEVED TO BE WELL WITHIN THE BROAD LIMITS IMPOSED UPON PILE DRIVING BY SUCH VARIABLES AS WEATHER, HAMMER EFFICIENCY, CONDITION OF THE PILE, FORMULA ACCURACY AND SOIL AND MOISTURE CONDITIONS.

Oregon State Highway Department

2A 232525
FIELD EVALUATION OF LIME-FLYASH-SOIL COMPOSITIONS FOR ROADS
A NUMBER OF FIELD PROJECTS HAVE BEEN STUDIED IN WHICH LIME-FLYASH-SOIL COMPOSITIONS HAVE BEEN USED IN THE CONSTRUCTION OF ROADS, PARKING AREAS, AN AIRFIELD RUNWAY, AND AN EARTHWORK WALL. PERFORMANCE HAS BEEN EVALUATED BY PHYSICAL INSPECTION, BY THE USE OF SONIC PROCEDURES AND BY TESTING OF UNDISTURBED SPECIMENS WHICH HAVE BEEN REMOVED FROM THE BASE. THESE RESULTS WERE COMPARED WITH LABORATORY STUDIES INVOLVING POZZOLANIC ACTIVITY TESTS CONDUCTED AT ELEVATED TEMPERATURE AND BEARING TESTS MADE ON SPECIMENS WHICH WERE SUBJECTED TO ALTERNATE WETTING AND DRYING CYCLES. THE RESULTS OF THE SURVEY HAVE BEEN QUITE FAVORABLE, EXCEPT FOR MINOR INDICATIONS OF DISTRESS ON A FEW OF THE PROJECTS INVOLVING UNSATISFACTORY SUBGRADE OR DRAINAGE CONDITIONS, THE BASES COVERED BY BITUMI-
CONSTRUCTION MATERIALS

2A

TEMPER TO DETERMINE THE TRUE FIELD VALUE OF HORIZONTALLY PERMEABLE SOILS.

The sampling, testing and design methods used by contractors and highway engineers in the past 18 years are reviewed in detail to determine the effectiveness of sand drain design, construction and performance. On three of these projects, the treatment was successful from the standpoint of providing foundation stability and eliminating detrimental pavement settlement. On the fourth project, serious post-construction settlements developed after the road was open to traffic. Undisturbed samples were obtained in the stabilized areas one to two years after construction was complete. The results of the investigation indicated that:

1. The gains in shear strength between samples taken before and after construction was greater than the predicted strength increase used for design analysis.
2. The final sections of the report discuss design and construction considerations for sand drain projects and are intended to serve as a guide to individuals and organizations involved with the design and construction of sand drain projects.

Author: Minnick, LJ
Highway Research Board Bulletin

AN APPRAISAL OF SAND DRAIN PROJECTS

In the past 18 years, the New York State Department of Transportation has used sand drains on nine projects as a method of stabilizing soft foundation soils for the purpose of supporting highway embankments. Four major projects were investigated in detail to determine the effectiveness of sand drain design, construction and performance. On three of these projects, the treatment was successful from the standpoint of providing foundation stability and eliminating detrimental pavement settlement. On the fourth project, serious post-construction settlements developed after the road was open to traffic. Undisturbed samples were obtained in the stabilized areas one to two years after construction was complete. The principal findings of the appraisal were as follows:

1. The sand drain design procedures developed by R.A. Baxton were used.
2. The use of displacement methods to install sand drains can alter the structural properties of sensitive silty clay and organic clay soils resulting in decreased horizontal permeability and increased magnitudes of settlement. This disturbance during installation was the cause of unsatisfactory performance of one project.
3. The sampling, testing and design methods used by the Department of Transportation are adequate for the design of sand drain projects with the exception of the determination of horizontal permeability. Laboratory test procedures should be improved and augmented with field tests to attempt to determine the true field value of horizontal permeability.
4. The change in moisture content of samples taken before and after construction accurately reflected the observed settlement.
5. The gain in shear strength between samples taken before and after construction was greater than the predicted strength increase used for design analysis.

Acknowledgment: Portland Cement Association

The complete text is available for further reading. The image provided is a page from a document discussing the effectiveness of sand drain projects in terms of foundation stability and settlement reduction. The paper highlights the investigation of four major projects and the principal findings, including the use of sand drains to stabilize soft soils, the impact on horizontal permeability, and the accuracy of sampling and testing methods. The text also mentions the need for improved design and testing procedures to better predict performance.

Acknowledgment: Portland Cement Association

2A 232529

A new grout, developed by a Japanese company, called Takenaka Aqua-Reactive Chemical soil stabilization (TACSS) is somewhat more expensive than conventional material. It is a water-bearing sand injected into a solid mass with a compressive strength up to 150 psi. TACSS does not gel instantly, but when it starts to gel it turns into a solid mass within several hours. It expands during the gelling process. Preventing wash-away by water during the process, when injected into watery sand where the water is still, TACSS creates a volume of gelatinized sand 7.5 times that of the fluid injected. The grout has been used in several building projects, in a sewer tunnel and in a subaqueous railroad tunnel. It has also been used for installation of earth anchors, and can be sprayed over wet ground to produce a hard surface.

Engineering News-Record

2A 232536

Lime stabilization of soils for highway purposes involves stabilizing reactive soils for subsequent use in pavement construction. Field tests were conducted on Illinois lime-mixtures to develop final specifications for all soil types that can be economically and effectively stabilized with lime. The study concluded that:

1. All medium and fine-textured Illinois soils are benefitted in some way by lime treatment.
2. The stabilization of reactive soils with quality lime produces high quality lime-soil mixtures that can be used as structural paving materials.
3. Lime stabilization of soils that do not react to produce substantial strength increase is beneficial.
4. The mixture design process and suggested testing methods developed are satisfactory and can be utilized for analyzing typical Illinois soils.
5. Project information pertaining to the properties of lime-soil mixtures can be of great value in developing thickness design procedures and evaluating probable field performance and behavior.
6. General lime can be used to successfully stabilize many Illinois soils.

Acknowledgment: Portland Cement Association

2A 232573

Field control in the cement stabilization of poor aggregates.

New Zealand Journal articles on cement stabilization often merely state that a suitable basis of design is 250 lb/sq in unconfined compressive strength at 7 days. To translate these apparently simple design standards into field practice is by no means easy. Elsewhere, there are various deposits of softer river gravels, poorly graded plastic nudes, stones and argillites, and also soft sandstones. The strengthening of these poorer materials with cement makes them attractive for use in areas without good materials. A table gives the physical properties of soils cement stabilization construction, laboratory testing, and field control are discussed.

Goodman, HB
New Zealand Cement and Concrete Association

Acknowledgment: Portland Cement Association

2A 232632

Cement stabilization of soils for highway purposes.

Lime stabilization of soils for highway purposes involves stabilizing reactive soils for subsequent use. One of the methods used was Lime-Mixtures to develop final specifications for all soil types that can be economically and effectively stabilized with lime. The study concluded that:

1. All medium and fine-textured Illinois soils are benefitted in some way by lime treatment.
2. The stabilization of reactive soils with quality lime produces high quality lime-soil mixtures that can be used as structural paving materials.
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4. The mixture design process and suggested testing methods developed are satisfactory and can be utilized for analyzing typical Illinois soils.
5. Project information pertaining to the properties of lime-soil mixtures can be of great value in developing thickness design procedures and evaluating probable field performance and behavior.
6. General lime can be used to successfully stabilize many Illinois soils.

Acknowledgment: Portland Cement Association

2A 232639

Construction method and stability of embankments of muskeg.

A method for the design and construction of relatively thick highway embankments across muskeg deposits is described. Using theoretical soil mechanics concepts it is predicted that the long-term...

Acknowledgment: Portland Cement Association
CONSTRUCTION MATERIALS

STABILITY OF THE MUSKEG NECESSITATES THE USE OF BERRMS DESPITE THE FACT THAT AN UNDRAINED STRENGTH ANALYSIS BASED ON IN SITU VANE TESTS MAY PREDICT A REASONABLE FACTOR OF SAFETY. CONSIDERATION OF BOTH THEORETICAL SOIL-MECHANICS CONCEPTS AND PRACTICAL CONSIDERATIONS SUGGESTED THAT THE INTERACTION BETWEEN THE SOIL AND THE BERM DictATES THAT BERM CONSTRUCTION SHOULD OCCUR FROM THE OUTER LIMITS TOWARDS THE CENTER AND SHOULD BE PLACED PRIOR TO THE CENTER FILL. SEVERAL CASE RECORDS ARE PRESENTED TO SUPPORT THE CONCLUSIONS DRAWN AND FURTHERMORE SUGGEST THAT THE WIDTH OF THE BERRMS SHOULD BE 1 1/2 TO 2 TIMES THE THICKNESS OF THE MUSKEG (PEAT PLUS LAKE MARL). /AUTHOR/

Raymond, GP Canadian Geotechnical Journal

2A 232640

A NOTE OF AN APPROPRIATE METHOD FOR CONSOLIDATION UNDER CONSTRUCTION LOADING


Madhav, MR Rao, KK
J Indian Natl Soc Soil Mech & Fdn Engr

2A 232656

SOIL AND FOUNDATION ENGINEERING IN THE UNION OF SOVIET SOCIALIST REPUBLICS

CONTENTS: INTRODUCTION DEVELOPMENT OF USA- USSR EXCHANGE ITINERARY FOR THE DELEGATION SEMINARS OBSERVATIONS AND IMPRESSIONS GENERAL STATUS OF SOIL ENGINEERING IN USSR EDUCATION AND RESEARCH SUMMARY ACADEMIES, RESEARCH AND DESIGN INSTITUTES INSTITUTION OF NATURAL SCIENCES INSTITUTE OF HUMANITIES INSTITUTE OF CONSTRUCTION AND ARCHITECTURE, MOSCOW INSTITUTE FOR DESIGN OF HYDROPOWER PLANTS, MOSCOW INSTITUTE OF FOUNDATION DESIGN, ACADEMY OF CONSTRUCTION AND ARCHITECTURE, MOSCOW RESEARCH INSTITUTE OF FROST STUDIES, USSR ACADEMY OF SCIENCES, MOSCOW CITY TRUST OF GEOLOGICAL ENGINEERING AND MAPPING INSTITUTE OF CONSTRUCTION AND ARCHITECTURE, KIEV LOCAL BRANCH, ACADEMY OF CONSTRUCTION AND ARCHITECTURE, LENINGRAD UNIVERSITIES AND ENGINEERING INSTITUTES GENERAL MOSCOW UNIVERSITY MOSCOW CIVIL ENGINEERING INSTITUTE KIEV POLYTECHNIC INSTITUTE KIEV CIVIL ENGINEERING INSTITUTE LENINGRAD POLYTECHNIC INSTITUTE CONSTRUCTION AND ARCHITECTURE, VOLGA-DON CANAL HYDROELECTRIC STATION BEARING AND SHEET PILES AND CAISSON SHELLS APARTMENT BUILDING CONSTRUCTION

Highway Research Board Special Reports

2A 232703

CLOSURE ON GROUND FREEZING IN CONSTRUCTION

GOLDSER'S REPORT ON A METHOD USED TO SOLVE A FREEZING PROBLEM SHOWS HOW ACCEPTABLE SOLUTIONS CAN BE REACHED IN HEAT CONDUCTION IN SOILS BY THE USE OF BASIC PRINCIPLES AND REASONABLE ASSUMPTIONS. DISCUSSIONS FOR SOLVING THE SAME PROBLEM OUT A DISCREPANCY IN THE COEFFICIENT OF THERMAL CONDUCTIVITY FOR SOIL. THE COEFFICIENT OF THERMAL CONDUCTIVITY FOR SOILS IS A DIFFICULT PARAMETER TO EVALUATE AND MEASURE. THE PROBLEM OF COST-ESTIMATING IN ARTIFICIAL GROUND FREEZING IS DISCUSSED. REFERENCES: GROUND FREEZING IN CONSTRUCTION, FREDERICK J. SANGER, ASCE PROCEEDINGS 5743, JANUARY, 1968.

2A 232739

BITUMINOUS STABILIZATION LABORATORY STUDY

THE PROJECT WAS INITIATED IN AN ATTEMPT TO DEVELOP A PROCEDURE USING STANDARD LABORATORY TESTS FOR DESIGNING SOIL-BITUMINOUS MIXTURES FOR A SUB-BASE OR SUBGRADE MATERIAL ON HIGHWAY CONSTRUCTION PROJECTS. HVEEM STABILOMETER AND COHESIOMETER AND UNCONFINED COMPRESSION TESTS WERE EVALUATED FOR THIS PURPOSE USING SEVERAL TYPES OF SOILS AND BITUMINOUS MATERIALS. STUDIES WERE CONDUCTED TO DETERMINE MIXING AND MOLDING PROCEDURES FOR DETERMINING THE DESIRED MIXING MOISTURE CONTENTS AND FOR CONDITIONING THE SPECIMENS BEFORE TESTING. IT WAS CONCLUDED THAT: (1) SUBMITTING SPECIMENS TO A 3-DAY OVEN CURE AT 140 F RESULTED IN MAXIMUM STRENGTH, (2) A 4-DAY IMMERSION IN WATER AND 6 CYCLES OF FREEZE-THAW FOLLOWING OVEN CURE RESULTED IN MINIMUM STRENGTH AND MAXIMUM WATER ABSORPTION, AND (3) THE BEST MIXING MOISTURE CONTENT WHICH WILL PRODUCE SPECIMENS WITH MAXIMUM STRENGTH AND COHESION STRENGTH IS TO DETERMINE THE MOISTURE CONTENT WHICH PRODUCES MAXIMUM STRENGTH IN UNTREATED SPECIMENS THE STABILOMETER SEEMS TO BE SATISFACTORY FOR DESIGNING SOIL-BITUMINOUS MIXTURES FOR ALL SOIL TYPES TO BE STABILIZED. THE UNCONFINED COMPRESSION TEST SHOULD NOT BE USED FOR THIS PURPOSE.

Korfhage, GR Clearinghouse Fed Sci & Tech Info Minnesota Department of Highways

CFSTI PB 183-445, IP62207382

2A 232791

THERMAL DESIGN IN PERMAFROST SOILS

METHODS OF CALCULATING THE THERMAL REGIME FOR THERMAL DESIGN IN PERMAFROST SOILS ARE DISCUSSED AND A SET OF EXAMPLES PRESENTED TO ILLUSTRATE SOME DESIGN PROCESSES. THE OCCURRENCE OF PERMAFROST IS SCHEMATICALLY SHOWN IN A FIGURE WHERE PERMAFROST IS THAT SOIL WHICH IS NEVER WARMER THAN 32 F DURING THE YEAR. THE ACTIVE LAYER AT THE GROUND SURFACE IS SEASONALLY THAWED AND FROZEN, AND THE SOIL BEYOND THE PERMAFROST LAYER HAS VERY LITTLE SEASONAL VARIATION AND IS ABOVE FREEZING. MANY DESIGN PROBLEMS CAN BE PROPERLY SOLVED BY USING RELATIVELY SIMPLE STEADY STATE HEAT FLOW CALCULATIONS. THE GREAT ADVANTAGE TO STEADY STATE ANALYSIS IS THAT SUPER-
CONSTRUCTION MATERIALS

SITION CAN BE APPLIED. A USEFUL, ANALYTICAL METHOD USING SUPERPOSITION BY AN EASY GRAPHICAL METHOD IS DESCRIBED. THIS METHOD IS CALLED THE TWO-LANE ROAD CASE BECAUSE HEAT FLOW LINES ARE SEGMENTS OF CIRCLES AND ISOTHERMS ARE DUALLY SPACED RADIAL LINES. TWO SOLUTIONS OF THIS TYPE CAN BE SUPERIMPOSED WHERE THE DISTURBANCE CAUSED BY THE HEATED REGION IS ADDED TO THE ORIGINAL UNIFORM SOIL TEMPERATURE. THE IRRIGATIONS ARE THEN CONSTRUCTED BY CONTOURING THE MANY INDIVIDUAL POINTS OF EQUAL TEMPERATURE AT INTERSECTIONS OF RADIAL LINES. THIS TYPE OF SOLUTIONS ASSUMES A HOMOGENEOUS SOIL, AND A LAYERED SYSTEM OF SOILS WITH VARIABLE THERMAL CONDUCTIVITY WILL HAVE A DIFFERENT THERMAL REGIME. THE LAYERED CASE CAN BE SOLVED BY SUPERPOSITION, BUT NOT DIRECTLY BY THIS METHOD. ANOTHER STEADY STATE SOLUTION IS THE CASE OF HEATED PIPELINE SUCH AS ONE CARRYING WARM CRUDE OIL. A SOLUTION HAS BEEN ANALYTICALLY SOLVED IN CLOSED FORM. PROBLEMS WHICH REQUIRE A THREE-DIMENSIONAL SOLUTION ARE CONSIDERABLY MORE DIFFICULT TO ANALYZE. AN EXCELLENT ANALYTICAL PROCEDURE WITH MANY APPLICATIONS HAS BEEN DEVELOPED BY LACHENBRUCH, 1958. THIS PROCEDURE ALLOWS A RATHER COMPLETE DETERMINATION OF THE THERMAL REGIME UNDER DISTURBED GROUND SURFACE AREAS OF ANY SHAPE AND IS APPLICABLE TO PROBLEMS ASSOCIATED WITH BUILDINGS, ROADS, AIRFIELDS, LAKES, AND SHORELINES. SEVERAL NUMERICAL TECHNIQUES ARE AVAILABLE FOR SOLVING STEADY STATE PROBLEMS, HOWEVER, ONLY RELAXATION IS DISCUSSED. THE TWO-DIMENSIONAL CASE IS USED AS AN EXAMPLE, AND IT IS SEEN THAT THE THREE-DIMENSIONAL CASE IS A SIMPLE EXTENSION. SINCE ROAD CONSTRUCTION INCREASES THE MEAN ANNUAL SOIL SURFACE TEMPERATURE AND THE VARIATION OF SEASONAL SOIL TEMPERATURE, BOTH OF WHICH INCREASE THE DEPTH OF SEASONAL THAW AND CAN CAUSE PERMAFROST THAWING, THE SOLUTION IS TO APPLY ENOUGH INSULATION BELOW THE ROAD SURFACE TO PREVENT PERMAFROST DEGRADATION.

Peyton, HR
Canadian Conf Proc On Permafrost

2A 232793
STABILIZATION OF ILLINOIS MATERIALS DEVELOPMENT OF GUIDELINES AND CRITERIA
RESEARCH WAS CONDUCTED TO DEVELOP, FOR TYPICAL ILLINOIS MATERIALS, GUIDELINES AND CRITERIA FOR DETERMINING THE APPLICABILITY OF CURRENT MATERIALS BENEFICIATION TECHNIQUES. THE RESEARCH PROCEDURE WAS: (1) TO CONDUCT A LIMITED LITERATURE SURVEY, (2) SELECT AND SAMPLE TYPICAL ILLINOIS MATERIALS, AND (3) CONDUCT A LABORATORY TESTING PROGRAM TO DETERMINE THE RESPONSE OF THE MATERIALS TO DIFFERENT STABILIZATION TREATMENTS. THE USE OF VARIOUS COMMON STABILIZATION PROCEDURES (CEMENT, LIME, BITUMINOUS, LIME-FLY ASH, AND COMBINATIONS) SHOWS GREAT POTENTIAL FOR UPGRADING TYPICAL LOCAL ILLINOIS HIGHWAY CONSTRUCTION MATERIALS. ANALYSIS OF THE LITERATURE SURVEY AND THE RESULTS OF THE LABORATORY DATA INDICATE THAT MOST MATERIALS IN ILLINOIS CAN BE UPGRADED WITH ONE OR MORE (INCLUDING COMBINATIONS) OF THE VARIOUS STABILIZATION PROCEDURES AVAILABLE. GUIDELINES AND CRITERIA WERE DEVELOPED TO PROMOTE THE OPTIMUM UTILIZATION OF THESE VARIOUS PROCEDURES IN THE TREATMENT OF HIGHWAY CONSTRUCTION MATERIALS. GUIDELINES AND CRITERIA ARE PRESENTED FOR BOTH INDIVIDUAL STABILIZERS, HOWEVER, IN MANY CASES MORE THAN ONE STABILIZER MAY BE SUITABLE FOR TREATMENT OF A GIVEN MATERIAL.

Robnett, QL Thompson, MR Ill Univ Hwy Res Lab Civil Eng Studies

2A 232834
DECOMPOSED LITHIC SANDSTONE AS A FEASIBLE PAVEMENT MATERIAL
THE SANDSTONE USED FOR PAVEMENT CONSTRUCTION IN THE WINTON REGION COMES FROM A BORROW AREA IN THE IMMEDIATE VICINITY OF THE TOWN. THIS SOFT PLASTIC SANDSTONE DOES NOT MEET THE USUAL SPECIFICATION REQUIREMENTS FOR A PAVING MATERIAL. THE METHODS ADOPTED IN INVESTIGATING THE MATERIAL AND THE DEVELOPMENT OF CONSTRUCTION TECHNIQUES TO PRODUCE A PAVEMENT ARE DESCRIBED. THE EFFECT OF MOISTURE CHANGES IN THE SANDSTONE MUST BE REDUCED TO THE EXTENT THAT CRACKING AND MOISTURE INGRESS ARE ELIMINATED. COMPACTION AND HEAVY PRIMING ALONE WILL NOT PREVENT THE FAILURE MECHANISM WHICH COMES WITH THE SOIL'S ELEVATED THERMAL REGIME, ROLLING IN OF THE ARMOURING MUST TAKE PLACE IMMEDIATELY AFTER COMPACTION OF THE SANDSTONE WHILE THE PAVEMENT IS STILL DAMP IN DEPTH. A 20-MILE SECTION OF ROAD IN THE THIRD YEAR OF SERVICE EVIDENCES NO PAVEMENT FAILURE. FURTHER TEST PAVEMENTS ARE UNDER CONSIDERATION IN AN ATTEMPT TO ELIMINATE THE ARMOURING.

Andrews, JH Vlassis, Z Pryor, AJ DISCUSSER Dickinson, EJ DISCUSSER Grant, K DISCUSSER Australian Road Research Board Proc

2A 232837
THE PERFORMANCE OF COMPACfION PLANT
FOLLOWING EARLIER STUDIES ON A RANGE OF VIBRATING ROLLERS IN COMPACTING THREE ROAD MATERIALS IN LOOSE THICKNESSES OF 9 IN. AT A SPEED OF 1.7 M.P.H., TESTING WAS CARRIED OUT ON SIMILAR MATERIALS WITH SIMILAR ROLLERS AT MOISTURE CONTENTS NOT COVERED IN THE ORIGINAL PROGRAM WITH THE OBJECT OF DETERMINING WHETHER THE EARLIER CONCLUSIONS ARRIVED AT WOULD APPLY TO THESE MOISTURE CONTENTS. IN ADDITION A HIGHER SPEED OF TRAVEL, 3.5 M.P.H. WAS USED IN SOME CASES TO ASSESS ITS EFFECT AND A PILOT STUDY WAS MADE OF THE COMPACTION OBTAINABLE THROUGH A THICKER LIFT OF CRUSHED ROCK. CONCURRENTLY WITH THESE INVESTIGATIONS THE PERFORMANCES OF HEAVY 7-WHEELED, PNEUMATIC-TIRED ROLLERS, AT DIFFERENT WHEEL LOADS AND TIRE PRESSURES, AND OF A DRAWN STEEL WHEEL ROLLER, BALLASTED UP TO 400 LB. PER LINEAL IN. WERE ASSESSED ON THE SAME MATERIALS. /AUTHOR/

Tynan, AE Morris, PO Williams, FH DISCUSSER Tope, AR DISCUSSER Brown, MW DISCUSSER Reilly, LA DISCUSSER Chester, LR DISCUSSER Haussmann, GA DISCUSSER Boori, L DISCUSSER Australian Road Research Board Proc

2A 232840
FIELD COMPACfION CONTROL
FACTORS AFFECTING THE ASSESSMENT AND ACCEPTANCE OF FIELD COMPACfION ARE REVIEWED WITH PARTICULAR REFERENCE TO ERRORS IN MEASUREMENT AND SAMPLING. THE COMPACTION OF MATERIALS IN ROAD STRUCTURE IS PRIMARILY AIMED AT ENSURING THAT THE LAYER COMPLY WITH THE DESIGN REQUIREMENTS OF STRENGTH AND POSEITY. THE FOLLOWING TWO APPROACHES MAY BE FOLLOWED TO ENSURE THAT THESE CONDITIONS ARE SATISFIED: THE So-CALLED METHOD AND THE RESULT TYPES OF SPECIFICATIONS. THE END RESULT TYPE OF SPECIFICATION IS
CATION TEST SECTION SHOWED THAT A
TIONS. AN IMPORTANT SECTION OF THE REPORT DEALS WITH

PROVIDE A COHERENT STABILIZED SLAB. THE LIME MODIFI­
SINGLE LIME STABILIZATION PROJECT, LIME FAILED TO
SOILS ARE AVAILABLE FOR INVESTIGATION WITH COMPE­
OF
THICKNESS REQUIRED AND THE CONCLUSION IS REACHED
INCHES OF TREATMENT WAS REQUIRED TO DELAY DEVELOP­
EXPANSIVE SOIL SUBGRADE. LIME SLURRY CRACK FILLING
PROJECTS INCLUDED LIME STABILIZATION AND MODIFICA­
UNLESS, OF COURSE. ADJOINING OLD ROADS ON SIMILAR
ROADS
SlJBGRADE MOISTURE AND DENSITY HAVE RECENTLY BEEN
CONSTRUCTION AND ENVIRONMENT ON SUBGRADE EQUI­
Cncl Scient & Indus Res /S Africa/
2A 2J2852
Loder, LF
Australian Road Research Board Bulletin Mar. 1970
2A 232787
USE OF LIME IN THE CONSTRUCTION AND MAINTENANCE OF
SASKATCHEWAN HIGHWAYS 1962-1968
PROJECTS INCLUDED LIME STABILIZATION AND MODIFICA­
OF HIGHLY PLASTIC LACUSTRIAN CLAY SOILS. ON THE
SINGLE LIME STABILIZATION PROJECT, LIME FAILED TO
PROVIDE A COHERENT STABILIZED SLAB. THE LIME MODIFI­
ICATION TEST SECTION SHOWED THAT A MINIMUM OF 12
INCHES OF TREATMENT WAS REQUIRED TO DELAY DEVELOP­
MENT OF TRANSVERSE RIDGING IN A PAVEMENT ON AN
EXPANSIVE SOIL SUBGRADE. LIME SLURRY CRACK FILLING
AND INJECTION TECHNIQUES HAD NO EFFECT ON THE FLUC­
TUATION OF TRANSVERSE RIDGES. USE OF LIME FOR SUB­
GRADE DRYING AND FOR AGGREGATE MODIFICATION FOR
ASPHALTIC CONCRETE WAS SUCCESSFUL. /AUTHOR/

Kuhn, SH Marais, CP
Cael Scient & Indus Res /S Africa/
2A 232852
ASPECTS OF THE DESIGN AND CONSTRUCTION OF RURAL
ROADS
A SUMMARY IS PRESENTED OF CONCLUSIONS REACHED
FROM A REVIEW OF THE LONG-TERM PERFORMANCE OF
MANY ROADS IN VARIOUS PARTS OF AUSTRALIA, AND
WHERE, IN MANY CASES, VERY MANY OBSERVATIONS OF
SUBGRADE MOISTURE AND DENSITY HAVE RECENTLY BEEN
MADE. IT POINTS OUT THE GREAT EFFECT OF TYPE OF
CONSTRUCTION AND ENVIRONMENT ON SUBGRADE EQUIL­
LIBRIUM MOISTURE CONTENT. THIS PARAMETER IS OF PARA­
MOUNT IMPORTANCE IN DETERMINING THE PAVEMENT
THICKNESS REQUIRED AND THE CONCLUSION IS REACHED
THAT IT IS IMPOSSIBLE AT PRESENT TO DETERMINE IT IN
ADVANCE WITH ANY REASONABLE ACCURACY, PARTICU­
LARLY IN THE AREAS INLAND OF THE COASTAL RANGES.
OF COURSE, ADDING OLD ROADS ON SIMILAR
SOILS ARE AVAILABLE FOR INVESTIGATION WITH COMPE­
TENT STAFF. SUGGESTIONS ARE MADE AS TO METHODS FOR
ECONOMICALLY ENSURING REASONABLY HIGH DENSITIES
AND LOW MOISTURE CONTENTS FOR SUBGRADES OF ROADS
IN THE CATEGORY BEING EXAMINED. INTERIM PROPOSALS
ARE GIVEN INVOLVING THE TRIAL AND OBSERVATION AP­
PROACH OF STAGE CONSTRUCTION FOR 'TAILORING' THE
PAVEMENT THICKNESS TO THE ACTUAL SUBGRADE CONDI­
TIONS AN IMPORTANT SECTION OF THE REPORT DEALS WITH
A WIDE VARIETY OF PAVEMENT MATERIALS WHICH HAVE
BEEN SATISFACTORY USE FOR ROAD PAVEMENTS. OFTEN
UNDER VERY HEAVY TRAFFIC, ALTHOUGH MANY ARE UN­
USUAL AND FALL OUTSIDE STANDARD SPECIFICATIONS.
/AUTHOR/

Loder, LF
Australian Road Research Board Bulletin Mar. 1970
2A 232903
AN EXPERIMENTAL SOIL-CEMENT ROAD IN ILLINOIS
THE FIRST SOIL-CEMENT ROAD TO BE CONSTRUCTED IN
ILLINOIS WAS IN 1936 AND WAS ENTIRELY EXPERIMENTAL.
PRELIMINARY SOIL SAMPLES WERE TAKEN BEFORE THE
GRADING WORK WAS COMPLETED. DATA WAS GIVEN ON THE
LAW NEGLECTED IS IN THE BULKING OF DAMP SAND WHEN
DISTURBED AND MANIPULATED. /AUTHOR/

Porter, HC
Highway Research Board Proceedings 1937
2A 232919
SOIL STABILIZATION USING ASPHALT CUT-BACKS AS
BINDERS
A METHOD OF DESIGN AND A RECOMMENDED PROCEDURE
FOR HIGHWAY CONSTRUCTION USING SOILS AND ASPHALT
CUT-BACKS OR SOILS, AGGREGATES AND ASPHALT
CUT-BACKS TO PRODUCE BASES FOR PAVEMENT CONSTRUC­
TION. A NONLINEAR ELASTIC IS NOW KNOWN THAT
THIS PROCEDURE IS IMPractical, AND NO MArTER HOW
STABLE THE SUPERSTRUCTURE MAY BE, SERVICE QUALITIES
WILL DEPEND LARGELY UPON THE SOIL STRUCTURE BE­
NEATH. MUCH HAS YET TO BE LEARNED ABOUT SOIL ME­
CHANICS, BUT MANY PHENOMENA WHICH ARE KNOWN ARE
STILL DISREGARDED IN SUBGRADE CONSTRUCTION. MANY A
PAVEMENT FAILURE MAY BE ATTRIBUTED TO THE PLACING
OF GRANULAR MATERIALS ON CLAYS IN SUCH FASHION
THAT GRAVITY WATER IS IMPOUNDED. ANOTHER NATURAL
LAW NEGLECTED IS IN THE BULKING OF DAMP SAND WHEN
DISTURBED AND MANIPULATED. /AUTHOR/

Glover, VL
Highway Research Board Proceedings 1937
2A 232933
EFFECT OF NONLINEAR MATERIAL RESPONSE ON THE
BEHAVIOR OF PAVEMENTS UNDER TRAFFIC
A REVIEW OF LABORATORY TESTS REVEALS THAT MOST
COMMON HIGHWAY MATERIALS, UNDER CONDITIONS Rep­
RESENTATIVE OF MOVING TRAFFIC ON AN INSERVICE PAVE­
MENT, EXHIBIT A NONLINEAR RESPONSE TO STRESS. THE
REPORTED STRESS-STRAIN RESPONSE OF PAVEMENTS CON­
STRUCTED WITH SUCH MATERIALS VARIES FROM THE
STRESS-SOFTENING TO THE STRESS-STIFFENING TYPE, IN
ACCORDANCE WITH THE RESPONSE OF THE CONSTITUENT
BINDERS.

Roediger, JC Klinger, EW
Highway Research Board Proceedings 1938
2A 232933
EFFECT OF NONLINEAR MATERIAL RESPONSE ON THE
BEHAVIOR OF PAVEMENTS UNDER TRAFFIC
A REVIEW OF LABORATORY TESTS REVEALS THAT MOST
COMMON HIGHWAY MATERIALS, UNDER CONDITIONS Rep­
RESENTATIVE OF MOVING TRAFFIC ON AN INSERVICE PAVE­
MENT, EXHIBIT A NONLINEAR RESPONSE TO STRESS. THE
REPORTED STRESS-STRAIN RESPONSE OF PAVEMENTS CON­
STRUCTED WITH SUCH MATERIALS VARIES FROM THE
STRESS-SOFTENING TO THE STRESS-STIFFENING TYPE, IN
ACCORDANCE WITH THE RESPONSE OF THE CONSTITUENT
BINDERS.

Roediger, JC Klinger, EW
Highway Research Board Proceedings 1938
CONSTRUCTION MATERIALS

TUTIVE EQUATION BASED ON PUBLISHED LABORATORY DATA, REVEALED A PRONOUNCED STIFFENING RELATIONSHIP BETWEEN THE APPLIED PRESSURE AND SURFACE DEFORMATION AND SLIGHTLY NONLINEAR RELATIONSHIPS BETWEEN THE APPLIED PRESSURE AND THE VERTICAL STRESSES INDUCED IN THE MASS. AN APPROXIMATE NONLINEAR ELASTIC ANALYSIS USING STRAIN-STRESS COEFFICIENTS AT REALISTIC STRESS LEVELS TO AN ENGINEERING APPROXIMATION, A LINEAR ANALYSIS WAS SUFICIENTLY ACCURATE IN THE CASE OF THIS PARTICULAR FULL-DEPTH ASPHALT CONCRETE PAVEMENT BUT APPEARED UNACCEPTABLE IN THE CASE OF A PAVEMENT WITH UNBOUND GRANULAR MATERIALS CLOSE TO THE SURFACE. /AUTHOR/

Deblin, GL Monismith, CL Highway Research Record, Hwy Res Board 1970

2A 233059
FACTORs AFFECTING THE TENSILE STRENGTH OF CEMENT-TREATED MATERIALS
RECENT THEORETICAL AND ANALYTICAL ADVANCES CONCERNED WITH PAVEMENT FAILURES DUE TO EXCESSIVE TENSILE STRESSES OR STRAINS OR BOTH WITHIN THE SOIL-PAVEMENT SYSTEM HAVE PLACED ADDED EMPHASIS ON THE INVESTIGATION OF TENSILE PROPERTIES OF HIGHWAY CONSTRUCTION MATERIALS. THIS STUDY EVALUATES THE FACTORS AND INTERACTIONS AFFECTING THE TENSILE CHARACTERISTICS OF CEMENT-TREATED MATERIALS. NINE FACTORS WERE INVESTIGATED: CEMENT CONTENT, MOLDING WATER CONTENT, AGGREGATE GRADATION, CURING TIME, CURING TEMPERATURE, TYPE OF AGGREGATE, TYPE OF CURING, TYPE OF COMPACTION, AND COMPACTIVE EFFORT. THE FIRST FIVE WERE INVESTIGATED AT 3 LEVELS AND THE LAST FOUR AT 2 LEVELS IN A STATISTICALLY DESIGNED FRACTIONAL FACTORIAL EXPERIMENT. THE PARAMETER CONSIDERED AS A PRIMARY INDICATOR OF THE TENSILE PROPERTIES OF CEMENT-TREATED MATERIALS WAS THE INDIRECT TENSILE STRENGTH. AN ANALYSIS OF VARIANCE WAS USED TO DETERMINE THE SIGNIFICANCE OF ALL MAIN FACTORS, 2-FACTOR INTERACTIONS, AND 3-FACTOR INTERACTIONS IN THE EXPERIMENT. THE HIGHEST SIGNIFICANT EFFECTS THAT ARE ALSO OF PRACTICAL SIGNIFICANCE TO THE ENGINEER ARE DISCUSSED, AND TABLES OF ALL ADDITIONAL FACTORS AND INTERACTIONS SIGNIFICANT AT ALPH levels of 1 and 5 percent are shown. A REGRESSION EQUATION THE PREDICTS VALUES OF INDIRECT TENSILE STRENGTH WITHIN THE FACTOR SPACE DEFINED BY THE EXPERIMENT IS PRESENTED. /AUTHOR/

Moore, RK Kennedy, TW Hudson, WR Highway Research Record, Hwy Res Board 1970

2A 233040
RESEARCH ON THE UTILIZATION OF SCREENINGS IN SUB-BASES OF ROAD PAVEMENTS

Danciger, F Road Research Institute /Brazil/ 1970

ACKNOWLEDGMENT: Road Research Institute /Brazil/

2A 233078
FACTORs INVOLVED IN STABILIZING SOILS WITH ASPHALTIC MATERIALS
SOIL PROPERTIES ARE INVESTIGATED FOR DATA TO BE USED IN THE DESIGN OF SOIL-ASPHALT MIXTURES FOR STRUCTURAL USE. A SERIES OF CONSTANTS IS DEVELOPED TO GIVE INFORMATION ON THE PAVEMENT FUNCTIONAL DESIGN OF THE HIGHWAY COMPACTED STATE IN WHICH IT IS EMPLOYED IN EARTH CONSTRUCTIONS. PRINCIPALS OF SOIL DESIGN ARE CONSIDERED. /AUTHOR/

Holmes, A Roediger, JC Wirsig, HD Snyder, RC Goldbeck, AT DISCUSSER Conner, CN DISCUSSER Highway Research Board Proceedings 1943

2A 233100
CLAY TECHNOLOGY AND ITS APPLICATION TO SOIL STABILIZATION
A BRIEF SURVEY OF MODERN TRENDS IN COLLOID REASONING AND ITS RELATIONSHIP TO CLAY TECHNOLOGY IS PRESENTED. THE APPLICATION OF THESE TEACHINGS TO THE USE OF CLAY WITHIN MODERN CLAY TECHNOLOGY IS PRESENTED. SUCH FACTORS AS MINERALOGICAL COMPOSITION AND PARTICLE DISTRIBUTION AFFECT RESULTS TO AN EXTENT WHERE THESE VARIABLES NO LONGER CAN BE IGNORED. RESULTS INDICATE THAT A RANGE OF PROPERTIES IS POSSIBLE IN SYNTHETIC GRADED SOIL MIXTURE WHEN ANY OF THE FOLLOWING FACTORS IS VARIED: (1) CLAY MINERAL, (2) POROSITY OF THE PAVEMENT MIXTURE, AND (3) COUNTER-ION ASSOCIATED WITH COLLOIDAL PORTION OF CLAY MINERAL. THE THERMAL METHOD OF IDENTIFICATION OF THE CLAY MINERALS AFFORDS AN EASY AND RAPID TEST. /AUTHOR/

Johnson, AL Davidson, DT Highway Research Board Proceedings 1947

2A 233114
IMPORTANCE OF VOLUME RELATIONSHIPS IN SOIL STABILIZATION
STABILIZED SOILS IN COMMON WITH OTHER POROUS CONSTRUCTION MATERIALS ARE THERMODYNAMICALLY UNSTABLE UNDER CONDITIONS OF NORMAL CLIMATIC EXPOSURE. THIS INSTABILITY IS NOT TOO IMPORTANT, SINCE SUCH MATERIALS ARE NOT EXPECTED TO LAST FOREVER; HOWEVER, IT IS IMPORTANT THAT THEY DO POSsess AN ECONOMICALLY JUSTIFIABLE SERVICE LIFE. THEREFORE, THE RATE OF DETERIORATION IS THE REALLY SIGNIFICANT FACT. INTERNAL DETERIORATION DEPENDS ON THE PRESENCE OF DETERIORATING AGENTS WITHIN THESE POROUS SYSTEMS. SINCE WATER ITSELF IS OFTEN AN IMPORTANT DETERIORATING AGENT, OR AT LEAST A VEHICLE FOR OTHER DETERIORATING AGENTS, THE RATE OF WATER INTAKE INTO SUCH SYSTEMS IS OF MAJOR IMPORTANCE. THIS RATE IS A FUNCTION OF THE PORES SIZE OF THE PORES AS WELL AS OF THE WATER AFFINITY OF THE INTERNAL SURFACE. AND OF THE SURFACE TENSION OF WATER. GENERAL FORMULAE ARE DERIVED FOR THE RATE OF CAPILLARY WATER PENETRATION AND TESTED BY MEANS OF SYNTHETIC EXPERIMENTS ON CLAY AND SAND-CLAY SYSTEMS. THE IMPORTANCE OF VOLUME RELATIONSHIPS IS DEMONSTRATED BY THE RESULTS OF STABILIZATION TESTS ON SYNTHETIC SALINE SOILS MADE WITH BEACH SAND AND CONTAINING ILLITE, KAOLINITE AND MONTMORILLONITE, RESPECTIVELY, AS CLAY FRACTION. /AUTHOR/

Winterkorn, HF Choudhury, AN Highway Research Board Proceedings 1949

2A 233119
SOILS ENGINEERING IN RAILWAY CONSTRUCTION AND MAINTENANCE
THE INVESTIGATION BY THE RAILROAD INDUSTRY INTO SOIL AND BALLAST PROBLEMS AFFECTING THE STABILITY OF RAILROAD TRACKS IS DESCRIBED. THE PROBLEMS ARE VERY SIMILAR BASICALLY TO THOSE ENCOUNTERED IN HIGHWAY AND AIRPORT CONSTRUCTION. ROADWAY STABILIZATION NOW IS
MAINLY A PROBLEM OF MAINTENANCE. NEW CONSTRUCTION IS LIMITED PRINCIPALLY TO LINE AND GRADE REVISIONS. ON THESE, CONTROL OF THE SOIL STRUCTURES IN ACCORD WITH CODES AND STANDARDS RECOMMENDS THE RESULTS OF STUDY. HOWEVER, INDICATE THAT THIS TYPE OF CONTROL FOR SOME SOILS IS NOT SUFFICIENT TO OBTAIN THE EXPECTED RESULTS AND SECTIONS WITH ABNORMALLY HIGH MAINTENANCE MAY APPEAR AFTER OPERATIONS BEGIN. TREATMENT OF NEW GRADES TO RESTORE ORIGINAL STABILITY, OF COURSE, IS A MAINTENANCE PROBLEM. /AUTHOR/

Wu, TH Peck, RB *Highway Research Board Proceedings* 1956

## 2A 233128

### TREATMENT OF SOFT FOUNDATIONS FOR HIGHWAY EMBANKMENTS

Soft foundation materials usually found in swamps, marshes, bogs, river and lake bottoms, and lacustrine clay areas require treatments to overcome problems of flat topography, poor drainage, and fine-grained or organic soils. The methods or treatments used for constructing embankments on soft foundations must consider the economics and the performance of the end results desired. The choice of the best method is dependent on the evaluation of all the contributing factors such as embankment dimensions, characteristics of foundation soil, construction materials available, construction schedule, planned, location, and class of highway.

Sinacon, MN Hofmann, WP Emery, AH *Highway Research Board Proceedings* 1952

## 2A 233141

### FIELD OBSERVATIONS ON SAND DRAIN CONSTRUCTION ON TWO HIGHWAY PROJECTS IN ILLINOIS

There has been increased use of sand drains for fill construction over soft and compressible subsoils. Marsh areas, to accelerate the process of consolidation in the subsoil under the weight of the fill. The resulting reduction in water content of the subsoil lead to an increase in the shear strength. The sand drain shortened the time interval required for consolidation and settlement in the subsoil. Field and laboratory investigations were made of two highway projects involving sand drain construction, (1) the relocation of highway U.S. 51, LaSalle, Illinois, and (2) highway Illinois 11, Barrington, Illinois. The LaSalle project involved the construction of an embankment 25 to 30 feet high over the flood plain of the Illinois river, a section length of 3 miles. The Barrington project involved a dual lane, divided highway located over several peat deposits. The highway consisted of two parallel embankments for the two directions of traffic, and although the fill nowhere exceeded 15 feet in height, the softness of the peat presented serious problems during construction. Subsoil conditions and a history of construction were given. Pore-water pressure and settlement were measured and the results were presented. Triaxial and consolidated tests were performed. The observations at LaSalle left little doubt that the subsoil behavior was in general agreement with the theory of consolidation and that consolidation was accelerated by an increase in strength. At Barrington, the studies indicate that the performance of the subsoil represented a departure from the theory of consolidation. The weight of the fill produced little or no consolidation in the subsoil. The large settlements, then, probably must be attributed to a plastic flow of the subsoil in a lateral direction. Data on sand drain construction was presented with the hope that a better understanding of the subsoil behavior under such conditions would be obtained.

Smith, R *Highway Research Board Proceedings* 1950

## 2A 233382

### LATERITE AND LATERITIC SOILS AND OTHER PROBLEM SOILS OF AFRICA

The development of engineering standards and criteria for the usage of laterite, lateritic soils, and other problem soils (including tropical black clays) is reported in connection with the construction of roads, highways and airfields in all of tropical Africa. With emphasis on Ghana. The AASHO classification system can be applied as well with tropical soils. Cement stabilization is a practical means of improving lateritic gravel unless the clay content and plasticity index are greater than 15. A pavement condition survey was performed in Ghana and the Ivory Coast to evaluate lateritic and tropical materials as structural components of existing roads. It is reported that these developing for base course thickness of six and eight inches. A CBR value of 30 was adopted for the subbase. Material specifications that are appropriate to the traffic were determined from the results of the pavement condition survey. /AUTHOR/

Arora, MG Khanna, SK Vasan, RM *Indian Roads Congress Road Res Bull* 1970

## 2A 233321

### SLURRY WALLS FOR BART CIVIC CENTER SUBWAY STATION

Deep excavations in difficult ground have long been an engineering challenge, with the sharp increase in mass rapid transit subway construction in urban areas during the 1960s. More than ever before deep excavations are being planned and carried out in difficult ground conditions. New types of structures are being proposed and executed with new methods of construction and improved ground-water control, and are more frequently being measured to monitor performance. Great effort is being made to improve predictions for lateral earth pressures. At the San Francisco Civic Center Station it was necessary to carry out an excavation approximately 700 feet long, 60 feet to 99 feet wide, and up to 78 feet deep. Because of adjacent compressible soils and the sensitive structures around the excavation, the ground-water

Lyon Associates Inc. June 1971
CONSTRUCTION MATERIALS 2A

LEVEL HAD TO BE MAINTAINED AS NEAR THE PRECONSTRUCTION LEVEL AS POSSIBLE. A CONSTRUCTION METHOD WAS ADOPTED AND COMPREHENSIVE FIELD INVESTIGATIONS WERE CARRIED OUT, WITH LABORATORY TESTS AND ANALYSES TO ASSIST IN PREDICTING THE LATERAL SOIL Pressures. CRITERIA FOR STRUCTURAL DESIGN AND CONTROL OF CONSTRUCTION WERE DEVELOPED. THE STRUCTURE WAS INSTRUMENTED AND THE MEASURED DATA WERE EVALUATED AND COMPARED WITH PRECONSTRUCTION ESTIMATES.


2A 233303
SOIL COMPACTION /IN PORTUGUESE/
DATA ON SOIL COMPACTION, COMPACTION EQUIPMENT, COMPACTION CONTROL METHODS, AND NEUTRAL PRESSURE OBTAINED DURING THE CONSTRUCTION OF 21 DAMS IN BRAZIL AND 3 DAMS IN PORTUGAL IS PRESENTED. /RI/

Cruz, PT Bezerra, DM Geotecina- Cesp /Brazil/ 1971

ACKNOWLEDGMENT: Road Research Institute /Brazil/

2A 233311
STABILIZATION STUDIES: AFGHANISTAN SOILS
THE FEASIBILITY OF STABILIZING OR OTHERWISE IMPROVING FOR CONSTRUCTION PURPOSES THREE UNSUITABLE SOILS FOUND IN AFGHANISTAN WAS STUDIED. THE STABILIZING AGENTS USED WERE LIME AND CEMENT commercially AVAILABLE IN AFGHANISTAN. TEST RESULTS INDICATED THAT ALL THREE SOILS CAN BE EFFECTIVELY STABILIZED WITH THE ADDITION OF LIME OR CEMENT. ALL THREE SOILS ARE REACTIVE WITH LIME OR CEMENT AND WILL READILY COMBINE TO INCREASE STRENGTH AND DURABILITY WITH THE RESULTING STABILIZED SOILS BEING SUITABLE FOR CONSTRUCTION. DURABILITY TESTS INDICATED THAT THE ADDITION OF LIME OR CEMENT ALSO INCREASES THE SOILS’ RESISTANCE TO MOISTURE AND ICE PENETRATION.

Aufmuth, RE Construction Eng Res Lab, Army Ce /US/ June 1972, 10 pp, 10 Fig. 5 Tab, 7 Ref

2A 233315
STABILIZATION STUDIES OF SOUTHEAST ASIAN SOILS: VIETNAM
THIS REPORT SUMMARIZES THE RESULTS OF AN INVESTIGATION TO DETERMINE PHYSICAL, CHEMICAL, AND SELECTED ENGINEERING PROPERTIES OF SIX SOUTHEAST ASIAN SOILS ENCOUNTERED IN PAVEMENT FACILITY CONSTRUCTION. LIME AND CEMENT MANUFACTURED IN THE UNITED STATES WERE USED TO STABILIZE OR OTHERWISE IMPROVE THE ENGINEERING CHARACTERISTICS (PLASTICITY, MOISTURE-DENSITY, AND CALIFORNIA BEARING RATIO) OF THE SOILS. TEST RESULTS INDICATE THAT FIVE OF THE SIX SOILS EVALUATED ARE REACTIVE AND WILL SHOW STRENGTH INCREASES IN EXCESS OF 100% OF THE NATURAL UNCONFINED COMPRESSIVE STRENGTH WITH EITHER LIME OR CEMENT AS THE STABILIZING MATERIAL. THE SIXTH SOIL, RECENT ALLUVIUM, CONTAINING 2.5% ORGANIC MATERIAL AND MONTMORILLONITE AS THE PRIMARY CLAY MINERAL, SHOWED IMPROVEMENT ONLY IN CERTAIN ENGINEERING PROPERTIES WITH THE ADDITION OF LIME OR CEMENT.

Aufmuth, RE Construction Eng Res Lab, Army Ce /US/ June 1972, 11 pp, 15 Fig. 8 Tab, 10 Ref

2A 233318
DEEP-PLOW LIME STABILIZATION FOR PAVEMENT CONSTRUCTION
DEEP-PLOW LIME STABILIZATION EQUIPMENT AND PROCEDURES FOR TREATING SUBSTANTIAL THICKNESSES OF IN SITU SUBGRADE SOIL ARE DESCRIBED. FIELD STUDY DATA AND RESULTS ARE SUMMARIZED, AND POTENTIAL FIELD APPLICATIONS ARE CONSIDERED. IT IS CONCLUDED THAT DEEP-PLOW LIME STABILIZATION PROCEDURES CAN BE SUCCESSFULLY UTILIZED IN THE CONSTRUCTION OF HIGHWAY IMPROVEMENTS CONSTRUCTED WITH A 20-CM THICK LAYER OF LAR Mixture WITHOUT ASPHALTIC COVER SHOWED NO FROST DEFORMATIONS AND IS IN EXCELLENT CONDITION AFTER 3 YEARS. LABORATORY INVESTIGATIONS ON LAR ARE IN PROGRESS. POWER PLANT ASHES ARE ALSO FOUND TO BE USEFUL CONSTRUCTION MATERIAL.

Evstatiev, D DISCUSSER Am Soc Civil Engr J Soil Mech Div Vol. 99 No. 6 Nov. 1972, pp 1299-1300, 2 Tab, 1 Ref

2A 233340
CURRENT PRACTICE IN ABUTMENT AND FOUNDATION TREATMENT
THE CURRENT PHILOSOPHY AND PRACTICE OF BECHTEL INCORPORATED IN THE TREATMENT OF ABUTMENTS AND FOUNDATIONS OF HIGH EMBANKMENT DAMS ON ROCK ARE CONSIDERED, WITH SPECIAL REFERENCE TO THE RECENTLY COMPLETED NEW DON PEDRO DAM IN CALIFORNIA. THE INCLUSIONS OF LAGOONED ASH WITH HIGH CALCIUM OXIDE CONTENT FROM TWO COAL FIRED POWER PLANTS, REVEALED IN ITS UPPER PARTS, HIGH WATER CONTENT AS WELL AS THE PROPERTY OF BEING EASILY COMPACTED AND STABILIZED BY PORTLAND CEMENT. TEST DATA FOR MIXTURES OF SPECIMENS WITH DIFFERENT QUANTITIES OF PORTLAND CEMENT COMPACTED IN NATURAL WATER CONTENT CONDITIONS UNTIL A SPECIFIC DRY DENSITY WAS REACHED ARE TABULATED. TESTS REVEALED RELATIVELY HIGH VALUES OF UNCONFINED STRENGTH AND AN IMPRESSIVE INCREASE IN STRENGTH WITH TIME. DESPITE THEIR HIGH WATER CONTENT THE SPECIMENS SHOWED A RELATIVELY SMALL LINEAR SHRINKAGE AFTER DRYING EQUAL TO 0.22 PERCENT THE PROPERTIES OF COARSE-GRAINED LAR Mixture WITH FINES 2 MM TO 0.05 MM, 1 PERCENT 0.05 TO 0.005 MM; AND 1 PERCENT FINES SMALLER THAN 0.005 MM) WITH A SPECIFIC GRAVITY OF 2.53 G PER CU CM ARE DESCRIBED AND COMPARED WITH LAS. AN EXPERIMENTAL ROAD SECTION BUILT WITH A 20-CM THICK LAYER OF LAR 5 PERCENT CEMENT MIXTURE WITHOUT ASPHALTIC COVER SHOWED NO FROST DEFORMATIONS AND IS IN EXCELLENT CONDITION AFTER 3 YEARS. LABORATORY INVESTIGATIONS ON LAR ARE IN PROGRESS. POWER PLANT ASHES ARE ALSO FOUND TO BE USEFUL CONSTRUCTION MATERIAL.

Burke, HH Content, CS Kolesar, RL Am Soc Civil Engr J Soil Mech Div Vol. 98 No Sm 10, Oct. 1972, pp 1033-52, 19 Fig

2A 233349
ENGINEERING PROPERTIES OF COMPACTED FLY-ASH-DISCUSSION
EXPERIENCES GAINED FROM FLY ASH UTILIZATION IN CIVIL ENGINEERING, AND INVESTIGATIONS ON ENGINEERING PROPERTIES OF COMPACTED FLY ASH AND LIME, AND PORTLAND CEMENT STABILIZED FLY ASHES ARE REVIEWED. INVESTIGATION OF LAGOONED ASH WITH HIGH CALCIUM OXIDE CONTENT FROM TWO COAL FIRED POWER PLANTS, REVEALED IN ITS UPPER PARTS, HIGH WATER CONTENT AS WELL AS THE PROPERTY OF BEING EASILY COMPACTED AND STABILIZED BY MEANS OF PORTLAND CEMENT. TEST DATA FOR MIXTURES OF SPECIMENS WITH DIFFERENT QUANTITIES OF PORTLAND CEMENT COMPACTED IN NATURAL WATER CONTENT CONDITIONS UNTIL A SPECIFIC DRY DENSITY WAS REACHED ARE TABULATED. TESTS REVEALED RELATIVELY HIGH VALUES OF UNCONFINED STRENGTH AND AN IMPRESSIVE INCREASE IN STRENGTH WITH TIME. DESPITE THEIR HIGH WATER CONTENT THE SPECIMENS SHOWED A RELATIVELY SMALL LINEAR SHRINKAGE AFTER DRYING EQUAL TO 0.22 PERCENT THE PROPERTIES OF COARSE-GRAINED LAR Mixture WITH FINES 2 MM TO 0.05 MM, 1 PERCENT 0.05 TO 0.005 MM; AND 1 PERCENT FINES SMALLER THAN 0.005 MM) WITH A SPECIFIC GRAVITY OF 2.53 G PER CU CM ARE DESCRIBED AND COMPARED WITH LAS. AN EXPERIMENTAL ROAD SECTION BUILT WITH A 20-CM THICK LAYER OF LAR 5 PERCENT CEMENT MIXTURE WITHOUT ASPHALTIC COVER SHOWED NO FROST DEFORMATIONS AND IS IN EXCELLENT CONDITION AFTER 3 YEARS. LABORATORY INVESTIGATIONS ON LAR ARE IN PROGRESS. POWER PLANT ASHES ARE ALSO FOUND TO BE USEFUL CONSTRUCTION MATERIAL.

Evsatliev, D DISCUSSER Am Soc Civil Engr J Soil Mech Div Vol. 99 No. 6 Nov. 1972, pp 1299-1300, 2 Tab, 1 Ref
CONSTRUCTION MATERIALS

NESE AND AUSTRALIAN CONDITIONS ARE OUTLINED. THE USE OF STAGE CONSTRUCTION IN ESTABLISHMENTS OF A ROAD NETWORK IN AUSTRALIAN CONDITIONS, AND THE APPLICATION OF CBR AND SOIL SUCTION METHODS TO PAVEMENT DESIGN ARE DETAILLED. MORE RECENT WORK ON RESILIENCE MODULUS AND CURRENT STABILIZATION PRACTICE ARE ALSO MENTIONED. THE PROBLEMS OF ROAD CONSTRUCTION ASSOCIATED WITH EXPANSIVE CLAYS AND EDGE CRACKING ARE DESCRIBED, AS WELL AS THE EFFICIENCY OF VARIOUS TYPES OF COMPACTION MACHINERY IN AUSTRALIAN CONDITIONS. THE WORK OF THE AUSTRALIAN ROAD RESEARCH BOARD IS PARTICULARLY NOTED AND COMMENDED. /CSIRO/

Ingles, OG
Pavements /Japan/ Vol. 6 No. 9, 1971, pp 34-6

ACKNOWLEDGMENT: Commonwealth Scient Indus Res Org / Austral/

2A 233403


2A 233409
RECOMMENDATIONS FOR SOIL COMPACTION ASSOCIATED WITH ROAD CONSTRUCTION

THE RECOMMENDATIONS WERE DRAWN UP BY THE WORKING COMMITTEE ON SOIL COMPACTION AFTER AN EXPLANATION OF MECHANICS PRINCIPLES AND PRELIMINARY INVESTIGATIONS WHICH HAVE TO BE CARRIED OUT, REFERENCE IS MADE TO THE PRACTICAL USE OF COMPACTION EQUIPMENT AND IN PARTICULAR TO THE DIFFERENT STATIC, DYNAMIC AND VIBRATING ROLLERS AND TAMPERS. SOIL TYPE, MOISTURE CONTENT AND SUITABILITY FOR COMPACTION ARE DISCUSSED TO AID IN THE CORRECT SELECTION OF EQUIPMENT FOR A PARTICULAR JOB. THE QUALITY REQUIREMENTS OF COHESIVE AND NON-COHESIVE SOILS AND OF EMBANKMENTS AND CUTTINGS ARE GIVEN. IN CONCLUSION REFERENCE IS MADE TO STANDARDS AND SPECIFICATIONS WHICH DEAL WITH THE TESTING OF COMPACTED SOIL. /TRRL/

Forschung Fur Das Strassenwesen /Ger/ R&D Rpt 1972, 32 pp, 22 Fig 1 Tab, 36 Ref

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

2A 233459
SANDWICKS CONSOLIDATE MOTORWAY EMBANKMENT

THIS ARTICLE DESCRIBES THE INSTALLATION OF SOME 600 SANDWICKS/PRE-PACKAGED SAN DRAINS FOR DISSIPATING POREWATER PRESSURES AND ACCELERATING SOIL CONSOLIDATION ON A SOFT ALLUVIUM AREA NEAR MANCHESTER IN CONNECTION WITH THE CONSTRUCTION OF A MOTORWAY EMBANKMENT: THE SANDWICKS WERE INSTALLED TO AN AVERAGE DEPTH OF 23ft, ON A SQUARE GRID SPACING OF 15ft. THEY WERE PLACED INTO HOLES DRILLED BY USING THE WASH BORING METHOD. BRIEF DETAILS ARE ALSO GIVEN OF SIMILAR CONSOLIDATION OPERATIONS CARRIED OUT FOR A NEW MOTORWAY EMBANKMENT IN YUGOSLAVIA. /TRRL/

Ground Engineering /UK/ Vol. 5 ( Mar. 1972, 15 pp 1 Fi, g. 1 Phot

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/ IRRD 201 669, 3C6223151

2A 233454
PROCEEDINGS OF WORKSHOP ON EXPANSIVE CLAYS AND SHALES IN HIGHWAY DESIGN AND CONSTRUCTION

THESE PROCEEDINGS ARE COMPRISED OF TECHNICAL PAPERS, REPORTS AND DISCUSSIONS PRESENTED AT THE WORKSHOP ON "EXPANSIVE CLAYS AND SHALES IN HIGHWAY DESIGN AND CONSTRUCTION" HELD IN AUCKLAND, NEW ZEALAND, FEBRUARY 1972. THE WORKSHOP COVER THE STATE OF THE ART ON HIGHWAY DESIGN AND CONSTRUCTION ON EXPANSIVE CLAYS AND SHALES. INCLUDING THE GEOLOGIC ORIGIN AND DISTRIBUTION OF EXPANSIVE CLAYS AND SHALES, METHODS FOR TESTING OF EXPANSIVE CLAYS AND SHALES, IN FIELDS AND IN LABORATORIES. TESTING OF EXPANSIVE CLAYS; AND (3) METHODS FOR PREDICTION OF HEAVE OR DISTRESS IN ENGINEERING STRUCTURES FOUND ON OR IN EXPANSIVE CLAY OR SHALE. /AUTHOR/

Lambdr, Hanna, SJ
Wyoming University Vol. 1 May 1973, 363 pp, Figs, Tabs, Refs

2A 233457
EXPANSIVE SOILS AND CALIFORNIA HIGHWAYS (RESEARCH FINDINGS)

CONSTRUCTION MATERIALS

2A

INVOLVED AN INTENSIVE ANALYSIS OF APPROXIMATELY 25 LOCATIONS SELECTED FROM THE INITIAL FIELD SURVEY. THOSE WERE REPRESENTATIVE OF THE RANGE OF DISTRESS OBSERVED, AS WELL AS GEOGRAPHICALLY DISTRIBUTED. THIS PORTION OF THE INVESTIGATION INCLUDED TAKING SOIL SAMPLES THROUGH THE ROADWAY, AND AN INTENSIVE "SHOTGUN" PROGRAM OF LABORATORY TESTING. THE DATA WERE ANALYZED TO DETERMINE THE RELATIONSHIP, IF ANY, BETWEEN THESE FACTORS AND THE OBSERVED DISTRESS. THE FOLLOWING CONCLUSIONS WERE REACHED: (1) EXPANSIVE SOIL TYPE DISTRESS IN CALIFORNIA IS PREVALENT ENOUGH TO BE CLASSIFIED AS A SIGNIFICANT PROBLEM. (2) THE PROBLEM IS HIGHLY LOCALIZED. POTENTIAL PROBLEM SITES ARE NOT TO BE MISSED BY "RANDOM SAMPLING" TYPE FOUNDATION INVESTIGATIONS, AS CONDUCTED FOR ROUTINE STRUCTURAL DESIGN PURPOSES. (3) SOILS HAVING MORE THAN 40 PERCENT PASSING THE NO. 200 SIEVE, OR MORE THAN 10 PERCENT OF CLAY SIZED FRACTION (LESS THAN 1.0 MICRON) HAVE A HIGH POTENTIAL FOR CAUSING DISTRESS. OTHER PARAMETERS HAVING USEFUL ASSOCIATIONS ARE CLAY MINERAL IDENTIFICATION, ATTERBERG LIMITS, LINEAR EXPANSION AND SHRINKAGE, AND INTERNAL SURFACE AREA. THE USE OF THE DEPARTMENT OF AGRICULTURAL SOILS BULLETINS SHOULD BE RESEARCHED WHEN EVALUATING A ROADWAY LOCATION FOR EXPANSIVE SOILS.

Smith, RE
Workshop Proceedings Vol. 1 May 1973, pp 255-74, 3 Fig, 1 Tab, 1 Ref

2A 233458
THE CURRENT PRACTICE OF BUILDING LIGHTLY LOADED STRUCTURES ON EXPANSIVE SOILS IN THE DENVER METROPOLITAN AREA IS DESCRIBED. THE CURRENT PRACTICE OF BUILDING LIGHTLY LOADED STRUCTURES ON EXPANSIVE SOILS IN DENVER HAS BEEN RELATIVELY SUCCESSFUL. METHODS AND TECHNIQUES HAVE BEEN DEVELOPED THROUGH EXPERIENCE TO HELP COPE WITH THE PROBLEMS CREATED BY SWELLING SOILS. SOME FOUNDATION SYSTEMS HAVE BEEN OVER-DESIGNED AND A FEW FOUNDATIONS HAVE NOT PERFORMED SATISFACTORY. BECAUSE THE ASSUMPTIONS USED IN THE JUDGMENTS MADE BY THE SOIL ENGINEER WERE NOT CORRECT, SITES THAT WERE CONSIDERED NOT USEABLE IN THE PAST MUST NOW BE BUILT UPON BECAUSE OF LOCATION AND ECONOMICS. THE DEMANDS IMPOSED UPON THE SOIL ENGINEER BY OWNERS AND BUILDERS ARE EVER INCREASING. IT IS OBVIOUS THAT NEW TECHNIQUES MUST BE DEVELOPED TO BETTER UNDERSTAND THE NATURE OF EXPANSIVE SOILS IN ORDER TO MEET THESE DEMANDS.

Sealy, CO
Workshop Proceedings Vol. 1 May 1973, pp 295-314, 4 Fig, 6 Ref

2A 233469
LIGHTLY TRAFFICKED ROADS--FRANCE

Joneaux, R Boontot J Cambournac, M Lepetit, P Remillon, A Perm Intl Assoc Road Congresses Proc Vol. 2 1971, pp 40, 8 Fig

2A 233470
LIGHTLY TRAFFICKED ROADS--FEDERAL REPUBLIC OF GERMANY

Kubler, G Perm Intl Assoc Road Congresses Proc Vol. 2 1971, 15 pp, 7 Fig

2A 233471
LIGHTLY TRAFFICKED ROADS--GREAT BRITAIN
THE REPORT DEMONSTRATES THAT THE PROPERTIES OF LOWGRADE MATERIALS (THOSE WHICH ON THE BASIS OF ESTABLISHED CRITERIA WOULD BE REJECTED FOR USE IN A PARTICULAR PAVEMENT) CAN BE IMPROVED TO ACCEPTABLE STANDARDS BY THE USE OF SMALL PROPORTIONS OF ADDITIVES SUCH AS LIME OR BITUMEN. SATISFACTORY PERFORMANCE MAY ALSO BE OBTAINED BY THE USE OF SOUND SELECTION AND CONSTRUCTION METHODS AND BY THE CONTROL OF FACTORS SUCH AS MOISTURE CONTENT. AGGREGATES WHICH SATISFY TEST CRITERIA BUT SUBSEQUENTLY DECOMPOSE IN SERVICE, MAY BE IDENTIFIED BY A SODIUM SULPHATE TEST OR BY PETROLOGICAL EXAMINATION TO DETERMINE THE SECONDARY MINERAL CONTENT. A PAVEMENT DESIGN PROCEDURE WHICH INCORPORATES
CONSTRUCTION MATERIALS

STAGE-CONSTRUCTION PRACTICES HAS BEEN DEVELOPED
FOR AREAS WHERE A HIGH RATE OF TRAFFIC IS EXPECTED
IN THE FUTURE. FOR ASSESSING THE STRENGTH OF SUB-
GRADE, IT IS RECOMMENDED THAT THE CBR SHOULD BE
MEASURED AT THE HIGHEST MOISTURE CONTENT IT IS
EXPECTED TO ATTAIN. FULL-SCALE PAVEMENT-DESIGN
EXPERIMENTS WITH STABILIZED AND UNSTABILIZED BASES,
AND METHODS OF DETERMINING THE OPTIMUM CEMENT
CONTENT IN SOIL-CEMENT PAVEMENTS IS DISCUSSED.
A PRACTICAL METHOD OF ASSESSING THE RESIDUAL
STRENGTH OF EXISTING PAVEMENTS, TO DETERMINE WHEN
STRENGTHENING IS REQUIRED, IS CONSIDERED TO BE THE
MEASUREMENT OF TEMPORARY DEFORMATIONS UNDER A MOV-
ING LOAD. INVESTIGATIONS ARE IN PROGRESS TO DEVELOP
SURVIVOR CURVES FOR TROPICAL CONDITIONS THE NEED
FOR FULL-SCALE EXPERIMENTS TO ASSESS THE PERFORMANCE UNDER TROPICAL CONDITIONS OF DIFFERENT BITUMINOUS MIXTURES IS EMPHASIZED. METHODS OF PREVENTING EROSION OF EMBANKMENTS, ROAD SHOULDERS AND DRAINS ARE REVIEWED. RESEARCH IN THE EFFICIENT USE OF TRANSPORT INVESTMENT FUNDS FOR THE RESOLUTION OF RURAL DEVELOPMENT PROBLEMS IS REPORTED. THE DEVELOPMENT OF MATHEMATICAL MODELS TO PREDICT THE TRANSPORTATION NEEDS OF CERTAIN LEVELS AND TYPES OF AGRICULTURAL DEVELOPMENT IS DISCUSSED, AND METHODS ARE SUGGESTED FOR RELATING GROWTH IN TRAFFIC DEMANDS TO GENERAL SOCIO-ECONOMIC INDICATORS.

Millard, RS White, CB Hudson, NW Staarman, FA Tingle, ED Wilson, RL Woodrow, EH Vol 2 1971, 33 pp, 6 Fig, 3 Tab, 32 Ref

2A 233473
LIGHTLY TRAFFICKED ROADS--ITALY
THE USE OF SAND AS A MATERIAL FOR THE CONSTRUCTION OF ROAD BASE AND SUB-BASE COURSES IS REPORTED (IN THE APPENDIX). AND THE DEVELOPMENT OF A MODEL WHICH, GIVEN THE ENVIRONMENTAL CONDITIONS AND TRAFFIC FLOW DATA, COULD BE USED TO PREDICT ROAD SURFACE CONDITION AND PERFORMANCE. A MODEL OF SOIL-CEMENT MIXTURES IS EMPHASIZED. METHODS OF PREVENTING EROSION OF EMBANKMENTS, ROAD SHOULDERS AND DRAINS ARE REVIEWED. RESEARCH IN THE EFFICIENT USE OF TRANSPORT INVESTMENT FUNDS FOR THE RESOLUTION OF RURAL DEVELOPMENT PROBLEMS IS REPORTED. THE DEVELOPMENT OF MATHEMATICAL MODELS TO PREDICT THE TRANSPORTATION NEEDS OF CERTAIN LEVELS AND TYPES OF AGRICULTURAL DEVELOPMENT IS DISCUSSED, AND METHODS ARE SUGGESTED FOR RELATING GROWTH IN TRAFFIC DEMANDS TO GENERAL SOCIO-ECONOMIC INDICATORS.

Rolla, S Pachowski, J Skalmonski, W Kalabinska, M Filippoto, W Vol 2 1971, 11 pp, 1 Tab

2A 233478
LIGHTLY TRAFFICKED ROADS--PORTUGAL

Santos, M P Ferreira, MN Hurtado, V De, MORAIS EL Raposo, AD Sequeira, FP Vol 2 1971, 14 pp

2A 233479
LIGHTLY TRAFFICKED ROADS--RHODESIA
IN RHODESIA, A 24 KM SECTION OF A DEVELOPMENT ROAD HAS BEEN SUCCESSFULLY CONSTRUCTED USING A HIGHLY PLASTIC AND VERY COARSE GRAVEL AS THE BASE COURSE. DESPITE THE DIFFICULTIES OF LAYING AND TESTING THE BASE COURSE CONSTRUCTION OF THE RUBBING SURFACE WAS FEASIBLE. AN ACCEPTABLE ROAD IN GOOD CONDITION BASED ON VISUAL APPEARANCE WAS DEVELOPED. THE STRUCTURAL PERFORMANCE UNDER TRAFFIC WAS SATISFACTORY AND WHERE DISTRESS OCCURRED THIS WAS NOT CAUSED BY THE NATURE OF THE BASE MATERIAL. THE RUNNING SURFACE WAS NOT AS SMOOTH AS MIGHT BE ACHIEVED WITH BETTER GRADED MATERIAL BUT THE SURFACE WAS CONSIDERED ACCEPTABLE FOR THE PURPOSE WHICH IT SERVES. EXPERIMENTAL SECTIONS OF SEVERAL TYPES OF ROAD HAVE BEEN...

Borgia, E Vol 2 1971, 21 pp, 4 Fig
TREATED WITH A SURFACE DRESSING USING AN AGGREGATE OF QUARTZITIC ORIGIN. IT WAS FOUND ESSENTIAL TO PRECOAT THE STONE WITH A COAL TAR PRIME. THE CALCULATED BINDER RATE IS BETTER ACHIEVED IN TWO APPLICATIONS ONE AS A TACK COAT AND A MIST SPRAY AFTERWARDS. THE STRENGTH AND DURABILITY OF THE AGGREGATE WAS DERIVED FROM THE EFFECTS OF TRAFFIC AND ROAD DRAINAGE. PRECOATING WITH LIME AND BITUMINOUS PROTECTION FOR SURFACING SEEMS LIMITED TO UNUSUAL CIRCUMSTANCES. WITH CAREFUL PRELIMINARY PROVING AND TESTING AND DILIGENT SITE CONTROL DURING CONSTRUCTION IT HAS BEEN ESTABLISHED THAT NATURALLY OCCURRING QUARTZ AGGREGATES CAN BE USED QUITE SATISFACTORILY FOR CONCRETE WORK. THE ORIGINAL WORK WAS OF NECESSITY UNDERTAKEN IN EXTREMELY REMOTE AREAS WHERE SITE CONDITIONS WERE DIFFICULT BUT PROVED AN EXTREMELY ECONOMIC PROCESS. AS A RESULT NATURAL AGGREGATES ARE NOW INVESTIGATED FOR ALL WORK EVEN WHERE IGNEOUS ROCK IS AVAILABLE FOR CRUSHING. THIS HAS ACHIEVED SIGNIFICANT ECONOMIES IN THE BRIDGE CONSTRUCTION COSTS. TRAFFIC STATISTICS BOTH IN RESPECT OF NUMBERS AND WEIGHT OF VEHICLES HAVE BEEN COLLECTED AND Utilized. ON EMPIRICAL EVIDENCE AND EXPERIENCE, DRAINS ARE RECOMMENDED AS A TACK COAT AND A MIST SPRAY APPLIED AND THE INTENSITY OF THE TRAFFIC. THE USE OF A DRAINAGE SYSTEM IS NOTED, BECAUSE THE IMPORTANCE OF A DRAINAGE SYSTEM IS NOTED, BECAUSE DETERIORATION OF THE BODY OF THE ROADWAY. THIS SHOULD BE TAKEN CARE OF BY RAISING THE LEVEL OF THE ROAD SLIGHTLY ABOVE THE LEVEL OF THE GROUND AND BY PROVIDING AS MANY WIDE DITCHES, GUTTERS AND DRAIN PIPES AS MAY BE NECESSARY. THE FUNCTIONS OF ROADS ARE, DEFINED IN RESPECT OF THEIR INFLUENCE ON THE SOCIAL AND ECONOMIC DEVELOPMENT OF THE AREA WHICH THEY SERVE, TO PROVIDE THE BEST MEANS OF ACCESS AND FACILITATE THE EXCHANGE OF PRODUCTS, ETC. VARIOUS KINDS OF BENEFITS ARE EVALUATED: TIME SAVING ON JOURNEYS, REDUCTION OF TRANSPORT COSTS, INCREASED VALUE OF ADJOINING LAND, ETC. IN SPAIN THIS IS CALCULATED BY A FORMULA. WITH FIXED VALUES FOR ITS COMPONENTS. IT IS THEN POSSIBLE TO DETERMINE IF THEY ARE JUSTIFIED AND THE NEED FOR THEM. RELEVANT DATA ARE USED TO PROVIDE A BENEFIT/COST RELATIONSHIP.

Delbario, E. Perm Intl Assoc Road Congresses Proc. Vol 2 1971, 14 pp

2A 233481
LIGHTLY TRAFFICKED ROADS—SWITZERLAND
LIME STABILIZATION IS A PROCESS WHICH ALLOWS THE USE OF CLAYEY AND WET SOILS AS CONSTRUCTION MATERIAL. LIME HAS A FAVORABLE INFLUENCE ON SOIL PROPERTIES AS A RESULT OF CHEMICAL REACTIONS PRODUCED WHICH ARE DEFINED IN RESPECT OF THEIR INFLUENCE ON THE SOCIAL AND ECONOMIC DEVELOPMENT OF THE AREA WHICH THEY SERVE, TO PROVIDE THE BEST MEANS OF ACCESS AND FACILITATE THE EXCHANGE OF PRODUCTS, ETC. VARIOUS KINDS OF BENEFITS ARE EVALUATED: TIME SAVING ON JOURNEYS, REDUCTION OF TRANSPORT COSTS, INCREASED VALUE OF ADJOINING LAND, ETC. IN SPAIN THIS IS CALCULATED BY A FORMULA. WITH FIXED VALUES FOR ITS COMPONENTS. IT IS THEN POSSIBLE TO DETERMINE IF THEY ARE JUSTIFIED AND THE NEED FOR THEM. RELEVANT DATA ARE USED TO PROVIDE A BENEFIT/COST RELATIONSHIP.

Mitchell, R. Mathews, A. Wootton, PM Perm Intl Assoc Road Congresses Proc Vol. 2 1971, 33 pp, 9 Fig, Tabs

2A 233480
USE OF LOCAL MATERIALS NOT NORMALLY ACCEPTED FOR PAVEMENT CONSTRUCTION—SPAIN
VARIOUS SOLUTIONS HAVE BEEN SET FORTH FOR ECONOMICAL ROADWAYS USING LOCAL MATERIALS COMBINED WITH LIME AND CEMENT, GRANULAR FOUNDATIONS AND BITUMINOUS PROTECTION FOR THE CARRIAGE BED. SEVERAL EXAMPLES ARE GIVEN WHICH SHOW THE CHARACTERISTICS OF SOILS OF DIFFERENT REGIONS, THEIR MODIFICATION BY THE TREATMENT APPLIED AND THE INTENSITY OF THE TRAFFIC. THE DURABILITY OF ROADWAYS IN THE PREVAILING CONDITIONS IS RECORDED FOR PERIODS OF UP TO FIVE YEARS. THE IMPORTANCE OF A DRAINAGE SYSTEM IS NOTED. BECAUSE

CONSTRUCTION MATERIALS

2A 233482
LIGHTLY TRAFFICKED ROADS—USSR

Nikolayev, AA Vasyliev, AP Lazebnikov, MG Erastov, AJ Rosov, VN Slavutsky, AK Kilmann, BA Malevansky, VV Perm Intl Assoc Road Congresses Proc. Vol. 2 1971, 31 pp. 10 Fig. 15 Tab

2A 233505
MISSISSIPPI'S EXPERIMENTAL WORK ON ACTIVE CLAYS IN THE YAZOO, PORTER'S CREEK, AND ZILPHA CLAY AREAS THAT COVER LARGE AREAS OF MISSISSIPPI, PAVEMENTS HAVE BEEN BADLY DISTORTED AND DESTROYED BY THE BEHAVIOR OF THE HIGHLY EXPANSIVE SUBGRADES. AN INVESTIGATION WAS CONDUCTED TO PRODUCE A DEFINITIVE STUDY FOR THE PREDICTION OF THE MOVEMENT OF CLAYS, AND TO PRESENT TO THE HIGHWAY ENGINEERS A CONSTRUCTION METHOD THAT WOULD ELIMINATE OR GREATLY REDUCE THE HEAVE OF THE SUBGRADE AFTER THE COMPLETION OF THE ROADWAY. THE DESIGN AND CONSTRUCTION OF THE RESEARCH PROJECT ARE DISCUSSED IN THIS REPORT, AND THE RESULTS AND SUBSEQUENT RECOMMENDATIONS ARE PRESENTED.

Teng, TC Maddox, RM Clisby, MB Workshop Proceedings Vol. 2 May 1973, pp 1-27, 25 Fig. 2 Ref

2A 233506


2A 233507
SOIL MODIFICATION HIGHWAY PROJECTS IN COLORADO THE HIGH INCIDENCE OF ROADWAY FAILURES IN EASTERN COLORADO DUE TO SWELLING SOILS HAS LED TO A MULTITUDE OF ATTEMPTS TO PREVENT REPEAT PERFORMANCES. SOME OF THE IDEAS THAT HAVE BEEN EXPRESSED FOR REDUCING SUBGRADE SWELLINGS ARE THE FOLLOWING: (1) MAKE CUTS WIDE SO WATER IS FAR FROM PAVEMENT AND USE FILL SECTIONS ONLY, IF POSSIBLE; (2) SUBEXCAVATE CUTS AND REPLACE WITH NON-SWELLING MATERIAL; (3) SUBEXCAVATE CUTS AND REPLACE WITH THE SAME MATERIAL, BUT TREATED TO BE NON-SWELLING; (4) SPREAD SOME MAGIC FLUID OR POWDER OVER THE SUBGRADE THAT WILL MAKE THE SUBGRADE INERT (NON-SWELLING); (5) IF THIS FLUID WILL NOT SOAK IN, PUMP IT IN OR DRILL HOLES AND LET IT SOAK IN; (6) PLACE AN IMPERVIOUS BLANKET OVER OR AROUND THE SHOULDERS AND DITCHES TO KEEP THE WATER OUT; (7) USE A THICK IMPERVIOUS PAVEMENT AS A BLANKET TO PREVENT WATER FROM ENTERING THE SUBGRADE (DEEP STRENGTH PAVEMENT); AND (8) CONSTRUCT THE ROADWAY OVER THE SWELLING SOIL AS ECONOMICALLY AS POSSIBLE AND WHEN THE SUBGRADE REACHES MOISTURE EQUILIBRIUM, PLACE A THICK LEVELING COURSE OVER IT TO TAKE OUT THE BUMPS (COMPACTION WITHOUT MOISTURE-DENSITY CONTROL). SINCE 1962, CONSTRUCTION PROJECTS HAVE BEEN SET UP AND CARRIED OUT TO TEST EVERY ONE OF THESE IDEAS AT LEAST ONCE. THIS PAPER DESCRIBES THESE PROJECTS AND PRESENTS AN ANALYSIS OF THE RESULTS IN A BRIEF FORM.

Gerhardt, BB Workshop Proceedings Vol. 2 May 1973, pp 33-48, 7 Fig

2A 233508
OBSERVATION OF EXPANSIVE CLAYS IN ROADWAYS EXPANSIVE CLAYS IN TEXAS ARE ESTIMATED TO CAUSE 9 MILLION DOLLARS IN DAMAGES TO STATE HIGHWAYS ANNUALLY. THIS AMOUNT OF MONEY REFLECTS ONLY THE MAINTENANCE COST ATTRIBUTABLE TO EXPANSIVE CLAYS AND NOT THE DEGRADATION OF RIDE QUALITY AND SERVICEABILITY TO THE PUBLIC. ONE PURPOSE OF CURRENT STUDIES IS TO MAKE COMPARISONS OF FIELD OBSERVATIONS WITH PREDICTIVE METHODS IN ATTEMPTING TO REDUCE THIS ANNUAL MAINTENANCE BILL AND THE INCONVENIENCE TO THE MOTORIST. FOUR DIFFERENT METHODS ARE AVAILABLE FOR REDUCING THE DETERIMENTAL EFFECTS OF SWELLING CLAYS: (1) REMOVAL OF THE CLAY; (2) CHEMICAL ALTERATION; (3) ENCAPSULATION IN WATERPROOF MEMBRANES; AND (4) CHANGE OF THE WATER CONTENT TO THAT EXPECTED AFTER CONSTRUCTION. THE LAST METHOD IS BEING STUDIED MOST CLOSELY AT THIS TIME. OBSERVATIONS ARE MADE IN THIS REPORT OF TWO METHODS PROPOSED BY THE TEXAS HIGHWAY DEPARTMENT FOR CHANGING THE IN-SITU WATER CONTENT PRIOR TO CONSTRUCTION: DRY-LAND FARMING AND PONDING. A NUMERICAL TECHNIQUE FOR PREDICTING MOISTURE MOVEMENT IN UNSATURATED SOILS HAS ALREADY BEEN DEVELOPED. A LONG-TERM FIELD EXPERIMENT IS DESCRIBED IN THIS REPORT WHICH WILL PROVIDE A TEST COMPARISON UNDER CONTROLLED CONDITIONS.

Stevens, JB Matlock, H Workshop Proceedings Vol. 2 May 1973, pp 49-65, 10 Fig. 1 Tab, 5 Ref
CONSTRUCTION MATERIALS

2A 233509
MEMBRANES AND ENCAPSULATION OF SOILS FOR CONTROL OF SWELLING

The advantages of preventing the entrance of moisture from above or below a layer of soil are obvious to designer and construction engineers alike. One of the most cost effective techniques for successfully achieving this is by using membranes. Membranes between the soil layer and possible sources of moisture. Previously, the major drawbacks to the use of membranes were the lack of integrity of low-cost membranes or the relatively high cost of membrane materials. The most effective system involves the technique of placing impervious membranes between the soil layer and possible sources of moisture. The recent work completed by the U.S. ARLMY engineer, waterways experimental station has developed a durable, inexpensive combination of membranes and proper construction techniques, which together overcome the past restrictions for use of membrane waterproofing. This report describes a membrane-enveloped soil layer (MESL) system. It consists of a subgrade upon which a foundation layer of compacted soil (constructed from natural subgrade or locally available soil) lies between a lower and upper waterproof membrane. The membranes are jointed and sealed along the edges, forming a waterproof encapsulated soil system. Following a brief discussion of materials and design, the construction technique for successful installation of a MESL system is presented. Results of structural and cost analyses studies are given and the limitations of the system are pointed out. Briefer mention is made of an alternate construction procedure which is currently being investigated.

Hammit, GM, Ahlvin, RG
Workshop Proceedings Vol. 2 May 1973, pp 80-85, 3 Fig, 12 Ref

2A 233510
EXPANSIVE CLAY ROUGHNESS IN THE HIGHWAY DESIGN SYSTEM

From an analysis of systems characterization of expansive clay roughness it appears that a proper characterization of such roughness requires a mixture of engineering (e.g., heave) and geomorphological (e.g., surface patterns) properties. An equation is presented which makes it possible to determine the effects on the serviceability index of reducing the amplitude and rate of heaving of a given clay subgrade by applying some pre-construction technique. The economic implications per lane mile per year of reducing the surface activity index can be read directly from a chart presented in this report for that specific pavement design. Obviously, there is some optimum mixture of pre- and post-construction of systems. This is a subgrade upon which a foundation layer of compacted soil (constructed from natural subgrade or locally available soil) lies between a lower and upper waterproof membrane.

Bracey, BA
Workshop Proceedings Vol. 2 May 1973, pp 155-89, 14 Fig, 7 Ref

2A 233511
MOISTURE STABILIZATION BY MEMBRANES, ENCAPSULATION AND FULL DEPTH PAVING

From a review of several experimental projects (at Clifton, Ordway, Elk Springs, and other sites) constructed on expansive soils in various regions of Colorado, the following conclusions were drawn: (1) Catalytically blown asphalt membranes can be placed for about 50 cents per square yard and are effective in maintaining as-constructed moisture in subgrade soils. (2) Full depth asphalt bases are effective in reducing moisture buildup in subgrade soils. Special precautions are needed, however, to prevent moisture in the base course from rising in the order to prevent longitudinal cracking in the pavement a few feet in from the shoulder. (3) Granular untreated bases, either directly or indirectly, are responsible for the higher moisture found under such bases in comparison to full depth asphalt bases. (4) Encapsulated or enveloped subgrade soils remain at a lower moisture content. This does not appear to be economically practical, however, since on the elk springs project, enough additional soil support was not gained over that under asphalt base to offset the extra cost of placing the membrane. (5) Soil support values under asphalt membranes and full depth asphalt bases are considerably higher than under granular untreated bases. (6) Traces of similar additivations, a new correlation of laboratory stability and field soil support values for the drier conditions is suggested. Under conditions similar to Ordway and Elk Springs, this would result in a decreased thickness of the pavement structure of about 0.45 structural number below that called for by the current Colorado flexible pavement design process. (7) The current procedure for flexible pavements is reasonably accurate for untreated granular bases and shows no need for adjustment. (7) It is not practical to reproduce field moisture conditions when molding stability specimens in the laboratory to predict actual field soil support values.

Lytton, RL
Vol. 2 pp 123-49, 7 Fig, 1 Tab, 47 Ref

2A 233512
CONTROL OF VOLUME CHANGES IN EXPANSIVE EARTH MATERIALS

Methods for the control of volume changes in expansive soils have been divided into (1) techniques that do not require additives: compaction control, prewetting, heating; and (2) techniques using additives: lime, cement, chemicals. Much can be done through control of compaction. A moderate density wet of optimum water content using a sheep foot roller should minimize swell, and current knowledge of the properties of compacted clay should enable designs accounting for strength, volume change, and permeability criteria. Prewetting is an effective means of volume change control when time is not critical. Lime treatment of the upper 6 to 12 inches of the wetted soil can be used to increase strength and facilitate construction. Lime continues to be the most effective additive for stabilization, and the design method provides means for treatment to depths up to 36 inches. On the other hand stabilization using lime slurries and lime piles is of doubtful value, except in dried, fissured materials. No chemicals have been found that are competitive with lime for treatment of expansive clays. Proprietary chemical stabilizers and compaction aids have not yet been shown effective for control of volume change.
2A CONSTRUCTION MATERIALS

2A 233513
UTAH'S PROBLEMS WITH SWELLING SOILS
THE MAJORITY OF UTAH'S PROBLEMS WITH SWELLING SOILS OCCURS IN THE MANCOS SHALE AREAS. TO DATE A PAVEMENT STRUCTURE WHICH WILL ADEQUATELY PREVENT OR SUPPRESS HEAVING TO A TOLERABLE LEVEL HAS NOT BEEN DESIGNED. PRESENTLY THERE ARE APPROXIMATELY 130 MILES OF STATE HIGHWAY AND 90 LANE MILES OF INTERSTATE THROUGH THE MANCOS SHALE AREAS, AND IT IS EXPECTED THAT THERE WILL BE 80 MORE LANE MILES OF INTERSTATE CONSTRUCTED IN THE MANCOS SHALE UTAH'S PROBLEM, THEREFORE, STEMS FROM THE FACT THAT A CONSIDERABLE MAINTENANCE BURDEN WILL RESULT IF THE SWELLING OF THE MANCOS SHALE CANNOT BE CONTROLLED BY ADEQUATE PAVEMENT STRUCTURES AND ROADWAY CONSTRUCTION PRACTICES. BRIEFLY, THIS REPORT (1) REVIEWS THE PROPERTIES OF CHARACTERISTICS OF THE MANCOS SHALE, (2) REVIEWS THE VARIOUS DESIGNS WHICH HAVE BEEN USED IN AN ATTEMPT TO PREVENT SWELLING, (3) INDICATES THE RELATIVE EFFECTS OF THESE DESIGN METHODS, AND (4) ATTEMPTS TO EXPLAIN WHY THESE DESIGNS WERE NOT SUCCESSFUL.

Price, DT
Workshop Proceedings Vol. 2 May 1973, pp 220-9, 7 Fig

2A 233514
REVIEW OF HIGHWAY DESIGN AND CONSTRUCTION THROUGH EXPANSIVE SOILS IN SOUTH DAKOTA ON I-95-MISSISSIPPI RIVER WEST-135 MILES
IN THIS REPORT A REVIEW IS PRESENTED OF RESEARCH CONDUCTED ON EXPANSIVE SOILS IN SOUTH DAKOTA. CONCLUSIONS ON THE BASIS OF THIS REVIEW ARE AS FOLLOWS: (1) IT IS POSSIBLE TO ACHIEVE RELATIVELY GOOD MOISTURE AND DENSITY CONTROL BY DESIGNATING ROLLER PASSES AND MAKING FREQUENT MOISTURE TESTS. (2) CONTROL OF SPECIAL UNDERCUTTING AND SOIL SELECTION CAN BE ASSURED BY USE OF SPECIALY TRAINED CREWS FROM THE CENTRAL MATERIALS SECTION, ASSIGNED TO CONTROL THE WORK. (3) EXTREME WARPING AND HEAVING OF THE SUBGRADE, OVER NARROW FAULT LINES, APPEARS TO BE REDUCED BY DEEP UNDERCUTTING OF EXPANSIVE SHALE AND REPLACEMENT WITH LOWER LIQUID LIMIT SOIL. (4) DEFINITE CONCLUSIONS ON IMPROVEMENT OF RIDEABILITY OF THE FULL LENGTH OF THE INTERSTATE ROUTE, WHERE THE SPECIAL UNDERCUT AND BACKFILL DESIGN WERE EMPLOYED, WILL NOT BE POSSIBLE UNTIL AT LEAST FIVE MORE YEARS HAVE ELAPSED. AT THIS POINT IN TIME, THE RIDEABILITY OF THE SURFACE IS EXTREMELY GOOD AND APPEARS TO BE BETTER THAN ON OTHER SIMILAR HIGHWAYS CONSTRUCTED THROUGH PIERRE SHALE WHERE SPECIFICATIONS DID NOT REQUIRE DEEP UNDERCUTTING AND MORE RIGID CONTROL OF COMPACTION EFFORTS. (5) MOISTURE APPLICATION COST COMPARISONS ARE NECESSARILY DEPENDENT ON TIME AND AT THIS POINT IT IS NOT POSSIBLE TO KNOW DEFINITELY HOW THE TWO SURFACING TYPES WILL COMPARE.

McDonald, EB Potter, AW
Workshop Proceedings Vol. 2 May 1973, pp 230-44, 4 Fig, 8 Ref

2A 233515
CALIFORNIA'S GENERAL EXPERIENCES
A VERY BRIEF REVIEW IS PRESENTED OF CALIFORNIA'S EXPERIENCES IN CONSTRUCTING HIGHWAYS IN AREAS HAVING EXPANSIVE SOILS.

Smith, RE

2A 233516
EXPANSIVE SOILS IN WYOMING HIGHWAYS
THIS PAPER BRIEFLY SUMMARIZES THE PROBLEMS ENCOUNTERED IN CONSTRUCTING HIGHWAYS IN WYOMING IN AREAS WITH EXPANSIVE SOILS, AND MENTIONS THE METHODS WHICH WERE USED TO SOLVE THEM.

Diller, DG

2A 233517
PROBLEMS OF HIGH-VOLUME CHANGE SOILS IN NORTH DAKOTA
FOLLOWING A BRIEF REVIEW OF PROBLEMS ENCOUNTERED IN NORTH DAKOTA IN AREAS WITH EXPANSIVE SOILS, IT IS CONCLUDED THAT THE EXPANSIVE SOILS ARE NO LONGER THE PROBLEM THAT THEY WERE IN 1967 OR PRIOR TO THAT TIME. THIS IS DUE TO THE FACT THAT THE CONTINUOUSLY REINFORCED PAVING CONCEPT HAS BEEN EMPLOYED AND NEW COMPACTION STANDARDS, WHEREBY SOILS ARE COMPACTED TO A LOWER DENSITY AND A HIGHER MOISTURE CONTENT, HAVE BEEN FOLLOWED. THERE MAY BE OTHER PROBLEMS WITH THE CONTINUOUSLY REINFORCED CONCRETE PAVEMENT IN THE FUTURE BUT FOR THE PRESENT, IT APPEARS TO BE THE ANSWER TO PAVEMENT ROUGHNESS FOR CONSTRUCTING ROADWAYS IN THE AREAS HAVING EXPANSIVE SOILS.

Plummer, DD
SAME APPROACH IN A MORE SEVERE ENVIRONMENT WOULD LIKELY NOT GIVE THE SAME RESULTS.

Clark, GN
Workshop Proceedings Vol. 2 May 1973, pp 274-82, 9 Ref

2A 23391
ARIZONA'S EXPERIENCE WITH SWELLING CLAYS AND SHALES IN ARIZONA MOST OF THE SWELLING CLAY LIES IN A VERY ARID REGION. MEMBRANE CONSTRUCTION, FULL DEPTH ASPHALT, WIDENED CUT DITCHES, AND MOISTURE CONTROL IN EMBANKMENTS ARE BEING UTILIZED. TWO THINGS PRESENTLY BEING INVESTIGATED IN ARIZONA ARE CHEMICAL STABILIZATION AND THE POSSIBLE PLACING OF MEMBRANES OVER THE ENTIRE PAVEMENT SURFACE.

Morriss, GR

2A 23383
USE OF WET SAND PROCESS FOR FARM ROAD CONSTRUCTION IN EAST GERMANY WET SAND IS A MIXTURE OF MOIST, NON-HEATED AGGREGATE MATERIAL (MAXIMUM PARTICLE SIZE 15 MM, PROPORTION OF PARTICLES UP TO 1 MM-70%) AND HEATED CUT-BACK BITUMEN. IT IS ADDED TO A MIXTURE OF SURFACE-ACTIVE AGENTS AND LIME HYDRATE WITH THE RESULT THAT THE HEATED CUT-BACK BITUMEN DISPLACES THE WATER ON TOP OF THE OTHER AGGREGATE, AND THE ENTIRE MIXTURE SETS FIRM. THE METHOD IS USED FOR LOW-COST ROAD CONSTRUCTION IN EAST GERMANY BECAUSE IT ENABLES LOCALLY AVAILABLE CONSTRUCTION MATERIALS TO BE USED, LEADS TO SUFFICIENTLY DENSE AND WEAR-RESISTANT SURFACINGS FOR LIGHTLY TRAFFICKED ROADS, IS RESISTANT TO WEATHERING, AND IS MORE ECONOMICAL THAN ANY OTHER BITUMINOUS METHOD. THE POSSIBILITY OF THE METHOD BEING USED FOR ROADS IN RESIDENTIAL AREAS IS MENTIONED. /TRL/

Freutenberg, G Strasse, Berlin /Germany/ Vol. 11 No. 5, 1971, pp 243-7, 12 Fig. 1 Tab
ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

2A 23385
SHAFT SINKING BY GROUND FREEZING: ELY OUSE-ESSEX SCHEME FOR THE SINKING OF SIX SHAFTS IN THE EAST ANGLIAN FENLANDS, GROUND FREEZING WAS ADOPTED AS THE SINGLE EXPEDIENT FOR TREATING A VARIED COMBINATION OF UNATTRACTIVE GROUND CONDITIONS. THE DECISION TO DO SO ON THE PERMANENT SHAFTS WAS TAKEN AT THE DESIGN STAGE AND THE METHOD WAS CHOSEN ALSO AT THE ALTERNATIVE WORKING SITES BY THE TENDERERS FOR THE SUBSEQUENT TUNNELLING CONTRACT. NOTWITHSTANDING SOME DIFFICULTIES IT LED TO THE SATISFACTORY COMPLETION OF ALL THE SHAFTS. THEY WERE AN IMPORTANT FIRST STEP IN THE BULK TRANSFER OF WATER, RIVER TO RIVER, FROM NORFOLK TO ESSEX. THAT SECTION OF THE TRANSMISSION LINK WHICH TRAVERSES THE FENS, BEING IN DIFFICULT COUNTRY FOR major PIPELINE WORK, LIES LESS EXPENSIVELY IN TUNNEL IN THE GAULT CLAY. THIS BED RUNS FROM ONE TO THREE HUNDRED FEET DEEP BELOW THE LOWER CHALKS AND UPPER GREENSAND WHICH ARE GENEROUS TO THE WATER SUPPLY UNDERTAKINGS OF THE REGION. THE CHALKS THEMSELVES ARE MASKED FOR THE MOST PART BY SUPERFICIAL DEPOSITS UP TO 50 FT THICK, CONSISTING OF PEAT, WHICH IS FARmed USING WIDE-TREAD TRACTORS, OR SANDS AND GRAVELS NORMALLY WORKED IN FLOODED PITS BY DRAGLINE EXCAVATORS. THE PAPER INDICATES SOME FACTS OF THE RELATIONSHIP WITHIN THE GROUND, WITH A DEPTH OF 30 M, OF 0,04 M-THICK SAND-CEMENT STABILIZED, UNDER A 0,26 M-THICK BITUMINOUS SURFACING COMPOSED OF 0,18 M GRAVEL ASHALTIC CONCRETE AND TWO LAYERS, EACH OF 0,04 M ASPHALTIC CONCRETE, AS BASECOURSE AND WEARING COURSE. THE AMOUNT OF CEMENT REQUIRED FOR THE BASE AND THE CONSTRUCTION EQUIPMENT AND METHOD ARE DISCUSSED. /TRL/

Grevelt, ER Polytechnisch Tijdschrift /Neth/ Vol. 26 No. 16, Aug. 1971, pp 639-42, 3 Tab, 5 Phot
ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

2A 23370
THE DETERMINATION OF THE MAXIMUM DENSITY WITH NUCLEAR GAUGES A STUDY TO DETERMINE THE FEASIBILITY OF USING NUCLEAR GAUGES TO OBTAIN TEST MAXIMUM DENSITY OF SOILS USED IN HIGHWAY CONSTRUCTION IS REPORTED. AN EXPERIMENTAL INVESTIGATION ON A VARIED COMBINATION OF UNATTRACTIVE GROUND CONDITIONS, ALLOWING THE USE OF A NUCLEAR GAGE ON THE COMPACTED SPECIMEN, WAS USED IN CONJUNCTION WITH NUCLEAR GAUGES TO OBTAIN THE MOISTURE-DENSITY RELATIONSHIP OF SOILS. TEST MAXIMUM DENSITY WAS REPORTED IN TERMS OF COUNT RATIO. SINCE THE SAME SOIL WOULD BE MEASURED IN THE FIELD, ALSO IN TERMS OF COUNT RATIO, GAGE CALIBRATION WOULD BE UNNECESSARY. BOTH BACKSCATTER AND DIRECT TRANSMISSION MEASUREMENTS WERE MADE WITH THE LATTER SHOWING A LES SER VARIABILITY.
RESULTS OF THE STUDY INDICATE THAT THE BASIC IDEA IS FEASIBLE BUT LARGELY IMPractical. THERE ARE TECHNICAL PROBLEMS WHICH MUST BE RESOLVED BEFORE THE CONCEPT COULD BE IMPLEMENTED AS A PRACTICAL COM- Faction TESTING PROCEDURE. /BPR/

Weber, W.G. Howe, DR
California Division Highways, Bureau of Public Roads /US/

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4723137 68)PB 178 223, 3C63021279

2A 233707
EQUILIBRIUM MOISTURE AND DENSITY CONDITIONS IN COLORADO SUBGRADE SOILS-SECOND INTERIM REPORT
AN ANALYSIS WAS CONDUCTED OF MOISTURE-DENSITY INFORMATION FROM COLORADO AND OTHER AREAS OF THE NATION AND WORLD. THE OBJECTIVE OF THE STUDY WAS TO DEVELOP A BASIS FOR PREDICTING EQUILIBRIUM MOISTURE AND DENSITY VALUES OF SUBSURFACE SOILS IN HIGHWAY CUTS AND FILLS. SOIL DENSITY WAS FOUND TO DEPEND ON SO MANY VARIABLES THAT A STRAIGHT-FORWARD APPROACH TO THE ANALYSIS WAS IMPOSSIBLE. IT WAS POSSIBLE, HOWEVER, TO DEVELOP A VALID RELATIONSHIP BETWEEN SOIL MOISTURE AND PLASTICITY. IT WAS FURTHER DETERMINED THAT IN COLORADO SUBSURFACE SOIL, MOISTURE USUALLY REACHES A STATE OF EQUILIBRIUM IN FIVE YEARS OR LESS AFTER THE CONSTRUCTION OF A HIGHWAY. DRAINAGE CONDITIONS APPEAR TO BE A MAJOR FACTOR INFLUENCING SOIL MOISTURE. /AUTHOR/

Colorado Department Highways, Bureau of Public Roads /US/ Apr. 1968

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4654464 68)PB 178 858, 1C63021336

2A 233745
FINITE ELEMENT PROGRAM FEECON FOR UNDRAINED DEFORMATION ANALYSES OF GRANULAR EMBANKMENTS ON SOFT CLAY FOUNDATIONS
A FINITE ELEMENT ANALYSIS OF EMBANKMENT CONSTRUCTION (FEECON) WAS DEVELOPED TO ENABLE THE ENGINEER TO RATIONALLY ANALYZE THE STRESSES, PORE PressURES, AND UNDRAINED SHEAR DEFORMATIONS CAUSED BY RAPID CONSTRUCTION OF GRANULAR EMBANKMENTS IN A SERIES OF LIFTS PLACED ON SOFT CLAY FOUNDATION SOIL. ADDITIONAL LOADING COMMANDS ARE AVAILABLE IN FEECON TO ENABLE THE ANALYSIS OF OTHER TYPES OF ENGINEERING PROBLEMS, SUCH AS Erosion. THIS TECHNIQUE DOES NOT CONSIDER DEFORMATIONS CAUSED BY CONSOLIDATION OF THE FOUNDATION OR BY CREEP. A CHOICE OF NONLINEAR, ISOTROPIC, ELASTIC STRESS-STRAIN DEFORMATION MODELS OF THE SOIL MATERIALS IS AVAILABLE TO REPRESENT THE UNDRAINED OR DRAINED SHEAR BEHAVIOR OF SOILS. TO DEMONSTRATE THE APPLICABILITY OF THE FEECON PROGRAM, THE SECOND STAGE CONSTRUCTION OF THE FORE RIVER TEST SECTION IN SOUTH PORTLAND, MAINE WAS ANALYZED. A GOOD AGREEMENT WAS OBTAINED WITH THE MOVEMENTS AND EXCESS PORE PressURES MEASURED IN THE FIELD. THE EXAMPLE ANALYSIS ALSO SHOWED THAT THE COMPUTED DEFORMATIONS CAN BE VERY SENSITIVE TO CHANGES IN SOME OF THE SOIL PARAMETERS, SUCH AS UNDRAINED SHEAR STRENGTH OF A SINGLE CLAY LAYER, BUT MAY BE INSENSITIVE TO OTHER MATERIAL PROPERTIES, SUCH AS THE INITIAL MODULUS OF THE FILL. /FHWA/

Simon, R.M., Ladd, C.C., Christian, J.T.
Massachusetts Institute Technology, Federal Highway Administration /US/ No. 294, Feb. 1972. 100 pp

ACKNOWLEDGMENT: Federal Highway Administration NTIS PB 208 407, 3C63022951

2A 233746
EROSION PREVENTION DURING HIGHWAY CONSTRUCTION BY THE USE OF SPRAYED ON CHEMICALS
NINE COMMERCIAL SPRAY ON PLASTIC CHEMICALS WERE TESTED IN Erosion INHIBITORS. ALL THE CHEMICALS WERE COMPARED WITH STRAW TACKED WITH ASPHALT EMULSION. /FHWA/ AND WITH UNTREATED SOIL. THE COST OF EACH CHEMICAL WAS ALSO USED TO DETERMINE IF THE MOST EFFECTIVE CHEMICALS WERE ECONOMICALLY FEASIBLE. THERE ARE THREE PRINCIPAL PHYSIOGRAPHIC PROVINCES IN VIRGINIA, EACH HAVING SOILS SIGNIFICANTLY DIFFERENT IN COMPOSITION AND ERODIBILITY. TWO HIGHWAY SLOPES WITH A VERTICAL HEIGHT OF 15 TO 20 FEET AND A SLOPE OF APPROXIMATELY 2:1 WERE SELECTED TO BE TESTED IN EACH PROVINCE. IT WAS FOUND THAT THE SAME CHEMICALS WERE NOT THE MOST EFFECTIVE IN THE DIFFERENT AREAS. ALSO, NO CHEMICAL PERFORMED BETTER OR COST LESS THAN THE STRAW TACKED WITH ASPHALT EMULSION IN ANY OF THE THREE AREAS. HOWEVER, SOME CHEMICALS SHOWED SIGNIFICANT EROSION PROTECTION AND ARE RECOMMENDED IN CASES WHERE THE CONVENTIONAL STRAW AND ASPHALT ARE UNDESIRABLE OR UNAVAILABLE. /FHWA/

Wyant, DC Sherwood, WC Walker, HN Virginia Highway Research Council July 1972

ACKNOWLEDGMENT: Federal Highway Administration NTIS PB 213 207, 4C63023054

2A 233776
ROADMAKING MATERIALS IN THE CARIBBEAN, /5/ THE VOLCANIC ANTILLES
 GEOLOGICAL FEATURES, ROCKS AND SOILS ARE CLASSIFIED ACCORDING TO USEFULNESS FOR ROAD ENGINEERING. TYPICAL LANDSCAPES ARE ILLUSTRATED AND BRIEF NOTES GIVEN ON SOIL EROSION, ROAD LOCATION AND ASSOCIATED DEVELOPMENT. TABLES ARE INCLUDED ON VOLCANIC SOIL CLASSIFICATION AND MORPHOLOGICAL AND ENGINEERING CHARACTERISTICS. /RRL/

Caroll, DM Beaven, PJ
Road Research Laboratory /UK/ JAN65

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 233803
THE STABILITY OF A SLURRY TRENCH IN COHESIONLESS SOILS
HYDROSTATIC PRESSURE, ARCHING OF THE SOIL AND ELECTRO-Osmotic forces have each been suggested as the dominant factor to account for stability of trench excavations in cohesionless soils supported by clay slurries. The authors suggest that the most important mechanism is the hydrostatic pressure of the SLURRY. HOWEVER, THE INCREASE IN DENSITY OF THE SLURRY DUE TO THE SUSPENSION OF CUTTINGS MUST BE CONSIDERED IN COMPUTING THIS HYDROSTATIC PRESSURE. WHILE A CONCRETE DIAPHRAGM CUT-OFF WAS UNDER CONSTRUCTION AT PIERRE- BENITE, FRANCE, AN UNEXPECTED FLOOD OCCURRED, CAUSING SEVERAL SLIPS IN THE TRENCH EXCAVATION. THE ANALYSIS OF THESE SLIPS IS PRESENTED AND IT CONFIRMS THAT THE STABILITY OF A SLURRY TRENCH IN COHESIONLESS SOIL CAN BE ACCOUNTED FOR PROVIDED THAT THE CORRECT DENSITY IS USED IN COMPUTING THE HYDROSTATIC PRESSURE OF THE SLURRY. /RRL/A/

Morgenstern, N Amir-tahmasseb, I
Geotechnique /UK/ Dec. 1965

ACKNOWLEDGMENT: Road Research Laboratory /UK/
CONSTRUCTION MATERIALS

2A 233841
TESTING THE ELASTIC PROPERTIES OF NATURAL STONE
THE COMPRESSION TEST FOR STONES IS NOT THE ONLY FACTOR DETERMINING THEIR QUALITY AND SUITABILITY IN ROAD CONSTRUCTION, THE DEFORMATION /ELASTICITY/ OF THE STONE MUST ALSO BE MEASURED. /FG/RRL/
Tenne, T Bitume, Teere, Asphalte, Fette /Gerl 1965
ACKNOWLEDGMENT Road Research Laboratory /UK/

2A 233937
STRUCTURAL FAILURE OF WESTERN HIGHWAYS CAUSED BY PIPING
HIGHWAY FILLS, EMBANKMENTS, BRIDGES, AND DRAINAGE STRUCTURES CONSTRUCTED FROM AND BUILT UPON LOCAL GEOLOGIC MATERIALS, PARTICULARLY VALLEY-FILL ALLUVIUM IN THE DRYLANDS WEST, ARE PIPED TO AN ALARMING DEGREE IN MANY PLACES. PIPING AND RELATED COLLAPSE STRUCTURE WERE OBSERVED AT NUMEROUS SITES. VALLEY ALLEVIUM AND MUCK OF THE BEDROCK IN THE MORE ARID PARTS OF THE WEST GENERALLY ARE HIGHLY MONTMORILLONITIC AND HAVE A HIGH CONTENT OF EXCHANGEABLE NA. ALSO, MUCH OF THE VALLEY FILL ALLUVIUM HAS A VERY LOW FIELD-MOISTURE CONTENT WITH LOOSELY COMPACTED COMPONENTS, CHIEFLY IN THE CLAY-SILT-SAND SIZE RANGE. COMMONLY THE SILT AND SAND-SIZE GRAINS ARE OF HARDER MATERIALS SUCH AS CRYSTALLINE-ROCK FRAGMENTS, WEAK CLAY OR Silt CEMENT BINDER, LAY OR SILT CEMENT BINDER, WHEN DRY, THE LOOSELY PACKED AGGREGATES INTO FIRM, STABLE MATERIALS. BUT WHEN THESE BECOME SATURATED WHERE WATER IS CONCENTRATED AND SEEP DOWNWARD THROUGH THE SOIL, THE CLAY AND SILT CEMENT MELT AWAY, COLLAPSE FOLLOWS, PRODUCING A VERTICAL HOLE OR DEPRESSION, THESE SINKS FURTHER CONCENTRATE DRAINAGE, AND IF A NEARBY GULLY OR DITCH OFFERS A SHORT, STEEP-GRADIENT PATH FOR THE INFILTRATING WATER, TO ESCAPE TO THE WATER WILL FLOW UNDERGROUND TO SUCH DISCHARGE POINTS AND IN DOING SO PRODUCE LATERAL DRAINAGE TUBES, THE PIPES, MOST PIPING AND RELATED COLLAPSE AFFECTING HIGHWAYS APPEAR TO BE INITIATED BY DRAINABLE DESSICATION CRACK SYSTEMS, STORM OR SNOW-MELT WATER FLOWING TO DISCHARGE POINTS THROUGH THE CRACKS RAPIDLY ENLARGES THEM WHERE WATER IS CONCENTRATED AND SEEP DOWNWARD THROUGH THE SOIL, THE CLAY AND SILT CEMENT MELTS AWAY, COLLAPSE FOLLOWS, PRODUCING A VERTICAL HOLE OR DEPRESSION, THESE SINKS FURTHER CONCENTRATE DRAINAGE, AND IF A NEARBY GULLY OR DITCH OFFERS A SHORT, STEEP-GRADIENT PATH FOR THE INFILTRATING WATER, TO ESCAPE TO THE WATER WILL FLOW UNDERGROUND TO SUCH DISCHARGE POINTS AND IN DOING SO PRODUCE LATERAL DRAINAGE TUBES, THE PIPES, THE FINEST DRAINAGE DEVICES, EXHIBIT STRONGER ELASTICITY AND DISAGGREGATION THE POROUS MONTMORILLONITIC ALLUVIAL GRAINS SORB WATER RAPIDLY AS IT FLOWS THROUGH THE DESSICATION CRACKS. PIPING AND ASSOCIATED COLLAPSE ALSO IS COMMONLY INITIATED IN SITUATIONS WHERE INFILTRATING WATER PENETRATES AND SATURATES A LAYER HAVING HIGHER PERMEABILITY THAN OTHER LAYERS IN THE ALLUVIUM, BRIDGE ABUTMENTS, WING WALLS, PIERS AND CULVERTS ARE MOST COMMONLY IMPERILED BY PIPING. TO MINIMIZE MAINTENANCE COSTS AND POSSIBLE LOSSES OF LIFE RELATED TO HIGHWAYS OR BRIDGE FAILURES DUE TO PIPING AND COLLAPSE STRUCTURE, PRE-CONSTRUCTION SURVEYS SHOULD ASCERTAIN IF LOCAL ROAD-BUILDING MATERIALS AND ROUTE LOCATIONS ARE SUBJECT TO PIPING. CATCHMENTS EMBANKING DRAINAGE AREAS OR CONTAINING ROADWAY JUNCTION LINES WOULD BE MOST USEFUL IN PREVENTING PIPING BENEATH ABUTMENTS AND ADJACENT BRIDGE APPROACHES. CULVERT DISCHARGE SHOULD NEVER BE CONCENTRATED NEAR THE HIGHWAY BUT SHOULD BE CARRIED OVERLAND TO DISCHARGE INTO THE MAIN FULY. THE MAIN RULES TO FOLLOW ARE: /1/ AVOID PIPING SITES AND MAJOR POSSIBLE AND /2/ AVOID ALLOWING CONCENTRATION OF WATER WHERE PIPING MAY UNDERMINE ROADWAYS, BRIDGES, OR DRAINAGE STRUCTURES.

2A 234119
INVESTIGATION OF EMBANKMENT PERFORMANCE
THE PERFORMANCE OF AN EMBANKMENT AND ITS FOUNDATION MUST BE INVESTIGATED AND EVALUATED BOTH DUR-

2A 234183
PURE DEVIATORIC LOADING DEVICE FOR SOILS.
IMPROVED PNEUMATIC CONTROL
THE THEORY OF PURE DEVIATORIC LOADING FOR SHEAR TESTING OF SOILS IS BRIEFLY DESCRIBED. A DETAILED DESCRIPTION IS GIVEN OF THE DESIGN, CONSTRUCTION AND PERFORMANCE OF A PNEUMATIC CONSOLE THAT IMPROVES THE PURE DEVIATORIC LOAD. SOME OF THE TECHNICAL AND SCIENTIFIC FEATURES OF THE UNIT ARE ALSO DISCUSSED.

2A 234419
GEOL O GIC ASPECTS OF SOFT-GROUND TUNNELING

Terzaghi, K Wiley, John & Sons, Inc 1950

2A 234440
SUB-SURFACE DRAINAGE
THESE REFERENCES ON SUB-SURFACE DRAINAGE INCLUDE SELECTIONS ON SUBDRAINAGE OF AIRPORTS AND HIGHWAYS, PO RE PRESSURES IN BASE COURSES, PERMEABILITY OF
SOIL AND ITS MEASUREMENT, ANALYSIS OF FLOW-PROBLEMS FOR HIGHWAY SUB-DRAINAGE, FLOW PATTERN NEAR A GRAVITY WELL, HIGHWAY CONSTRUCTION ACROSS MARSH DEPOTS, STABILIZATION OF MUCK-Peat SOILS, VERTICAL SAND DRAINS, FILTER WELLS, DESIGN CRITERIA FOR PROTECTIVE FILTERS AND FOR DRAINAGE WELLS, CONSOLIDATION OF FINE-GRAINED SOILS BY DRAIN WELLS, USE OF ELECTRO-Osmosis IN SOIL STABILIZATION, AND CONTROL OF LANDSLIDES BY UNDERDRAINAGE.

Highway Research Information Service  July 1970

2A 234485
A STUDY OF THE PROTECTION OF HIGHWAYS EMBANKMENTS

/FG/RRL/

Proyectos /Cuba/  1966

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 234556
VEHICLE TUNNEL CONSTRUCTION-VOL 1-PLANNING, DESIGN AND CONSTRUCTION
DISCUSSIONS COVER: THE RELATIONSHIP BETWEEN TUNNEL STRUCTURE AND MOUNTAIN (FOUNDED AND STRUCTURE, GEOLGY, PETROGRAPHY, ROCK AND SOIL TYPES, HYDROLOGY AND ROCK MECHANICS, STATICS, BASIC METHODS OF TUNNEL CONSTRUCTION, INCLUDING OPEN CONSTRUCTION ON LAND AND UNDER WATER AND CLOSED CONSTRUCTION METHODS, AND SPECIAL AND AUXILIARY METHODS USED IN VEHICLE TUNNEL CONSTRUCTION, PARTICULARLY IN MOUNTAINOUS AREAS.

/FG/RRL/

Wagner, H
Ernst Und Sohn, Berlin /Germany/  1968

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 234689
SOIL MECHANICS FOR ROAD CONSTRUCTION /GERMAN/
SOIL MECHANICAL PROBLEMS OF ROAD CONSTRUCTION AND TEST METHODS FOR ROAD CONSTRUCTION MATERIALS ARE DISCUSSED. STABILIZATION OF SOILS AND PRACTICAL DESIGN TAKING ACCOUNT OF TRAFFIC LOADING AND SOIL BEARING CAPACITY ARE ALSO DISCUSSED.

/FG/RRL/

Balduzzi, F
Druck Svenska Cementforeningen /Swed/  126 pp, 1967

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 234730
BIBLIOGRAPHY ON SOIL MECHANICS. VOL 5, 1965-1966 /IN GERMAN/
THE BIBLIOGRAPHY IS ARRANGED UNDER THE FOLLOWING HEADINGS: (1) BIBLIOGRAPHIES; (2) GENERAL; (3) SOIL; (4) PROPERTIES OF SOIL; (5) STATICS AND DYNAMICS OF SOIL; (6) GROUNDWATER, PORE WATER, SURFACE WATER; (7) FOUNDATION ENGINEERING, HYDRAULIC ENGINEERING, TUNNEL CONSTRUCTION, MINING; (8) ROAD CONSTRUCTION, EARTHWORKS, RAILWAY CONSTRUCTION, AGRICULTURAL CONSTRUCTION ENGINEERING.

/Petermann, H Kuhn, H
Road Research Society /Germany/, Forschungsarbeit Aus Str Wesen /Ger/  1969

Acknowledgment: Road Research Laboratory /UK/

2A 234772
GEOTECHNICAL PROBLEMS WITH SOFT BANGKOK CLAY ON THE NAKHON SAWAN HIGHWAY PROJECT
FROM THE START AT KM. 51.8 UP TO APPROXIMATELY KM. 72 NEAR AYUTHAYA THE NAKHON SAWAN HIGHWAY WILL BE BUILT ON SOFT BANGKOK CLAY. IN THIS AREA THERE IS A CONTINUOUS LAYER OF SOFT CLAY HAVING A THICKNESS OF 4.5 METERS, AND IN PLACES IT EXTENDS DOWN TO 16-18 METERS. THESE DEEP GULLIES IN THE UNDERLYING STIFF CLAY ARE OLD RIVERBEDS, AND THE ROAD LINE CROSSES THEM AT SEVEN PLACES. BEIDES THE SOIL INVESTIGATIONS CARRIED OUT ALONG THE ROAD LINE, SPECIAL ATTENTION HAS BEEN PAID TO THE OLD RAILWAY EMBANKMENT WHICH RUNS ALMOST PARALLEL TO THE ROAD AT A DISTANCE OF 1-3 KM. TO THE WEST. THIS EMBANKMENT, 60 YEARS OLD, IS OF APPROXIMATELY THE SAME HEIGHT AS THE PLANNED HIGHWAY. CONSIDERABLE DIFFICULTIES HAVE ALREADY BEEN ENCOUNTERED IN MAINTAINING THIS STRETCH, AND SOIL INVESTIGATIONS HAVE BEEN CARRIED OUT ON VARIOUS TROUBLE SPOTS IN ORDER TO ANALYSE BOTH THE STABILITY AND THE SETTLEMENT CONDITIONS. IT SHOULD ALSO BE MENTIONED THAT EXPERIENCE FROM TWO TEST SECTIONS ON THE BANGKOK-SIRACHA HIGHWAY, WHICH HAVE NOW BEEN UNDER OBSERVATION FOR MORE THAN ONE YEAR, HAS BEEN UTILIZED IN ANALYSING THE PROBLEMS FOR THE NAKHON SAWAN HIGHWAY. IN MANY RESPECTS THE BANGKOK CLAY CANNOT BE DEALT WITH USING CONVENTIONAL TEXTBOOK METHODS. UNTIL ADDITIONAL RESEARCH WORK HAS FURTHER REVEALED ITS GEOTECHNICAL PROPERTIES THE GREATEST SIGNIFICANCE HAS TO BE ATTACHED TO THE FIELD OBSERVATIONS.

Eide, O
Norwegian Geotechnical Institute Publ  1968

Acknowledgment: Road Research Laboratory /UK/

2A 234864
LOESSIAL COLLAPSIBLE SOILS AS FOUNDATION BASE IN ROMANIA
THE PROPERTIES ARE DESCRIBED OF LOESS SOIL DEPOSITS, INCLUDING MOISTURE CONTENT, GRADING, PLASTICITY AND SHEAR STRENGTH, AND THE PROBLEMS ENCOUNTERED DURING THE EXECUTION OF CONSTRUCTION WORK IN LOESS SOIL. METHODS OF IMPROVING CONSTRUCTIONAL PROPERTIES OF THE SOIL, PARTICULARLY BY CONTROLLING THE MOISTURE CONTENT AND WETTING OF STRUCTURES FOUNDED IN IT, ARE DISCUSSED.

Botes, E Stanculescu, I Bally, RJ Antonescu, IP
Soil Mech & Fdn Engineering /Rom/, Natl Cncl Engineers & Technicians /Rom/  1969

Acknowledgment: Road Research Laboratory /UK/

2A 234882
XIIIth CONGRESS TOKYO 1967. QUESTION II: PLANNING OF PROJECTS-EARTHWORKS
THE FOLLOWING TOPICS WERE DISCUSSED: (1) PRELIMINARY SURVEYS FOR THE STUDY OF PROJECTS, (2) GEOMETRIC STUDIES FOR THE PROJECTS-COMPUTER PROCESSES-PLAN SURVEY-ALIGNMENT, VOLUME OF EXCAVATION-SETTING OUT; (3) SITE SAMPLING; (4) EARTHWORKS IN CONTACT WITH THE TERRAIN; THE EARTHWORKS, AND (6) SPECIAL CASES (ROADS ON SUBSOILS OF LOW BEARING CAPACITY, ROADS ON SOILS LIABLE TO LANDSLIP, SUBSIDIENCY AND SUBJECT TO BE COVERED WITH SAND, AND ROADS ON SALTY SOILS). A GENERAL REPORT BY THEIBAULT, A., IS APPENDED.

Theibault, A
Perm Intl Assoc Road Congress

Acknowledgment: Road Research Laboratory /UK/
CONSTRUCTION MATERIALS
CONTROL OF SLIDE BY VERTICAL SAND DRAINS
THE VIRGINIA HIGHWAY DEPARTMENT WAS RELOCATING AND WIDENING A HIGHWAY LOCATED IN ROUGH AND MOUNTAINOUS TERRAIN, WITH THE MOUNTAINS BEING CUT BY NUMEROUS STREAMS FORMING A NUMBER OF WATER GAPS. EXCAVATION SHOWS THAT THE ROAD PASSED THROUGH A THICK MANTLE OF TALUS, MOSTLY SANDY SOIL, AND BOULDERS. SLIDES SHOWED EVIDENCE OF DEVELOPING IN THE TALUS MATERIAL. TO STUDY THE PRESENCE OF A HORIZONTAL BED OF PLASTIC VARVED IMPERVIOUS CLAY ABOUT 35 FEET ABOVE GRADE. IT WAS FEARED THAT WATER DRAINING THROUGH THE LOOSE SAND WOULD REACH THIS BED OF CLAY, THEN FOLLOW IT AND BREAK OUT ON THE SLOPE. SAND DRAINS WERE INSTALLED IN HOPES THAT THE WATER WOULD BE CARRIED DOWN AND DISCHARGE IN THE POROUS MATERIAL AT THE BOTTOM. A WELL-DRILLING COMPANY CONTRACTED TO DRILL THE HOLES. THESE DRAINS WERE CONSTRUCTED AT LOW COST AND HAVE PERFORMED WELL FOR SEVEN YEARS. IT IS CONCLUDED THAT THESE DRAINS ARE OPERATING EFFICIENTLY AND CONTROLLING DRAINAGE PROBLEMS.

Parrott, WT  *Highway Research Board Bulletin* 1955

SUBSURFACE DRAINAGE OF HIGHWAYS AND AIRPORTS
SUBSURFACE DRAINAGE IS A METHOD OF CONTROLLING THE MOISTURE CONTENT OF SUBGRADE SOILS AND BASE COURSES FOR PAVEMENTS BY RESTRICTING THE ENTRANCE OF WATER OR PROVIDING MEANS FOR ITS ESCAPE, OR IN SPECIAL CASES, PREVENTING EXCESSIVE LOOSENESS. FACTORS TO BE CONSIDERED ARE CLIMATE, SOIL, GROUND WATER, CAPILLARITY AND PERMEABILITY, ROAD LOCATION, SURFACE DRAINAGE, SUBSURFACE DRAINS, INTERCEPTION DRAINS, WATER TABLE DRAINS, DRAINAGE OF GRANULAR BASES, ECONOMICS, UNDERDRAIN CONSTRUCTION, AND UNDERDRAIN FAILURES. BASIC PRINCIPLES OF LOCATION, DESIGN, AND CONSTRUCTION ARE PRESENTED AND THEIR APPLICATIONS ARE ILLUSTRATED.

*Highway Research Board Bulletin* 1959

ON THE FRICTION BETWEEN SANDS AND CONSTRUCTION MATERIALS

Berardi, G  *Atti Dell'Instituto Di Delle Costr* 1966

ACKNOWLEDGMENT: Applied Mechanics Review


Stacho, ZA  *Boston Society Civil Engineers Journal* 1968
CONSTRUCTION MATERIALS

2A 235644
TUNNEL SURVEY, PART II

Muller, L. Geomechanical Society Symp / Austria/ 283 pp, 1968

ACKNOWLEDGMENT: Applied Mechanics Review

2A 235777
PRINCIPLES OF SOIL MECHANICS INVOLVED IN FILL CONSTRUCTION


Palmer, LA Barber, ES Krynine, DP DISCUSSER Highway Research Board Proceedings 1937

2A 235895
DESIGN AND CONSTRUCTION OF TIE-BACK SHEET PILE WALL


O. COLMAN E Ramirez, JI Highway Focus Dec. 1970

2A 236004
PILE TESTS-ARKANSAS RIVER PROJECT

FIELD DRIVING AND LOADING TESTS WERE MADE ON A VARIETY OF PILES DRIVEN WITH DIFFERENT HAMMERS TO DEVELOP CRITERIA FOR THE DESIGN AND CONSTRUCTION OF FOLDER FOUNDATIONS IN SAND FOR LOCKS AND DAMS ON THE LOWER ARKANSAS RIVER. THE EFFECT OF JETTING ON THE CAPACITY OF A PILE WAS DETERMINED. STEEL PIPE AND H-PILES WERE INSTRUMENTED TO MEASURE STRAINS PRODUCED BY COMPRESSION AND TENSION LOADINGS TO DETERMINE THE DISTRIBUTION OF STRESS IN THE PILES. LOAD
CONSTRUCTION MATERIALS

Tests were also made on piles driven during construction of some of the locks in the lower valley. The pile tests showed that a 12-in. dia. 6-in. 50-ft. long displacement piles driven into the alluvial sands in the Arkansas River Valley have capacities in excess of 100 tons in compression, and 50 tons in tension. The pile capacity was the same regardless of hammer used to drive the pile. Compression test failure loads checked capacities calculated from the Pacific Coast Uniform Building Code and Janbu equation except for H-piles. /ASCE/


2A 236006 LATERAL LOAD TESTS ON PILES-ARKANSAS RIVER PROJECT Field lateral load tests were made on a variety of piles driven with different hammers to develop criteria for the design and construction of piles foundations in sand for locks and dams of the lower Arkansas River. The investigation included determination of the effects of pile batter, repetitive load, jetting and prejetting, and densification of the foundation soils on the flexural and lateral load-deformation behavior of individual piles. The pile tests showed that: (1) triangular distribution of modulus of horizontal subgrade reaction NH with respect to depth is a good approximation; (2) coefficient NH is dependent on the pile deflection; (3) repetitive loading increases total deflection at a given load level by about 100%; (4) for a given lateral load, fully jetted piles deflect 20% to 30% more than unjetted piles; (5) densification of the foundation sands increases NH value by about 100%; and (6) the lateral load capacity of a pile is essentially independent of the hammer used to drive the pile. /ASCE/


2A 236058 ANCHORED DIAPHRAGM WALLS IN SAND-SOME DESIGN AND CONSTRUCTION CONSIDERATIONS A method of estimating the anchor loads required to support a multi-tied continuous wall is introduced. It involves a procedure which calculates the position and magnitude of a resultant tie at any stage of excavation by treating the wall as a single tied structure. Comparison of designs carried out by the cementation method and experimental work indicate that the results obtained provide a good estimate of the horizontal forces. The results obtained by the generally used methods are also shown. The main design and stability considerations associated with trench excavation under the pile caps are described. Recommendations covering the main requirements for tremie concrete for load bearing diaphragm walls are given. Methods of estimating anchor location, overall stability and load carrying capacity with relevant safety factors are illustrated. Anchor construction stages are described together with the post driving procedures and corrosion protection normally recommended for sand anchors. Finally, the influence of prestressed tie-backs on the lateral movements and settlement of the retained soil mass is discussed. /Author/


2A 236092 THE SEISMICITY OF INDIANA AND ITS RELATION TO CIVIL ENGINEERING STRUCTURES Previous records of earthquakes are examined. Their location and year noted and discussed in relation to geologic faulting. A description of the seismic geology of the Indiana area includes consideration of the structural framework, fault systems, and the relationship between earthquakes and faults. The seismic history of the region since 1672 is described and plotted on a map. The possibility of reoccurrence of earthquakes is predicted and potential damage of highway structures is detailed. Construction plans of highway bridge structures were reviewed, and the foundation provisions and location, soil type and relative strength, and the location of the ground water table were studied. Soil conditions at 12 bridge sites were studied and areas with the largest potential earthquake damage were identified. Ground accelerations were predicted for earth of the twelve sites using acceptable seismological techniques and the values are tabulated. The need is indicated for further studies to evaluate damage by shaking as well as liquefaction at the bridge areas. Seismic building codes are discussed as are existing seismic design standards in Indiana. Lessons drawn from the San Fernando earthquake are listed. Conclusions drawn from information presented in the report draw attention to earthquakes that may be expected in the future. Recommendations are made with regard to the development of a seismic design code for Indiana.

Kovacs, WD Purdue & Ind State Hwy Comm Jhrp No. 44, Dec. 1972, 42 pp. 10 Fig. 3 Tab. Refs

2A 236541 GROUNDWATER CONTROL IN TUNNEL CONSTRUCTION Tunnel dewatering involves groundwater hydrology and soil mechanics: hydrology to understand the control of water outside the tunnel, soil mechanics to predict the effect of water entering the tunnel. After completing a geological study, the next step is to analyze what kind of aquifer to use for a given tunnel depending on the permeability thickness, storage of water, and recharge sources that are available. If ground water problems are predicted, then recommendations should include sieve analyses for pervious soils, Atterberg limits for less pervious soils, and pumping tests. The methods of predrainage are well point systems, deep wells, and ejector systems: the costs of predrainage depend on drilling costs, well completion, submersible electric pumps, electrical power, discharge system, operating costs, and maintenance costs. Sometimes compressed air is used along with predrainage methods to displace water, although some form of grouting must be utilized on the casings. The services of a skilled hydrologist, geologist, or soils engineer are recommended for any unusual conditions-settlements. Existing water supplies, shaft predrainage, etc.

Powers, JP N Am Rapid Excav & Tunneling Conf Proc Vol. 1 June 1972, pp 331-36, 7 Fig. 14 Ref

2A 236642 PERFORMANCE OF A SOFT GROUND TUNNEL ON THE WASHINGTON METRO The objectives were to determine the relationship of construction methods to settlements and to observe the pattern of soil movement around the
TUNNEL AS AN AID IN EVALUATING UNDERPINNING CRITERIA FOR NEARBY STRUCTURES. THREE LINES OF SOIL DISPLACEMENT INSTRUMENTS (INCLINOMETERS, EXTENSOMETERS, AND PIEZOMETERS) WERE PLACED THROUGH A TEST SECTION IN THE LAFAYETTE PARK TUNNEL, WASHINGTON, D. C.: INSTRUMENT MEASUREMENTS WERE COORDINATED WITH SHIELD MOVEMENTS. SOIL DISPLACEMENTS AROUND THE SHIELD, CAUSED BY SETTLEMENTS, ARE THE RESULT OF: (1) THE POLING PLATES ON THE SHIELD, (2) PLOWING AND YAWING OF THE SHIELD, (3) GRouting THROUGH THE SHIELD, (4) RIP EXPANSION, AND (5) RIB DEFLECTION.

Hanssire, WH Cording, BJ N Am Rapid Excav & Tunnelling Conf Proc Vol. 1 June 1972, pp 371-89, 13 Fig, 3 Ref


Beaulieu, AC N Am Rapid Excav & Tunnelling Conf Proc Vol. 2 June 1972, pp 933-63, 6 Fig, 8 Tab


Arthur, HG N Am Rapid Excav & Tunnelling Conf Proc Vol. 2 June 1972, pp 985 81, 6 Fig, 4 Ref

2A 236572 CONSTRUCTION DIFFICULTY INDEX FOR TUNNEL CONSTRUCTION THE PAPER REPORTS PROGRESS ON A CONTINUING STUDY BEING MADE FOR PURPOSES OF DEVELOPING RELIABLE DATA FOR PREDICTING COSTS AND PROGRESS ON FUTURE TUNNEL CONTRACTS. BASIC DATE ON THE PROGRESS PER SHIFT, HOURS MINED PER SHIFT, HOURS OF DOWNTIME PER SHIFT, CAUSE OF DOWNTIME, AND TYPE OF SOIL MINED IS REPORTED, AND AN EXAMPLE OF A WEEKLY MINING REPORT IS PRESENTED. DATA REGARDING MANPOWER AND EQUIPMENT USED DURING TUNNELLING OPERATIONS IS SUPPLIED. THE SOIL TYPE BEING MINED WAS VERIFIED BY VISUAL OBSERVATION AND COMPARED WITH DATA LISTED ON A PREVIOUSLY PREPARED SOIL PROFILE. MACHINE MINING DATA FOR FIVE CONTRACTS ARE TABULATED. INFORMATION CALLED FROM A REVIEW OF THE DATA IS PRESENTED AND INCLUDES SUCH ASPECTS AS PROGRESS RATES, RATES OF TUNNEL PROGRESS WHICH COULD BE USED FOR ESTIMATING PURPOSES, THE REMOVAL OF LARGE BouldERS, MINING MACHINES, CONTROL OF GROUNDWATER, SOIL PROFILES, AND PRECONSTRUCTION PLANNING. THE NEED IS INDICATED FOR A STANDARDIZED DATA GATHERING PROCEDURE APPLIED TO ALL TUNNEL CONSTRUCTION ON A NATIONAL BASIS AND COORDINATED BY A NATIONAL AGENCY.

Sulinski, SJ N Am Rapid Excav & Tunnelling Conf Proc Vol. 2 June 1972, pp 997 101, 12 Fig

2A 236580 THE ROMEO TUNNEIS-DETROIT, MICHIGAN-A CURRENT REPORT ON RAPID EXCAVATION IN DIFFICULT GROUND RAPID EXCAVATION IN HIGHLY VARIABLE SOIL CONDITIONS WHICH INCLUDE CLAYS RANGING FROM VERY PLASTIC TO VERY HARD, GRAVELS, SANDS, SILTS AND BOULDERS, AND IN PERMEABLE SOILS WHICH CONTAIN HIGH CONCENTRATIONS OF METHANE GAS COMPRESSED BY GROUNDWATER LEVELS SOME 40 FT. ABOVE TUNNEL INVERT IS DESCRIBED. THE PAPER DEMONSTRATES THAT CONTINUOUS RAPID EXCAVATION IN DIFFICULT GROUNDS IS LIMITED BY FACTORS OTHER THAN THE EXCAVATION PROCESS ITSELF: IN THIS PROJECT, THE ENTIRE TUNNEL WAS EXCAVATED UNDER COMPRESSED AIR AND AN EXTENSIVE DEWATERING PROGRAM WAS UNDERTAKEN TO REDUCE GROUNDWATER PRESSURES TO A LEVEL WHICH COULD BE CONTROLLED BY LOW TUNNEL AIR PRESSURE. SOLUTIONS TO THE PROBLEM OF COMPRESSED AIR LOSS AT THE HEADING ARE SUGGESTED. CONVENTIONAL 4 IN. CIRCULAR STEEL RIBS AT 4 FEET INTERVALS WITH SOLID 3 IN. THICK TIMBER LAGGING WAS USED AS TUNNEL LINING. THREE ALTERNATIVE TYPES OF MECHANICAL EXCAVATORS (CLOSED FACED ROTARY BORING MACHINE; OSCILLATING ARM OR WINDSHIELD WIPER EXCAVATOR; AND THE EXCAVATOR SHIELD) THAT COULD BE SUCCESSFULLY USED FOR THIS PROJECT ARE DESCRIBED. DETAILS ARE GIVEN OF THE EQUIPMENT ITSELF AND THE OPERATION OF THE ROBBINS EXCAVATOR SHIELD.
CONSTRUCTION MATERIALS

THE MACHINE CONSISTS OF A SHIELD ASSEMBLY FITTED WITH AN EXCAVATOR, BREASTING SYSTEM, MUCK APRON, MUCK CONVEYOR AND THRUSTING SYSTEM TUNNELING EQUIPMENT FOR WORKING IN MOST EVERY KIND OF SOIL CONDITION IMAGINABLE. TUNNELING PLANT PRODUCTION DATA ARE PRESENTED.

Taylor, TW *N Am Rapid Excav & Tunnelling Conf Proc* Vol. 2 June 1972, pp 113-24, 3 Fig

2A 236601 GROUTING COHESIONLESS WATER-BEARING SOILS IN CITY TUNNELS

EXAMPLES ARE PRESENTED OF THE USE OF GROUTING PROCESSES FOR TREATMENT OF WATER-BEARING GRANULAR SOILS AND ITS APPLICATION IN THE FIELD OF UNDERGROUND WORK PARTICULARLY IN URBAN AREAS. THE SELECTION OF THE GROUTING METHOD AND THE EXTENT OF TREATMENT REQUIRED DEPENDS ON THE NATURE AND BEHAVIOR OF THE SUBSOIL, AND WHETHER THE TREATMENT IS TO BE OF A PERMANENT OR TEMPORARY NATURE. GENERAL PRINCIPLES OF GROUTING ARE REVIEWED AND ECONOMIC DATA ARE DISCUSSED. THE USE OF A CEMENT-BASED, AERATED, EXPANSIVE MIX WITH SPECIAL CHARACTERISTICS USED TO TREAT CALCAREOUS BOULDER-MUD-STONE AND LIMESTONE IN A PARIS CONSTRUCTION PROJECT IS DESCRIBED. TREATMENT WAS PARTICULARLY DELICATE IN THE HAMBURG SUBWAY CONSTRUCTION PROJECT WHERE THE SOILS WERE SANDY AND WITH FINE AND HOMOGENEOUS GRADING, AND CONSTRUCTION TOOK PLACE AT A SHALLOW DEPTH. GROUTING WAS ESPECIALLY DIFFICULT IN UNDERGROUND CONSTRUCTION IN MUNICH WHERE THERE WERE THE NECESSITY TO AVOID HEAVING. DETAILS ARE GIVEN OF OTHER PROJECTS IN MUNICH, FRANKFURT, VENNA, MILAN, AND IN SERRORA, SPAIN. IN SOME OF THESE EXAMPLES, THE GROUTING PROCESS IS AUXILIARY TO TRADITIONAL METHODS AND IN OTHERS THEY ARE PRIMARY. IT IS STIPULATED THAT THE USE OF THE TECHNIQUE REQUIRES THE UTMOST CARE AND THE SKILL OF AN EXPERIENCED SPECIALIST CONTRACTOR.

Haffen, M Janin, J *N Am Rapid Excav & Tunnelling Conf Proc* Vol. 2 June 1972, pp 1539-68, 12 Fig, 36 Ref

2A 236637 EROSION CONTROL STRUCTURES

EROSION AND EXCESS RUNOFF ARE PRODUCTS OF MANY FACTORS: SOIL TYPE, PLANT COVER, CROPING PRACTICES, CLIMATIC ZONES, RAINFALL AMOUNTS AND INTENSITIES, AND DEGREE AND LENGTH OF SLOPE TO NAME A FEW. WATER EROSION USUALLY OCCURS AS SHEET EROSION, WHICH IS THE PERIODIC REMOVAL OF THIN SHEETS OF SOIL OVER AN AREA, OR AS GULLY EROSION THAT FORMS INCISED CHANNELS. THE END PRODUCT IS SEDIMENT. IT IS IN THE CONSTRUCTION STAGE THAT NATURAL CONDITIONS SUCH AS TOPOGRAPHY, NATURAL COVER, SOIL CONDITIONS, AND DRAINAGE PATTERNS ARE BEING DISRUPTED DUE TO MANIPULATIONS BY MAN AND MACHINES. IT SHOULD BE THE GOAL OF EACH DESIGN AND CONSTRUCTION ENGINEER TO CONTROL THESE RESULTS WITHIN REASONABLE LIMITS DURING THE CONSTRUCTION STAGE AND FINALLY TO PERMANENTLY STABILIZE THE AREA FOR CONTROL OF EROSION AND RUNOFF UPON COMPLETION OF THE JOB. THERE ARE A NUMBER OF BASIC PRINCIPLES FOR CONTROLLING RUNOFF AND EROSION THAT HAVE PROVED SOUND OVER THE YEARS FOR OTHER LAND USES AND THAT CAN PROVE TO BE JUST AS USEFUL FOR HIGHWAY CONSTRUCTION. THESE INCLUDE SUCH THINGS AS PROPER ATTENTION TO SOIL, FOUNDATION, AND TOPOGRAPHY IN SITE SELECTION, MINIMUM EXPOSURE OF BASED AREAS UNDER CONTROL OF CLEARING AND GRADING OPERATIONS, DIVERSION OF WATER AWAY FROM CRITICAL AREAS, FLATTENING SLOPES, REDUCING SLOPE LENGTHS, USE OF TEMPORARY COVER, AND CONTROL OF EQUIPMENT ACCESS AND TRAVEL WAYS. A NUMBER OF STRUCTURAL MEASURES ARE DISCUSSED THAT MAY BE USED AS EITHER TEMPORARY OR PERMANENT INSTALLATIONS. THESE INCLUDE SUCH THINGS AS GRASSES OR PAVED WATERWAYS, BURIED PIPE, OUTLETS, DIVERSION TERRACES, BENCHES, VARIOUS TYPES OF GRADE CONTROL STRUCTURES, CHUTES, INLETS, AND DEBRIS BASINS. [AUTHOR/}

Barnes, RC *Highway Research Board Special Reports* No. 135, 1973, pp 94-8, 1 Ref

2A 236639 PENNDOT'S RESPONSE TO EROSION CONTROL


Huber, HH *Highway Research Board Special Reports* No. 135, 1973, pp 123-8, 3 Fig, 1 Tab, 2 Ref

2A 236643 SOIL AS AN ENGINEERING CONSTRUCTION MATERIAL /IN JAPANESE/

BECAUSE OF THE GREAT DISTANCES AND VARIED CLIMATIC CONDITIONS, MANY SOIL TYPES OCCUR IN AUSTRALIA, AND THEIR PROPER USAGE AS CONSTRUCTION MATERIALS REQUIRES A KNOWLEDGE OF HOW TO DEAL WITH SOIL VARIABILITY. TERRAIN EVALUATION AND SOIL RECOGNITION METHODS HAVE BEEN HIGHLY DEVELOPED FOR THESE PURPOSES, AS WELL AS THE VARIOUS METHODS OF SOIL STABILIZATION. RECENTLY, NEW METHODS OF STATICAL ANALYSIS (BAYESIAN PROBABILITY) HAVE BEEN STUDIED AS A MEANS OF IMPROVING CONSTRUCTION CONTROL AND ASSISTING DESIGNERS IN THE OPTIMUM SELECTION OF MATERIALS INVOLVED IN ANY PARTICULAR SOIL CONSTRUCTION WORK. NEWLY DEVELOPED TECHNIQUES FOR THE TESTING AND EVALUATION OF SOIL AND STABILIZED SOIL FOR USE AS PAVEMENT MATERIAL, AND IN EARTH ENHANCEMENT CONSTRUCTION, ARE
CONSTRUCTION MATERIALS

2A

DESCRIBED WITH PARTICULAR REFERENCE TO CURRENT AUSTRALIAN RESEARCH, BOTH IN THE LABORATORY AND AS CONTROLLED LONG-TERM FIELD TRIALS. THE RESULTS OF THIS EXPERIENCE ARE NOW BEING INCORPORATED IN PRACTICAL CONSTRUCTION MANUALS. 

/CSIRO/

Ingles, OG

ACKNOWLEDGMENT: Commong Scient Indus Res Org /Austral/

2A 236706

OSCILLATION OF PILES-SOME MARINE EXPERIENCE

AN INNOVATION IN THE CONSTRUCTION OF CUT-OFF WALLS IS DESCRIBED. THE METHOD, CALLED "PAROI MOULEE PLASTIQUE," ITS ECONOMY IS DUE TO THE RE-USE OF ALL THE BENTONITE STABILIZING SLURRY ABOUT 150 KG OF CEMENT TYPE CL 325, AND SOME RETARDER OF THE LIGNOSULFITE TYPE. THE INVENTORS CLAIM THAT THIS TYPE OF IMPERMEABLE CUT-OFF WALL WOULD RESPOND WITH ELASTIC DEFORMATION TO EXCESSIVE STRESSES AND WOULD NOT DEVELOP CRACKS. A COMPARISON WITH HYDRATION PRODUCTS OF VARIOUS CEMENTS AND PLASTER OF PARIS INDICATED SIMILARITIES OF MICROSTRUCTURE. IT SEEMED THAT THE BENTONITE/CEMENT SLURRY PROVIDED THE PERFECT MEDIUM FOR THE GROWTH OF CALCIUM SLATE CALCIUM HYDROXIDE, WHICH APPARENTLY PREVENTS THE STACKS OF PLAT, PLATE-LIKE CLAY PARTICLES WITH WET SURFACES FROM SLIDING APART. PERHAPS THE MOST REMARKABLE FACT IS THAT THE IN SITU STRENGTH OF THE CUT-OFF WALL MATERIAL WAS UP TO 30 KG/SQ CM AT 28 DAYS.

Sainsbury, RN Mowlem, J
Ground Engineering /UK/ Vol. 6 No. 3 May 1973, pp 44-51, 2 Fig, 3 Phot

2A 236852

DESIGN CONSIDERATIONS FOR DEEP RETAINED EXCAVATIONS IN OVER-CONSOLIDATED SEATTLE CLAYS

THE HARD CLAYS FOUND IN MANY PARTS OF THE SEATTLE AREA HAVE PRESENTED MAJOR PROBLEMS TO HIGHWAY ENGINEERS IN THE LAST 10 YEARS DURING INTERSTATE FREeways, STATE HIGHWAYS AND OTHER LOCAL CONSTRUCTION PROJECTS HAVE REQUIRED DEEP EXCAVATIONS AND STRUCTURES LOCATED WITHIN THE CLAY STRATA. IT WAS THE CONSTRUCTION OF INTERSTATE 5 THROUGH DOWNTOWN SEATTLE THAT CREATED THE MOST SERIOUS PROBLEMS AND RESULTED IN A UNIQUE RETAINING WALL SYSTEM OF CALCIUM SULFATE HYDRATE, WHICH APPARENTLY PREVENTS THE STACKS OF PLAT, PLATE-LIKE CLAY PARTICLES WITH WET SURFACES FROM SLIDING APART. PERHAPS THE MOST REMARKABLE FACT IS THAT THE IN SITU STRENGTH OF THE CUT-OFF WALL MATERIAL WAS UP TO 30 KG/SQ CM AT 28 DAYS.

Strazer, RJ Wilson, SD Bestwick, LK
Workshop Proceedings Vol. 2 May 1973, pp 96-122, 12 Fig, 14 Ref

2A 236861

FOUNDAliON OF A TUNNEL BY THE SAND-FLOW SYSTEM


/TRL/

Giacobino, GP
Tunnels & Tunnelling /UK/ No. 4, pp 6 Fig

2A 237006

PATEIN METHOD OF EXCAVATING SOFT GROUND TUNNELS BY DRIVING IN A SET OF ANTI-CRUMBLING NEEDLES

THE ARTICLE DESCRIBES A METHOD FOR EXCAVATING TUNNELS IN SOFT GROUND. IT USES A SYSTEM OF TUBULAR STEEL 'NEEDLES' ABOUT 2.50 M LONG DRIVEN INTO THE GROUND FOR STRENGTHENING PURPOSES. THE 'NEEDLES' ARE POSITIONED USING A CENTERING MEMBER. FURTHER STRENGTHENING MAY BE OBTAINED BY INJECTING THROUGH THE NEEDLES LIQUID CEMENT OR BENTONITE, WHICH WILL BE ABSORBED BY THE SURROUNDING SOIL.

/TRL/

Giacobino, GP
Tunnels & Tunnelling /UK/ No. 4, 3 pp, 6 Fig

2A 237037

TUNNELS FOR ROADS AND MOTORWAYS

THE PAPER USES THREE EXAMPLES OF ROAD TUNNEL CONSTRUCTION IN BRITAIN TO SHOW HOW WIDE VARIATIONS IN TUNNELING COST DEPEND UPON GROUND CONDITIONS. THE EXAMPLES USED ARE THE GREAT CHARLES STREET TUNNEL, BIRMINGHAM, THE HEATHROW AIRPORT CARGO TUNNEL AND THE CLYDE TUNNEL. THE PRINCIPLES TO BE CONSIDERED IN TUNNEL PLANNING AND CONSTRUCTION ARE OUTLINED IN ORDER TO OBTAIN THE MOST SATISFACTORY SOLUTION FOR THE LEAST COST. THE RELATIVE COSTS OF BORED TUNNELS COMPARED WITH THOSE OF CUT-AND-COVER METHODS OF CONSTRUCTION ARE BRIEFLY MENTIONED.

Wood, AM
Quarterly J of Engineering /UK/ Vol. 5 No. 1, 1972, pp 111-26, 4 Fig, 3 Tab, 20 Ref

2A 237097

CONSIDERATIONS ON AN EXPERIMENTAL EMBANKMENT CONSTRUCTED ON COMPRESSIBLE SOIL

A PROPOSED NAPLES MOTORWAY BYPASS WOULD INVOLVE ROAD CONSTRUCTION ON THE RIVER SARNO PLAINS, AN INTENSIVELY CULTIVATED AND IRRIGATED AREA WITH A LARGELY ORGANIC AND THEREFORE COMPRESSIBLE SUB-SOIL. THIS ARTICLE DESCRIBES THE CONSTRUCTION OF A FULL SCALE EXPERIMENTAL ROAD EMBANKMENT ON THIS TERRAIN AND THE FIELD TESTS CARRIED OUT TO MEASURE ITS COMPRESSIBILITY AND FORECAST SETTLEMENT. THE RESULTS OF THE EXPERIMENT FAVOR A VIADUCT SOLUTION FOR THIS BYPASS.

/TRL/

Manacorda, A Oliva, N Autostrade /Italy/ Vol. 14 No. 8, Aug. 1972, pp 4-15, 8 Fig, 2 Tab, 3 Phot

2A 237186

PREVENTIVE MEASURES TO REDUCE FROST ACTION ON HIGHWAYS IN FINLAND-AND DISCUSSION

THE REPORT DESCRIBES THE METHODS USED TO DIMINISH OR PREVENT THE DETRIMENTAL EFFECTS OF FROST IN FINLAND. THE LEVELING OF THE NON-UNIFORM FROST HEAVING CAME ABOUT BY USING WEDGES ON THE BORDER OF ROCK CUTS, WHERE EMBANKMENTS AND CUTS MEET, WHERE SOIL CHANGES, AND BETWEEN BOTH SIDES OF CULVERTS. PREVENTION OR REDUCTION OF FROST HEAVING WAS BROUGHT ABOUT BY REPLACING THE FROST-SENSITIVE SOIL WITH NON-FROST-SENSITIVE SOIL OR INCREASE-
CONSTRUCTION MATERIALS

IN THE EMBANKMENT ON FRIST-SUSCEPTIBLE SOIL, ABSORPTION OF THE GROUNDWATER TABLE INTO THE BASE COURSE WAS PREVENTED BY USING AN INSULATING COURSE, LOWERING THE GROUNDWATER TABLE DEEP DRAINAGE, DITCHING OF THE ROAD OR BY CHEMICAL STABILIZATION. VERTICAL DRAIN WITH GRAVEL FILL HAS ALSO BEEN USED TO REDUCE THE SUCTION OF WATER INTO THE BORDER ZONE OF FREEZING AND TO EVAPORATE WATER FROM THE BASE AND SUBBASE COURSE. THIS REPORT ALSO DESCRIBES SOME ASPECTS TO BE CONSIDERED IN THE CONSTRUCTION OF FROST-RESISTANT ROADS. /AUTHOR/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 237278

PRINCIPLES OF GEOCRYOLOGY (PERMAFROST STUDIES)

PART 2. ENGINEERING GEOCRYOLOGY, CHAPTER 10, USE OF ICE, SNOW AND FROZEN SOIL IN ENGINEERING STRUCTURES

THIS TRANSLATION IS THE ELEVENTH FROM THE SOVIET PERMAFROST PUBLICATION PRINCIPLES OF GEOCRYOLOGY, PART II. THIS TRANSLATION OF CHAPTER 10 REVIEWS THE USE OF ICE, SNOW AND FROZEN SOIL AS CONSTRUCTION MATERIALS IN PERMAFROST REGIONS. THE DESIGN AND CONSTRUCTION OF ENGINEERING STRUCTURES OF SNOW, ICE AND FROZEN SOIL ARE DESCRIBED. THE CHAPTER CONCLUDES WITH A DISCUSSION OF THE CONSTRUCTION AND OPERATION OF ICE-WALLED STOREHOUSES. /CRGB/


ACKNOWLEDGMENT: Canadian Good Roads Association AD 652 774. 3C6401330

2A 237351

INFLUENCE OF THE FROST ACTION OF THE HIGHWAY PAVEMENTS RESISTANCE

OBSERVATIONS AND INVESTIGATIONS ON THE INFLUENCE OF FROST ACTION ON HIGHWAY PAVEMENT RESISTANCE ARE PRESENTED. TYPICAL FROST FAILURES OCCUR ON PAVEMENTS ALREADY IMPAIRED BY FATIGUE AND ARE THEREFORE A SECONDARY PHENOMENA. THE CRACKS ARE DUE TO FATIGUE IN THE ASPHALT SURFACE. DEEPER COMPACTED, MULTI-LAYER ROAD SYSTEMS ARE RECOMMENDED FOR FROST RESISTANCE.

Tuinein, OA Jumikis, AR Gray, H Highway Research Record, Hwy Res Board 1963

2A 237460

FREEZING AND THAWING TESTS OF MASONRY AND EXPOSED AGGREGATE CONCRETE PANELS

KNOWLEDGE CONCERNING DURABILITY OF BRICK MASONRY AND EXPOSED AGGREGATE CONCRETE WAS REQUIRED TO DETERMINE SUITABILITY OF MATERIALS FOR TUNNEL PORTAL STRUCTURES LOCATED HIGH IN THE MOUNTAIN REGIONS. THESE PANELS REMAINED IN AN ICY CONDITION. ONE BRICK MASONRY PANEL DEVELOPED RANDOM CRACKS AT 380 CYCLES, APPARENTLY CAUSED BY ABSORPTION CHARACTERISTICS OF THE BRICK. /AUTHOR/

Porter, LC Bureau of Reclamation /US/ Nov. 1967

2A 237471

HIGHWAY DESIGN AND CONSTRUCTION PROBLEMS ASSOCIATED WITH THE LOESSIAL SOILS OF WEST TENNESSEE

THE INTERSTATE HIGHWAY PROGRAM CAUSED TENNESSEE TO BECOME CONCERNED ABOUT THE DESIGN AND CONSTRUCTION OF ROADWAYS IN THE LOESS BELT. THE MOISTURE ACCUMULATION AFFECTS THE PRIMARY FACTOR AFFECTING THE STABILITY OF ROADWAYS CONSTRUCTED IN THE LOESS BELT. SUBGRADE TREATMENT WAS MENDED FOR FLEXIBLE PAVEMENTS IN THIS AREA. IF RIGID PAVEMENTS ARE DESIRED, A SOIL-CEMENT BASE IS RECOMMENDED. RIGID PAVEMENTS GENERALLY ARE MUCH MORE SATISFACTORY THAN FLEXIBLE PAVEMENTS WHERE THE DESIGN IS BASED ON COMPARABLE LOAD REQUIREMENTS. THE IMPORTANCE IS RECOGNIZED OF A APPROPRIATE BASE AND PAVEMENT THICKNESSES AND PROPER DRAINAGE. RIGID CONTROLS MUST BE EXERCISED IN THE CONSTRUCTION OF LOESS EMBANKMENTS. PERMEABILITY AND CBR TESTS HAVE PROVEN THAT LOESS, WHEN COMPACTED TO ITS MAXIMUM DENSITY AT OPTIMUM MOISTURE CONTENT, IS ESSENTIALLY IMPERVIOUS. SIDE SLOPES FOR FILLS ARE PRESENTLY CONSTRUCTED ON A 2:1 RATIO. WHATEVER THE SLOPE DESIGN CHOSEN, SURFACE DRAINAGE MUST BE CONTROLLED AT ALL TIMES. SIDE DITCHES SHOULD BE FLAT-BOTTOMED AND, DEPENDING ON THE GRADIENT, SHOULD BE PAVED, SODDED OR SEEDED.

Royster, DL Rowan, WH Highway Research Record, Hwy Res Board 1968

2A 237476

EFFECT OF INORGANIC CHEMICALS ON THE CONSISTENCY PROPERTIES OF AN EXPANSIVE SOIL SAMPLE

CONSISTENCY PROPERTIES OF A SOIL TO A CERTAIN EXTENT INDICATE THE BEHAVIOR OF THE SOIL FOR ENGINEERING CONSTRUCTION. THE RESULTS ARE REPORTED OF THE EFFECT OF 20 INORGANIC CHEMICALS IN VARYING AMOUNTS ON THE CONSISTENCY PROPERTIES OF AN EXPANSIVE SOIL SAMPLE FROM POONA. CERTAIN SOLUBLE AND INSOLUBLE HYDROXIDES MAKE THE SOIL FRIABLE. POTASSIUM CHLORIDE, SODIUM CHLORIDE AND AMMONIUM HYDROXIDE ARE ALSO FOUND EFFECTIVE IN IMPROVING THE SHRINKAGE CHARACTERISTIC OF THE SOIL. FERROUS CHLORIDE AND AMMONIUM HYPOPHOSPHATE MAKE THE SOIL MASS POROUS. /AUTHOR/


2A 237515

ENVIRONMENTAL FACTORS EXCEPT FROST

THESE REFERENCES ON ENVIRONMENTAL FACTORS, EXCEPT FROST, INCLUDE SELECTIONS ON SOIL, MOISTURE AND EVAPORATION. SOIL-MOISTURE THEORY, MOISTURE MOVEMENT IN SOIL DUE TO A TEMPERATURE GRADIENT, EFFECT OF SURFACE COVER ON SOIL MOISTURE LOSSES BY EVAPORATION, DIRECTION OF MOISTURE IN SOILS, SOIL TEMPERA-
The increases in traffic and wheel loadings on highways have made it necessary to consider frost conditions in greater detail in pavement design. This paper describes criteria formulated by the Corps of Engineers to meet the needs of its construction in areas of seasonal frost. The variation of subgrade strength through the seasons is illustrated, and it is indicated that the frost-melting period is critical when conditions are conducive to active frost action. Methods for recognition of conditions of soil, temperature, and moisture which result in detrimental frost action are described. Base composition requirements are given. Load design charts for airfield and highway flexible pavements for various types of loadings are presented. Load-design criteria for rigid pavements are also given. The application of these methods is illustrated by means of design examples. Needed studies to further improve the present design criteria are discussed. [Author]

Lindel, KA Highway Research Board Bulletin 1953

2A 237524

EFFECT OF CLIMATIC FACTORS ON SUBGRADE MOISTURE CONDITIONS

Research was conducted upon subgrade moisture conditions to extend existing knowledge to a wider range of climates. Measurements made under several road and airfield pavements in both tropical and semi-tropical countries are considered. The main factor in determining the moisture condition of the subgrade, irrespective of climate, is the closeness of the water-table to the surface. Where the water-table is deeper, or non-existent, the relation between the subgrade moisture condition and the climatic water balance is examined, and evidence is presented for a relation between the section of soil moisture in the subgrade and the thornthwaite moisture index. The main factors determining moisture in the subgrade are temperature, rainfall, and evapotranspiration, and it is suggested that a climatic classification, based on the moisture balance, may be useful in connection with estimating the probable moisture conditions in road subgrades and in the assessment of the performance of road-making materials in areas with differing climates.

Russon, K Coleman, JD Geotechnique /UK/ Mar. 1961

2A 237526

FROST ACTION

These references on frost action include selections on loss of pavement supporting capacity due to frost, frost action in soils, freezing and thawing of soils as factors in the destruction of highway pavements, soil-moisture conditions and phenomena in frozen soils, mechanics of frost research, thermal properties of soils, soil temperatures and factors influencing it, calculation of depth of freezing and thawing under pavements, strength of permanently frozen soils, permafrost and related engineering problems, dam construction in permafrost areas, and use of aerial photographs in northern areas.

Highway Research Information Service July 1970

2A 237540

FROST DESIGN CRITERIA FOR PAVEMENTS

The increases in traffic and wheel loadings on airfield and highway pavements in the past 10 to 15 years, the rising costs of pavement construction, maintenance, and repair, the greater need for maintaining pavements in fully serviceable condition at all times, and the increasing of operating speeds have made it necessary to consider frost action in greater detail in pavement design. This paper describes criteria formulated by the Corps of Engineers to meet the needs of its construction in areas of seasonal frost. The variation of subgrade strength through the seasons is illustrated, and it is indicated that the frost-melting period is critical when conditions are conducive to active frost action. Methods for recognition of conditions of soil, temperature, and moisture which result in detrimental frost action are described. Base composition requirements are given. Load design charts for airfield and highway flexible pavements for various types of loadings are presented. Load-design criteria for rigid pavements are also given. The application of these methods is illustrated by means of design examples. Needed studies to further improve the present design criteria are discussed. [Author]

Lindel, KA Highway Research Board Bulletin 1953

2A 237548

PLASTIC SOIL CEMENT

Results of freezing and thawing, wetting and drying, and shrinkage tests, are shown on the soil cement mixture used in road construction.

Nagano, R Wada, H Nakano, K Chemical Abstracts Semento Givutsu Nempo /Japan/ 1962

Acknowledgment: Portland Cement Association

2A 237550

EXPANDED POLYSTYRENE AND THE IMPROVEMENT OF ROADS (FRENCH)

To reduce the cost of road construction and avoid using gravel to replace frost-susceptible materials such as loam, clay or marl, research workers at B.A.S.F. have developed elastified styropor plates. These plates made from pre-foamed or elastified styropor are laid on the subgrade on layers of stone and are covered first with sand, then with sets, bitumen or concrete surfacing. New types of surfacing with a heat-resistant acrylic polyethylene-linenester-bitumen base will not soften even in extreme heat. /LCPA(A)/RRL/

Modern Plastics, Paris /Fr/ May 1967

Acknowledgment: Road Research Laboratory /UK/

2A 237555

OBSERVATIONS ON FREEZING AND THAWING OF SOIL CLEARED OF SNOW IN FINLAND IN 1958-1964

Computer processing of results obtained from 110 frost penetration meters located throughout Finland has yielded information on the following questions: /1/ The relationship between freezing index and frost penetration, and between freezing index and thawing, /2/ Freezing of the soil and thawing in various parts of the country and for winters and varying intensity, /3/ The relationship between freezing index and frost penetration in different soils, and /4/ The length of the freezing and thawing periods in various parts of the country, with particular consideration of problems encountered in road construction. /RRL/

Soveri, U Johansson, S State Inst Technical Research /Finland/ 1966

Acknowledgment: Road Research Laboratory /UK/

2A 237562

INSULATED HIGHWAY CROSSES FINNISH SWAMPS

Concrete, rock and thick glass wool plates will carry a superhighway across the weak soil and swamps along the southern coastline of Finland.
THE NEW ROAD WILL BE AN EXTENSION OF THE FOUR-LANE HIGHWAY LEADING SOUTH FROM HELSINKI. DETAILS OF THE SOIL CONDITIONS, FOUNDATION LAYER, AND ROAD DECK ARE GIVEN. /RRL/

Engineering Construction World /Neth/ Aug. 1967

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 237574
FROST AND FOUNDATIONS (IN GERMAN)
ROCKS, LOOSE SOIL AND VOLCANIC ASH ARE DISCUSSED AS FOUNDATION CONSTRUCTION MATERIALS AND THE EFFECT OF TEMPERATURE CHANGES, WIND AND FROST ON FOUNDATIONS AND STRUCTURES. THE ROCKS ARE CHARACTERIZED ACCORDING TO THEIR BEHAVIOUR UNDER THE ACTION OF FROST. PARTICULAR MENTION IS MADE OF THE ADVERSE EFFECT OF FROST AND THAWING ON ROAD FOUNDATIONS AND THE BEARING CAPACITY OF ROADS. FINALLY, METHODS OF TESTING THE FROST RESISTANCE OF MATERIALS AND FIGHTING FROST EFFECTS IN FOUNDATIONS ARE DESCRIBED. /FG/RRL/

Flenzy, E Revue Gen Des Routes & Aerodr /France/ Mar. 1968

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 237605
ELECTRIC ANALOGUE TEST ON HEAT INSULATION COURSES IN ROADS (IN GERMAN)
ELECTRIC ANALOGUE TESTS TO CLARIFY THE THERMODYNAMIC BEHAVIOR OF ROADS HAVING HEAT INSULATION COURSES TO AVOID FROST DAMAGE ARE DESCRIBED. THE INSULATING COURSE IN THE TEST ROAD LAY DIRECTLY BENEATH THE BITUMINOUS PAVEMENT. FIRST RESULTS OF THE TESTS SHOW THAT THE FUNCTIONAL RELATION BETWEEN THE DESIGN AND EFFECTIVENESS UNDER VARIOUS OUTSIDE CONDITIONS CAN BE DETERMINED WITHOUT DIFFICULTY IF THE TEMPERATURE AND HEAT CONDUCTION VALUES OF THE CONSTRUCTION MATERIALS AND SOILS ARE KNOWN. FURTHER WORK IS TO BE CENTERED ON THE DETERMINATION OF CONSTANT VALUES. /FG/RRL/

Behr, H Strasse Und Autobahn /Germany/ 1969

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

2A 237635
BARK AS FILLER-AND LIGHT FILL MATERIAL IN ROAD EMBANKMENTS (IN NORWEGIAN)
BARK WAS USED AS CONSTRUCTION MATERIAL ON A NEW MOTORWAY AT VINTERBRU NEAR OSLO. THE PROBLEM OF OBTAINING BARK IN SUFFICIENT QUANTITIES DURING THE CONSTRUCTION PERIOD IS DISCUSSED. THE EFFICIENCY OF DIFFERENT TYPES OF CONSTRUCTION MACHINERY IN HANDLING THE BARK BOTH REGARDING VOLUME CAPACITIES AND TRACTION CONDITIONS DURING THE LOADING, HAULING AND UNLOADING STAGES IS THEN MENTIONED. METHODS EMPLOYED IN PLACING AND COMPACTING THE BARK ARE DESCRIBED. IMPROVED LOAD SPREADING EFFECT IS OBTAINED BY A 20-40 CM LAYER OF BARK ON SOFT MATERIALS WITH LOW BEARING CAPACITY. FURTHER RESEARCH IS NEEDED ON THE USE OF BARK IN ROAD CONSTRUCTION, BUT EXPERIENCE INDICATES THAT IT CAN BE EASILY HANDLED EVEN IN WET CONDITIONS DURING RAINY PERIODS BY ORDINARY CONSTRUCTION MACHINERY. /SVV/RRL/

Klem, I H Klem, G S Teknisk Ukeblad, Oslo /Norway/ Feb. 1970

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 237771
ORGANIC CATIONIC CHEMICALS AS STABILIZING AGENTS FOR IOWA LOESS
THIS PAPER PRESENTS THE RESULTS OF PRELIMINARY EVALUATION STUDIES OF A NUMBER OF ORGANIC CATIONIC CHEMICALS AS STABILIZING AGENTS FOR IOWA LOESS. THE LOESS RANGES TEXTURALLY FROM SILTY LOAM TO SILTY CLAY. THE MATERIALS ARE FOUND IN THE SOUTHERN PART OF IOWA. THE CHEMICALS WERE USED FOR RATING THE CHEMICALS. IN THIS TEST, THE PRINCIPAL CRITERIA OF STABILITY ARE COMRESSIVE STRENGTH, MOISTURE ABSORPTION, AND SWELLING AFTER 24 HOURS IMMERSION IN WATER. THE EFFECTS OF THE CHEMICALS ON AIR-DRY STRENGTH AND SHRINKAGE DURING AIR DRYING ARE ALSO CONSIDERED IN EVALUATING THE BENEFITS TO STABILITY. THROUGH OF A PRELIMINARY NATURE, THE INVESTIGATION DEMONSTRATES THE SUPERIORITY OF SEVERAL OF THE NINETEEN CATIONIC CHEMICALS USED. CHEMICALS DESIGNATED BY THE TRADE NAMES AROQUAD 2HT, AROQUAD 2S, ARMEE RESIDUE, ARMAC T, CRUDE AMINE, AND ARMEEN RESIDUE AROQUAD, ARE CONSIDERED PARTICULARLY WORTHY OF FURTHER STUDY. THESE CHEMICALS IN AMOUNTS RANGING FROM 0.08 TO LESS THAN 1.0 PERCENT BY DRY WEIGHT OF THE SOIL, SUBSTANTIALLY IMPROVE THE STABILITY OF LOESS. USED IN SUCH AMOUNTS, THE COST OF THE CHEMICALS PER SQUARE YARD OF BASE COURSE SIX INCHES THICK RANGES FROM ABOUT $0.14 TO $1.13, WHICH IS ECONOMICALLY FEASIBLE FOR HIGHWAY CONSTRUCTION. IT IS BELIEVED THAT CONVENTIONAL HIGHWAY CONSTRUCTION EQUIPMENT AND PROCEDURES COULD BE EXPENDED FOR PROCESSING OF SOILS WITH ORGANIC CATIONIC CHEMICALS. THE MOST PRACTICAL METHOD OF APPLYING THE CHEMICALS TO THE SOIL IS AS SOLUTIONS OR DISPERSIONS IN WATER, AND A SOLUTION OR DISPERSION WOULD BE ADDED TO THE SOIL IN THE AMOUNT NECESSARY FOR COMPACTION TO NEAR STANDARD PROCTOR DENSITY. IN THE CONCENTRATIONS USED, THE VISCOSITY OF THE SOLUTION OR DISPERSION IS LOW ENOUGH TO PERMIT SPRAYING. FIELD EXPERIMENTATION WILL BE NEECARY TO EVALUATE MORE FULLY THE EFFECTIVENESS OF THE CHEMICALS. /AUTHOR/

Hoover, JM Davidson, DT Highway Research Board Bulletin 1956

2A 237738
DIGITAL SOLUTION OF MODIFIED BERGEREN EQUATION TO CALCULATE DEPTHS OF FREEZE OR THAW IN MULTILAYERED SYSTEMS
A METHOD IS PRESENTED FOR A DIGITAL COMPUTER SOLUTION USING THE FORTRAN LANGUAGE, OF THE MODIFIED BERGEREN EQUATION FOR COMPUTING DEPTHS OF FROST AND THAW PENETRATION IN NON-HOMOGENEOUS (MULTILAYERED) SOIL SYSTEMS. A PROGRAM SOURCE LISTING, SAMPLE SOLUTIONS, AND TABLES OF THERMAL PROPERTIES SOILS AND CONSTRUCTION MATERIALS ARE PRESENTED. /AUTHOR/

Aitken, GW Berg, RL Crrel Special Reports, Army Dept /US/ Oct. 1968

ACKNOWLEDGMENT: Road Research Laboratory /UK/

2A 237776
PROBLEMS OF FROZEN SOIL MECHANICS IN ENGINEERING PRACTICE
MORE THAN A QUARTER OF THE WORLD'S LAND AND ABOUT 47 PERCENT OF THE USSR TERRITORY ARE COVERED BY PERMANENTLY FROZEN SOILS. THE DEFORMATIONS OF STRUCTURES BUILT ON PERMANENTLY FROZEN SOILS ARE DUE TO THEIR SETTLING AT UNPROPORTIONAL THAWING AND THE HEAVING OF SOILS AND FOUNDATIONS AT FREEZING. THE MOST IMPORTANT PARAMETERS OF FROZEN SOILS
CONSTRUCTION MATERIALS

ARE: (1) SHEARING STRENGTH, AS THE INITIAL VALUE FOR LIMIT LOAD AND DEFORMATION MODULUS OF FROZEN SOILS DETERMINATION, WHEN THEY ARE CONSIDERED AS FOUNDATIONS, (2) CONTINUOUS STRENGTH AND DEFORMATION MODULUS OF FROZEN SOILS AS CONSTRUCTIONS MATERIALS, AND (3) HEATING FORCES, CONGLOMATION STRENGTH, SOLIDITY COEFFICIENTS OF FROZEN SOILS AS A MEDIUM FOR CONSTRUCTION. FIGURES PRESENT THE RESULTS OF EXPERIMENTAL INVESTIGATIONS OF FROZEN SOIL MECHANICS: (1) THE PRINCIPLE OF DYNAMIC BALANCE OF WATER AND ICE IN FROZEN SOILS, (2) THE CONDITIONS OF WATER MIGRATION IN FREEZING AND FROZEN SOILS, (3) DEPENDENCE OF FROZEN SOILS STRENGTH ON THEIR COMPOSITION, TEMPERATURE AND STRUCTURE, (4) DECREASE OF FROZEN SOIL STRENGTH TO EXTERNAL FORCES WITH TIME DUE TO THE RELAXATION OF STRESSES, (5) THE CONDITIONS OF FROZEN SOIL DENSIFICATION AND THE BEGINNING OF PLASTIC FLOW, (6) THE DEPENDENCE OF FROZEN SOIL SETTLEMENT AT THAWING ON THE VALUE OF EXTERNAL PRESSURE, AND (7) THE BREAKING OF STRUCTURAL BONDS IN FREEZING-THAWING CYCLES. SOME GENERAL SOLUTIONS ARE PRESENTED OF ENGINEERING PROBLEMS CONCERNING THE MECHANICS OF FROZEN SOILS INCLUDING THE CALCULATIONS OF FOUNDATIONS WITH PRESERVATION OF PERMAFROST ACCORDING TO THE CONSTRUCTIVE METHOD, TAKING INTO ACCOUNT THE THAWING SETTLEMENTS, AND BY THE METHOD OF PRECONSTRUCTION THAWING.

Tsytoishvili, NA  
Highway Research Board Special Reports 1960

2A 237790  
SHRINKAGE AND SWELL PROPERTIES OF LIME-SOIL MIXTURES  
The engineering properties of fine-grained soils can be improved by the addition of small amounts of lime. Plasticity is reduced, workability improved, shrinkage decreased, and with reactive soils substantial strength increases are obtained. In a reactive soil, the strength increase is due to a pozzolanic reaction whereby lime reacts with the soil silica and/or alumina to form various cementing agents. The agents which develop substantial strength increases are normally termed 'lime reactive.' Some of the stabilized materials used in highway construction are adversely affected by volume changes which result from moisture induced shrinkage and swell. Alternate cycles of shrinkage and swell can cause cracks which will reduce the structural integrity and load carrying capacity of a stabilized soil layer. The purpose of this study was to evaluate the shrinkage and swell properties of compacted lime-soil mixtures and to determine if these properties would restrict the application of these materials for highway construction. [Author/]

Dempsey, BJ  
Thompson, MR  
Ill Univ Hwy Res Lab Civil Eng Studies  
Clearinghouse Fed Sci & Tech Info 1969

PB 183 906, IP6420642

2A 237864  
CONTROLLING THE EFFECTS OF FROST ACTION IN MICHIGAN  
EARLY EFFORTS OF FROST-ACTION CONTROL IN MICHIGAN CONSISTED OF EXCAVATING SILT WHERE IT OCCURRED IN THE SUBGRADE WITHIN FROST RANGE. THE EFFECT OF FROST ACTION ON HIGHWAY PAVEMENTS IS CONTROLLED BY SELECTING CONSTRUCTION MATERIALS LEAST AFFECTED BY FREEZING AND THAWING. THE AMOUNT AND QUALITY OF CLAY BINDER TO USE IN STABILIZED GRAVEL AND THE CHARACTER OF AGGREGATES TO BE USED IN BITUMINOUS AND PORTLAND-CEMENT CONCRETES ARE STUDIED CAREFULLY IN AN ATTEMPT TO KEEP THE DESTRUCTIVE EFFECT OF FROST ACTION TO A MINIMUM. SOIL MATERIALS CAPABLE OF CAUSING FROST HEAVING OF SUFFICIENT MAGNITUDE TO BE DESTRUCTIVE OF PAVEMENTS AND DANGEROUS TO TRAFFIC ARE REMOVED FROM THE HIGHWAY SUBGRADE. FROST-HEAVE EXCAVATIONS ARE BACKFILLED WITH SOIL MATERIALS SIMILAR TO THE MATERIAL SURROUNDING THE FROST HEAVE POCKET. DRAINAGE IS CAREFULLY WATCHED BECAUSE POOR DRAINAGE MAY ALSO BE THE CAUSE OF FROST HEAVING. SPRING BREAKUP IS MOST COMMONLY EXPERIENCED ON FLEXIBLE LAND-ACCESS ROADS. AN ADEQUATE GRANULAR SUBBASE IS THE MOST EFFECTIVE MEANS FOR CONTROLLING SPRING BREAKUP.

Stokstad, OL  
Highway Research Board Special Reports 1952

2A 237919  
GROUND FREEZING, CENTURY-OLD, GETS SPACE-AGE APPLICATIONS  
The process of ground freezing is being applied in stabilizing soils in construction sites from the Alaskan permafrost to the summer baked valley of Phoenix, Arizona. The refrigeration rigs which make all this possible range from a multi-ton behemoth on wheels to a specially designed plant that fits snugly into a cargo airliner and can then be transported to its final destination by helicopter. Unstable ground is frozen with a series of brine-bearing dual pipes inserted at necessary intervals. The brine is generally circulated through the system at 8 to 10 degrees. Various applications are reported, including freezing the ground on either side of the cut for Interstate 94's tunnel in Minneapolis.

Norland, J  
Air Conditioning, Heating & Refrig News Sept. 1970

2A 237951  
THERMAL CONDUCTIVITY OF SOME HIGHWAY CONSTRUCTION MATERIALS. PART I: THE ROLE OF THE THERMAL CONDUCTIVITY IN THE FROST PROBLEM /AN NORWEGIAN/

HAVING ILLUSTRATED A SIMPLIFIED METHOD FOR COMPUTING THE FROST PENETRATION IN A HOMOGENOUS MATERIAL (STEFAN'S EQUATION), WATZINGER'S EQUATION IS USED FOR COMPUTING THE FROST RESISTANCE OF A COMBINED LAYERED SYSTEM. BY MEANS OF THIS EQUATION THE EFFECT ON FROST PROTECTION BY VARIATION IN MOISTURE CONTENT IN DIFFERENT COMBINATIONS OF MATERIALS HAS BEEN INVESTIGATED, FURTHER MORE A DISCUSSION OF THE POSSIBILITY OF FINDING COMBINATIONS OF MATERIALS WITH NEXT TO CONSTANT FROST RESISTANCE AT FLUCTUATING MOISTURE CONTENTS IS GIVEN. THE SIGNIFICANCE OF A BETTER KNOWLEDGE OF THE AMOUNT OF HEAT SUPPLIED BY THE SUBSOIL IS STRESSED.

/PER/

Johansen, O  
Royal Norwegian Council Sci & Indus Res, Public Roads Administration /Norway/

2A 237980  
FROST INVESTIGATIONS AT DOW FIELD, BANGOR, ME.  
AN INVESTIGATION WAS MADE TO DETERMINE THE EFFECT OF FROST ACTION IN SUBGRADE SOIL BENEATH THREE PAVED AREAS UPON THE LOAD SUPPORTING CAPACITY OF THE PAVEMENTS. THREE DIFFERENT PAVEMENT CONSTRUCTIONS WERE TESTED AS TO: (1) PAVEMENT BASE, AND SUBGRADE CONDITIONS; (2) PAVEMENT HEAVING AND ICE LENS FORMATION IN THE SUBGRADE; (3) PERFORMANCE UNDER
WHEEL LOADS OF FROM 10,000 TO 40,000 LB; (4) FIELD CBR TESTS ON SUBGRADE SOILS AND FIELD BEARING TESTS. THE INVESTIGATION INDICATES THE NECESSITY FOR CONSIDERING THE EFFECTS OF FROST ACTION IN SUBGRADES UPON THE PLANE SUPPORTING CAPACITY OF PAVEMENTS. /AUTHOR/

Shannon, WL. *Highway Research Board Proceedings* 1944

**2A 237993**

SILICIC CHEMISTRY IN HIGHWAY RESEARCH

THE COLLOID CHEMISTRY OF SILICON, OR SILICIC CHEMISTRY, IS THE CHEMISTRY OF SILICEOUS MATTER CHARACTERIZED BY A PREPONDERANCE OF SURFACE OVER TOTAL VOLUME. THIS RESULT IN STRUCTURES CHARACTERIZED BY AN UNBALANCED DISTRIBUTION OF ELECTRIC CHANGES, WHICH EXPLAINS THEIR REACTIVITY AS COMPARED TO THAT EXHIBITED BY THE SAME CHEMICAL COMPOUND IN PRESENT IN A COARSER STATE OF SUBDIVISION THAN THAT WHICH HAS BEEN TERMED THE COLLOIDAL RANGE OF DIMENSIONS. THE COLLOID CHEMISTRY OF SILICEOUS MATTER IS APPLIED TO HIGHWAY CONSTRUCTION AND SOIL STABILIZATION. COLLOID CHEMISTRY IS EQUALLY APPLICABLE TO ORGANIC COLLOIDS. /AUTHOR/

Hauser, EA. *Highway Research Board Proceedings* 1947

**2A 237990**

PRESENT ATTEMPTS AT SOLVING THE PROBLEM OF FROST IN ROAD CONSTRUCTION

THE MECHANISM OF ICE FORMATION IN SOIL AND THE DAMAGE OCCURRING DURING THE THAWING PROCESS ARE EXPLAINED. THE VARIOUS FROST CRITERIA ARE CRITICALLY DISCUSSED, AND HYDROLOGICAL VIEWPOINTS INTRODUCED. IN COMBINATION WITH THE HEIGHT OF CAPILLARY RISE, THE DETERMINATION OF WHICH CAN BE MADE BY PERMEABILITY MEASUREMENT, IT IS POSSIBLE TO REPLACE THE CONCEPT OF "FROST-RESISTANT MATERIAL" BY THE "FROST-RESISTANT STATE" CONCEPT OF A STRUCTURE, TAKING ACCOUNT OF ENVIRONMENTAL INFLUENCES. IT IS PROPOSED THAT IN FUTURE MORE ATTENTION SHOULD BE PAID TO THE THERMAL PROPERTIES OF THE LAYERS, AND THAT ROADBASES (OR HEAT INSULATING COURSES) SHOULD BE BUILT WHICH, APART FROM ADEQUATE BEARING CAPACITY, HAVE A LOW HEAT CONDUCTIVITY. PROPSALS (PLASTIC MATERIAL, BITUMEN-COATING, LIGHTWEIGHT AGGREGATE) ARE COMPARED FOR THEIR SUITABILITY FOR CONSTRUCTION. /AUTHOR/

Gragger, F. *Straassen Und Tiegebau* /Germany/ 1970

**2A 238066**

HIGHWAY CONSTRUCTION ON SOILS OF THE TYPE "MASSAPE" /IN PORTUGUESE/

SPECIFIC METHODS OF PAVING IN THE RECONCAYO BAHIANO ARE DISCUSSED WITH REGARD TO THE SOIL PROPERTIES THERE. SPECIFIC STUDIES OF SOILS AND ECONOMIC SOLUTIONS FOR THE PAVEMENTS ARE PRESENTED. /RRI/

Monteiro, R. Fed Dist Hwy Dpt, Salvador /Braz/

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/IRRD 205 108, 2CG4305108

**2A 238055**

OCCURRENCE AND TESTING FOR DELETERIOUS SALTS IN ROAD CONSTRUCTION MATERIALS WITH PARTICULAR REFERENCE TO CALCARETES

THE TYPES OF SOLUBLE SALTS PRESENT IN ROAD CONSTRUCTION MATERIALS ARE REVIEWED AND IT IS CONCLUDED THAT SODIUM CHLORIDE, SODIUM SULFATE, SODIUM CARBONATE, MAGNESIUM SULFATE AND CALCIUM SULFATE ARE LIKELY TO BE THE DELETERIOUS SALTS MOST COMMONLY ENCOUNTERED. SIMPLE CONDUCTIVITY METHODS ARE SUGGESTED FOR THE ROUTINE CHECKING OF SOILS. CRUSHED ROCKS AND WATERS USED IN ROAD CONSTRUCTION IN ARID AND SEMI-ARID AREAS. /TRRL/

Netterberg, F. Nat Inst Road Research /S Africa/ May 1970, 8 pp, 3 Fig, 3 Tab, 27 Ref

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

**2A 238156**

DEEP PLOUGHING

LAYERS OF LENSES OF FROST SUSCEPTIBLE CLAY/SILT ARE OFTEN FOUND IN ALLUVIAL (NON-FROST SUSCEPTIBLE) SAND DEPOSITS. AS THE LENSES OCCUR FREQUENTLY IN SMALL LENSES, IT IS NOT POSSIBLE TO IDENTIFY THEM DURING SOIL SURVEYS. PAVEMENT DESIGN SHOULD BE BASED ON THE PROPERTIES OF THE SAND (DESIGN THICKNESS APPROXIMATELY 0.5 M), NOT OF THE SILT (DESIGN THICKNESS APPROXIMATELY 1.0 M). DURING CONSTRUCTION VISIBLE LUMPS OF SILT/CLAY IN THE FORMATION LEVEL IN CUTS ARE REMOVED DOWN TO HALF A METER BELOW THE FORMATION LEVEL AND SAND IN DEPTH IS SAWN OFF. THE REMAINDER OF THE FORMATION LEVEL IS THEN PLOUGHED IN DEPTH AND 0.5 M. DURING CONSTRUCTION VISIBLE LUMPS OF SILT/CLAY IN THE FORMATION LEVEL IN Cuts ARE REMOVED TO HALF A METER BELOW THE FORMATION LEVEL. THIS TECHNIQUE IS APPLICABLE TO SOILS IN WHICH THE location and Removal of FROST SUSCEPTIBLE MATERIALS IS EASIER. THE PRICE OF PLOUGHING IS LOW. /RRI/

Netterberg, F. Conf Paper 1971, pp 67-92, 3 Fig, 1 Tab, 27 Ref

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

**2A 238148**

ANTITRUST LAWS AND HIGHWAY CONTRACTS

ANTITRUST LAWS ARE REVIEWED WHICH RELATE TO HIGHWAY CONSTRUCTION. BIDS RECEIVED FOR HIGHWAY CONSTRUCTION COMMODITIES SHOULD BE REVIEWED TO DETERMINE IF UNUSUAL SIMILARITIES APPEAR OR IF THERE IS INDICATION OF ALLOCATION OF TERRITORY OR FAILURE TO BID IN CERTAIN AREAS. RECORDS SUBMITTED BY PRIME CONTRACTORS FOR UPCHARGE OF MATERIAL SHOULD BE EXAMINED TO SEE WHETHER ANY UNUSUAL CIRCUMSTANCES APPEAR. INVESTIGATIONS BY HIGHWAY ATTORNEYS MUST BE CONDUCTED WHERE INDICATED AND IN THE ENFORCEMENT OF ANTITRUST LAWS, AS WELL AS OTHERS PERTAINING TO THE HIGHWAY PROGRAM.

Hyder, RL. *Highway Research Board* 11 pp, Apr. 1964

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CONSTRUCTION MATERIALS

2A 242120
ESTIMATE OF COST: GRAVITY VACUUM TRANSIT TUBES, RAILS, SUPPORTS
THE REPORT DOCUMENTS PROJECTED CONSTRUCTION COSTS FOR MAJOR GUIDEWAY COMPONENTS OF A PROPOSED GRAVITY VACUUM TRANSIT (GVT) SYSTEM. SEVERAL DIFFICULTIES WERE ENCOUNTERED IN THE COST ESTIMATES, PARTICULARLY IN THAT THE ANTICIPATED HIGH SPEED OF INDIVIDUAL GVT TRAINS AND THE PNEUMATIC REQUIREMENTS NECESSARY FOR THEIR OPERATION REQUIRE THAT TUBES AND ATTACHED RAILS BE FABRICATED AND INSTALLED TO AN UNPRECEDENTED DEGREE OF PRECISION. FOR THIS REASON, THE COST PROJECTIONS MAY FLUCTUATE IN REALITY ACCORDING TO: (1) THE NEED TO FABRICATE SPECIAL STEELS FOR CONSTRUCTION, AND (2) THE ABILITY FOR BUILDERS TO RELAX CERTAIN SPECIFIED TOLERANCES DUE TO FUTURE IMPROVEMENTS IN GVT DESIGN. SUBSEQUENT ESTIMATES PRESENTED IN THE REPORT ARE PREDICTED ON THE ASSUMPTION THAT FABRICATION AND DEVELOPMENT PROBLEMS ARE ELIMINATED. THE REPORT OUTLINES THE ACCOUNTANTS' COST ESTIMATES FOR TWO PROPOSED GVT SYSTEMS, IN NEW YORK AND SAN FRANCISCO. ALL ASPECTS OF CONSTRUCTION COSTS ARE CONSIDERED, INCLUDING CONSTRUCTION METHODS, LABOR, PERMANENT MATERIALS, PLANT AND EQUIPMENT, EQUIPMENT OPERATION, JOB MATERIALS AND SUPPLIES, ETC. SEPARATE ACCOUNTINGS ARE PROVIDED WHERE CHOICES AMONG METHODS OR MATERIALS EXIST. THE FINAL CONCLUSION ISSUES CONCERNING THE COSTS OF GRADING AND PROPRIETARY CONSTRUCTION PROPOSAL AT APPROXIMATELY $3,941,000 PER MILE AND $3,558,000 PER MILE FOR SAN FRANCISCO. A COMPREHENSIVE ESTIMATE OF ANNUAL MAINTENANCE COSTS IS ALSO INCLUDED. /UMTA/

Acknowledgment: UMTA

July 1970

2A 242763
ENVIRONMENTAL QUALITY ASSURANCE THROUGH DEMONSTRATION PROJECTS

Darby, LM Public Roads. Us Fed Highway Admin Vol. 37 N Sept. 1972, pp 57-60, 1 Fig. 12 Phot

Acknowledgment: Transport & Road Research Lab /UK/

2A 242993
AUSTRALIAN-NEW ZEALAND BIBLIOGRAPHY ON ROADS AND ROAD TRAFFIC (1956-66)
APPROXIMATELY 1,640 REFERENCES ARE PRESENTED FROM AUSTRALIA AND NEW ZEALAND ON: ACCIDENTS AND ROAD SAFETY, ADMINISTRATION, BITUMINOUS CONSTRUCTION, CONTRACTORS, SAFETY, LOSSES IN MILEAGE, ECONOMICS, YIELD FACTORS, SPECIFICATIONS AND REGULATIONS, TERRESTRIAL HARDWARE, MECHANICAL HAZARDS, DESIGN PROBLEMS, MILEAGE ESTIMATES, TRAFFIC CONTROL, VEHICLES, ETC. THE ECONOMICS INVOLVED IN ROAD MAINTENANCE, SOIL STABILIZATION, TRAFFIC CONTROL, TRAFFIC FLOW, AND TRANSPORT VEHICLES. THE BIBLIOGRAPHY ORGANIZED UNDER THE FOLLOWING SUBJECT HEADINGS: ACCIDENTS AND ROAD SAFETY, ADMINISTRATION, BITUMINOUS CONSTRUCTION, contracting, soil stabilization, traffic control, and traffic flow. AN AUTHOR INDEX IS PRESENTED.

Mathieson, J
Australian Road Research Board Nov. 1969
CONSTRUCTION MATERIALS

The possibility is discussed of the establishment of a data bank for soil survey information. A data bank of at least geological and hydrological maps would prove most helpful.

Neddy, WJ (Frankipile (South Africa) Pty Limited) Ground Engineering Vol. 7 No. 1, Jan. 1974, pp 38-42, 3 Figs., 1 Tab., 11 Ref.

2A 3406270 THE IMPACT OF THE ENERGY CRISIS ON HIGHWAY CONSTRUCTION CONTRACTS

The energy crisis has created shortages of highway construction materials. As of June 2-6, 1974, asphalt mats is being actively considered. Equipment and personnel. 2) Mowing is being restricted. 3) Reduction of stabilized base. The rapidly improving cost position of rigid vs. flexible construction methods and design procedures that could reduce energy consumption and materials usage, maintenance changes,围绕 cooling consumption of energy: 1) More efficient planning in use of equipment and personnel. 2) Mowing is being restricted. 3) Reduction of interchanges. Lighting has been accomplished. 4) Rejuvenation of old asphalt mats is being actively considered.

This report is from the WASHO Conference held in Portland, Oregon From June 2-6, 1974.


2A 3406275 ENERGY RESOURCES-SHORTAGE-HIGHWAYS

The number of construction projects in Colorado has dropped from March of 1972 (147) and March of 1973 (124) to March of 1974 (115). While it is conceded that other factors are at work, energy shortages, real or potential, have definitely limited the number, value and type of projects that Colorado is willing to obligate. Costs have increased due: (1) higher administrative and supervisory expenses; (2) scheduling (when is the best time to award grants?) uncertainty: (3) more travel times; (4) higher rates.

The quality of projects may suffer due: (1) supervisory personnel seeking jobs in more stable fields of employment; (2) substitution of materials and designs to supplement benefits achieved through material substitutions, Colorado is considering various changes in construction requirements. Under advisement are: 1) Designation as mandatory, material pits that will effect fuel saving. 2) Thicker lifts in embankment construction as long as density specifications are met. 3) Most economical balance of surface course and emulsified asphalt treated base thicknesses. 4) Use of dry-disc mixers; and for standard asphalt plants, temperature-viscosity relationships to establish the lowest permissible mixing temperatures. In the area of transportation planning emphasis is being placed on preferential treatment for high occupancy vehicles, car pooling, and the National Transportation Energy Conservation Action Plan. The effect of the energy crisis on truck travel, air quality and travel demand are being analyzed. Traffic counting methods are being employed extensively. The reduction in the availability of asphaltic materials has given rise to investigation of the following problems: (1) elimination of the use of rapid curing "cut-Back" liquid asphalt; (2) partial elimination of substitution for medium curing "cut-back" liquid asphalt; (3) improving the penetrating quality of emulsified asphalt for use as a prime coat; (4) substituting other stabilizing agents for emulsified stabilized base. The rapidly improving cost position of rigid vs. flexible pavement is being closely watched. Bridge design personnel are investigating construction methods and design procedures that could reduce fuel consumption and materials usage. Maintenance changes,围绕 cooling consumption of energy: 1) More efficient planning in use of equipment and personnel. 2) Mowing is being restricted. 3) Reduction of interchanges. Lighting has been accomplished. 4) Rejuvenation of old asphalt mats is being actively considered.

This report is from the WASHO Conference held in Portland, Oregon From June 2-6, 1974.

Haase, EN (Colorado Department of Highways) Western Association of State Highway & Transp Off Proceeding June 1974, 14 pp

2A 3406445 MEMBRANE ENCAPSULATED SOIL LAYERS (MESL) FOR ROAD CONSTRUCTION IN COLD REGIONS

The possible use is examined of membranes to encapsulate frost susceptible soils, compacted at water contents below optimum, to inhibit frost action by maintaining the water content at a low level. Laboratory test data are presented to show the effects of soil type and compaction conditions on the potential field performance of such encapsulated soils. The three soils tested in the laboratory are: a moderately plastic clay from Ellsworth, S.D.; a sandy silt; from Hannover, N.H.; and lean clay from Elmendorf, Alaska. Soils similar to those tested will also be utilized in field trials subjected to freezing and thawing. The results of the unfrozen water content determinations, and freezing tests on the Ellsworth clay are described and discussed. The Ellsworth clay seems ideally suited to use in membrane encapsulated soil layers (MESL) in a frost area. The behavior of Hannover silt in a brief test program was very different. CBR values for unsaturated samples of Hannover silt decline much more rapidly with increasing water content than does the optimum. On the dry side of optimum, the CBR of the silt is essentially constant. Freezing tests, post thaw strength and possible chemical treatment are also considered. Investigations indicate Elmendorf clay is less plastic (PI=18) and of uniform particle size than the Ellsworth clay (PI=25). Freezing point depression tests suggest that a significant percentage of the soil water may remain unfrozen at temperatures only a few degrees below zero deg. C. Freezing tests, lime treatment and placement requirements related to Elmendorf clay are also considered.

This paper was presented during the Symposium on Frost Action on Roads held in Oslo, Norway, 1-3 October, 1973.


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRR D 214598)

2A 3406457 DURABILITY AND FROST RESISTANCE OF LIME AND CEMENT STABILIZED SOILS

The various aspects of freeze-thaw durability are considered and basic concepts of a recently developed durability evaluation system are presented. Adequate strength must be achieved in the cured stabilized material prior to the first winter of service. Both cyclic freeze-thaw and heaving types of deterioration may need to be considered, depending on field conditions. If it is assumed that acceptable quality stabilizing additives (lime and cement) are used and adequate quality control is being achieved, mixture preparation and construction, then mixture design becomes a key process. In many mixture design analyses, it has been found that durability considerations control and establishment of stabilizer content levels and/or limit the utilization of the stabilized material relative to its location (base-subbase-modified subgrade) in the pavement system. Freeze-thaw durability testing and evaluation consists of 4 broad areas. (1) Characterization of the field environment: This would involve development of a model that accurately simulates the temperature regime in a pavement system. An idealized freeze-thaw cycle is proposed (and illustrated) for describing the time-temperature history of a particular point in a pavement. (2) Realistic simulation of field conditions: A laboratory simulation is outlined which utilizes an automatic programmed freeze-thaw unit which provides independently programmed top and bottom temperature control for a series of cylindrical specimen and a water table provided at the bottom of the specimen if desired. (3) Based on a comprehensive consideration of various evaluation procedures and a large quantity of cyclic freeze-thaw data, it was concluded that the compressive strength of a stabilized material after various numbers of freeze-thaw cycles is the best procedure for evaluating freeze-thaw durability. (4) Establishment of durability criteria: A discussion of the development of durability criteria based on the residual strength concept gives consideration to the key factors of minimum tolerable strength, residual strength and strength time profile.

This paper was presented during the Symposium on Frost Action on Roads held in Oslo, Norway, 1-3 October, 1973.


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRR D 214598)
CONSTRUCTION MATERIALS

2A 260445
USING SHOTCRETE TO SUPPORT UNDERGROUND STRUCTURES

A conference was conducted to discuss the making, testing, and using of shotcrete for underground support. With regard to the making of shotcrete, quality control was considered essential. It was believed that average 28-day compressive strengths in the range of 3,000-4,000 psi (20.6-27.5 million N/sq m) were more realistic than the presently specified 5,000 psi (34.4 million N/sq m) compressive strength at 28 days. Opinion on the maximum size of coarse aggregate to be used in a shotcrete mix favored at least 1/2-inch (13 mm) maximum size. The importance of compatibility tests of the cement and accelerator to be used was emphasized. Though remotely controlled nozzles and wet mix shotcrete equipment has had wider use in Europe, there was considerable interest shown in the use of skilled nozzlemen as employed in the U.S. Cubes, core, probe, impact, and pull-out tests were discussed, and it was concluded that such tests need further development. In discussions of where to use shotcrete, it appeared that shotcrete offered economies in nominally unlined water tunnels built by the drill and blast method, where it could serve the dual function of support and final lining. It also appeared to offer economies where a drill and blast tunnel had a persistent need for support and coverage of the rock to prevent deterioration due to moisture change or stress relief. Though it is not believed to be presently compatible with the tunneling machine, an example was presented where a tunneling machine had been designed to accommodate the use of a specific shotcrete system.

Morris, JW (Bureau of Reclamation) ASCE Civil Engineering Vol. 43 No. 9, Sept. 1973, p 17

2A 260484
DRAINAGE IS THE FIRST ROAD ESSENTIAL: MAYBE MCDAM WAS RIGHT, AFTER ALL

Excess water that enters structural sections (primarily from rain water and other surface infiltrations) is causing serious pavement distress, greatly shortening pavement life and increasing the annual costs of a great many important pavements. Tests indicate damages during periods of free water present in the structural sections were 100 to 200 times greater than when no free water was present. Research on infiltration into surface cracks in PCC pavement revealed that 70 to 95 percent of surface precipitation of 2in./hour entered into cracks with widths of 0.35 to 0.125 in. All joints and cracks have been observed to be filled by overflowing within a half-hour or less after rain started. The detrimental action that takes place when flooding occurs is outlined. Unless high-permeability drainage layers are installed under the full widths of the traveled ways of important pavements, the water that enters often remains on the subgrade or within the layers of the structural section for weeks and even months after it stops raining. Experience is recounted which contrasts with the belief that any aggregate material with not more than 2 percent (or even 5 percent) of minus 200 fines will provide ample drainage for most roadbeds. The suitability of various classes of aggregate materials for seepage control is discussed. Even crude estimates with roughly approximated values for permeabilities, when used with good judgement and experience, can aid in eliminating serious errors in selecting types of materials for various kinds of jobs. Tell-tale signs which indicate the very slow rates of drainage provided by the normal pavement are described. Designing and building pavements as rapidly draining systems (using fundamental engineering principles such as Darcy's law) can greatly extend their useful life and can save billions of dollars in total costs.

Cedergren, HR Rural and Urban Roads Vol. 11 No. 5, May 1973, 4 pp, 2 Fig.

2A 260537
A DESIGN PROGRAM FOR THE ESTIMATION AND ABATEMENT OF SOIL LOSSES FROM HIGHWAY SLOPES

A computerized design program is described which estimates the soil loss from a highway slope or median strip. The program which was intended for use in new construction and scheduled erosion control maintenance of existing projects, is designed for the IBM model 370. Input into the program consists of a basic description of the slope (location, soil erodibility, slope length and gradient) and duration of construction. The output consists of an estimated annual soil loss and a peak loss assuming a 10-year storm event over the construction period. The preventive measures required to control this peak soil loss from getting into streams are in terms of the number of straw barriers needed per 100 feet of roadway. An equivalency table is also output for alternate sitation controls and procedures in terms of straw barriers. The use is discussed of the Universal Soil Loss Equation (and modification of it) for estimation of soil loss from highway construction. A mathematical description of the method of calculation, the data input format and program listing are included in appendices.


2A 260632
MODERN CONCEPTS FOR DENSITY CONTROL PHASE III: EMBANKMENT MATERIALS

From 1967 through 1972 density data were obtained on embankment materials that were being constructed on several Minnesota trunk highways. Data were collected and analyzed from randomly selected locations on five embankment projects. A statistical analysis was also performed on historical data results from five embankment projects selected at random from office files. Variation was determined from these data by computing the mean and standard deviation to reveal existing variability in acceptable construction of embankment materials. The results were used to evaluate present specifications and to prepare a new acceptance sampling plan. The plan is based on statistical concepts that will define the degree of acceptable variation upon which decisions can be made with an established degree of confidence. Proposed statistical specifications are presented. (FHWA/Minnesota Department of Highways Final Rpt. 1973, 51 pp

ACKNOWLEDGMENT: Federal Highway Administration (P-0048)
PURCHASE FROM: NTIS Repr. PC, Microfiche PB-231552/AS

2A 260911
BOTTOM ASH AND BOILER SLAG

This paper presents the results of laboratory studies conducted at West Virginia University to determine the physical, chemical, and engineering properties of bottom ash and boiler slag. The identification tests consisted of a determination of (1) the shape and surface texture of the particle with the use of photomicrographs, (2) grain size distribution, and (3) specific gravity, as well as (4) a complete chemical analysis of each bottom ash. Tests to evaluate the bottom ash as an aggregate and construction material included (1) sulfate soundness, (2) Los Angeles abrasion, (3) relative density, (4) standard Proctor compaction, (5) constant head permeability, (6) one-dimensional compression, and (7) shear strength. The various test values and properties are compared to the properties of representative granular soils or to appropriate specifications. Also included in the paper is a review of experience accumulated during the past 3 years on the utilization of bottom ash and boiler slag in actual construction in West Virginia and the surrounding States. It is concluded from the data presented that the properties of most bottom ashes and boiler slags compare favorably with those of conventional natural aggregates, and that these materials can be successfully utilized in one form or another in the construction industry.


2A 260914
MARKETING POWERPLANT AGGREGATES AS A ROAD BASE MATERIAL

This paper identifies the variety of ash forms, their many applications, and availability. Marketing information from 8 years of experience is given concerning quality, transportation, economies, and the importance of generating confidence through research and testing. Results from West Virginia Department of Highways projects on Route 2 construction, secondary road improvement, backfilling slide areas, and grouting bridge approach slabs along Interstate 79 are presented as representative proof that PPA is a valuable addition to the myriad of construction materials being utilized in building and maintaining our highways. /Author/

Proceedings: Third International Ash Utilization Symposium. Sponsored by National Coal Association, Edison Electric Institute, American Public Power Association, National Ash Association, and Bureau of Mines,
CONSTRUCTION MATERIALS

Blocker, WV (Highway Materials); Morrison, RE (American Electric Power Service Corporation); Morton, WE (Highway Materials);
Babcock, AW (Monongahela Power Company)
Bureau of Mines Proceeding No. 8640, Mar. 1973, pp 208-223, 8 Fig., 8 Ref.

2A 260906
RESULTS OF THE 1973 QUESTIONNAIRE ON HIGHWAY APPLICATIONS OF NUCLEAR TECHNIQUES
The responses are summarized of 50 state agencies and Canadian Provinces and cities to questionnaires related to the development and use of nuclear gauges on highways. Thirty nine states are using nuclear systems for specification control of the moisture and density of soils and aggregates. Nuclear systems for specification control of the density of bituminous concrete are used in twenty nine states, and systems for non-specific uniformity checks are used in an additional 10 states. Fifteen states measure asphalt content by nuclear systems. Data concerning the distribution of 1,473 portable surface M/D Systems are tabulated. A tabular comparison is presented of the nuclear questionnaire results over a period of 11 years. In Canada, five provinces utilize nuclear systems for specifications control of the moisture and density of soils and aggregates and 3 provinces use them for specification control of bituminous concrete. The results of the Canadian survey are tabulated.

Highway Research Circular No. 159, July 1974, 5 pp, 1 fig., 2 Tab

PURCHASE FROM: TRB Repr. PC

2A 260990
CONSTRUCTION COSTS REDUCED BY PAVEMENT REJUVENATION AND OVERLAYS
A method (which is seen as a means of stretching available funds in this time of economic crisis) is described of restoring badly cracked pavements through a process of heater scarification followed by an asphaltic concrete finishing application. The surface of the existing crack-up and usually dried-out pavements will be heated and scarified to a depth of approximately 0.75 inch, the scarified material will be rejuvenated and recompacted followed by the placement of an asphaltic concrete finishing course. Pavements of this type of rehabilitation have been in service for 2 or 3 years and the performance is judged exceptionally good. The procedure is outlined, and the characteristics of the heater unit used in the operation are discussed. The required depth of heat must be accomplished before any scarification is attempted, for once the surface is scarified, the fluffed up material acts as an insulator opposing any subsequent heat that might be applied. It is not effective to have a heater scarification combination followed by a second such unit. With proper balance of heater units to pavement conditions, with the flame shielded and/or positioned other than directly upon the pavement surface, the heating phase can be accomplished effectively and without emission control problems. Specifications require that the action to scarifying the pavement to a depth of approximately 0.75 inch, the system should be designed that a tumbling action of the scarified material is effected. This will break and cause some mixing of the material. The leveling device is discussed. It has been found effective to accomplish the compaction while the material is still hot and before the rejuvenating agent is applied. Pneumatic tired rollers are used and the specification is made that the rolling shall be completed within one hour from scarification. The asphaltic concrete finishing course is described and the results of a cost study are discussed.

This report was presented at the 53rd Annual Conference of WASHO, held in Portland, Oregon from June 2-6, 1974.

Allen, GJ; Howard, RL
Arizona Highway Department No. 491, 1974, pp 52-59, 5 Fig., 14 Ref.

2A 260983
FUEL USAGE FACTORS FOR HIGHWAY CONSTRUCTION
Data are summarized that were obtained from more than 400 highway contractors in response to action by a task force seeking to formulate fuel usage factors which would enable computation of fuel requirements for highway construction jobs. The figures presented here are intended as guides in making job estimates. The fuel factors represent gallons of fuel required per unit of construction. Fuel requirements are presented for the three excavation items (earth, rock and other), and include the total of both diesel and gasoline. The on-site aggregate production fuel usage factors must be used only when the contractor contemplates erecting a plant to produce aggregates for a particular project. The usage factors for aggregate base include fuel for hauling, spreading, compacting and finishing the base. The factor for asphalt concrete production includes all requirements to produce one ton of asphaltic concrete, including the material handling at the plant site, drying and heating of aggregates, heated asphalt storage and generating power for all plant machinery. Also, asphalt concrete hauling and placement represent the total fuel requirement for the item. If both gasoline and diesel haul units are used, appropriate adjustments should be made. Usage factors are also presented for production, hauling and placement of portland cement concrete. Fuel usage factors and fuel requirements for structures and miscellaneous construction are also outlined.

This report was presented at the WASHO Conference held in Highways Report Circular No. 158, July 1974, 7 pp

PURCHASE FROM: TRB Repr. PC

2A 261480
PROPOSED REVISION OF ACI 311-64: RECOMMENDED PRACTICE FOR CONCRETE INSPECTION
This recommended practice sets forth standards and procedures relating to concrete construction which will serve as a guide to owners, architects, and engineers in planning their inspection program. The need for adequate inspection as a requirement for high quality, attractive appearing concrete at the least cost is emphasized.

Reported by ACI Committee 311.


2A 261674
ALTERNATES FOR ASPHALT CEMENT
The use of asphalt cement is re-assessed in the light of the current energy crisis and economic situation. There are no currently available cements that can compete in cost with asphalt even at the present price of asphalt, and there is no outlook for a competitive cement in the foreseeable future. The next most economical cementing material for pavement is portland cement. Portland cement is 28 percent higher than asphalt based on the amounts of each required to produce a given amount of pavement. Cement is in limited supply and it is estimated that the cement industry would be hard pressed to provide additional cement equivalent to as much as 4 percent of the 1973 supply of asphalt. Tar could provide pavements equivalent to about 5 percent of the volume provided by asphalt in 1973 at a cost of binder of about 2.5 to 3.0 times that of asphalt. The fumes from tar paving will bother plant and laydown personnel. Sulfur can be emulsified in asphalt and the resulting binder used with conventional aggregates and equipment. If mixes made with sulfur-asphalt emulsions prove durable and if hydrogen sulfide gas is not a safety hazard, sulfur offers a means of extending the supply of asphalt. Currently there is no surplus sulfur, but a surplus may develop in the future which could be used to extend the asphalt supply. Total production, quantities used in pavements, and relative price data are

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2A 261675
THE POTENTIAL FOR USING HIGH TYPE EMULSION-AGGREGATE MIXTURES FOR BASE AND SURFACE COURSES
The need is stressed for the design and construction of high type pavements with asphalt emulsion aggregate mixes in this current period of shortages (particularly of petroleum fuel). Problems that must be overcome in the successful utilization of such mixes are set forth. These relate to the need for standardization of the more than 35 grades and types of asphalt emulsions, the need to use only emulsions without the lighter distillates and only very little if any, of the oil distillates, the need for leaner than normal hot mixes and its attendant problems, the addition of cement or lime at the cold feed to increase stability, the supply of chemicals, the base stock, and the lack of experience in the procedures. Recommendations are presented related to the need for a high quality aggregate, a larger maximum size aggregate, the need for aggregate that is evenly graded from coarse to fine, but on the coarse, somewhat open-graded side of the maximum density curve, the need for laboratory tests, and other factors related to aggregate, mix and design.

For presentation at Annual WASHO Meeting, Portland, Oregon, June 3-6, 1974.

Bohman, RA (Federal Highway Administration)
Western Association of State Highway & Transp Off Conf Paper June 1974, 4 pp, 9 Ref.

2A 261677
CONSERVATION OF PETROLEUM PRODUCTS IN HIGHWAY CONSTRUCTION
Suggestions are presented here related to petroleum conservation which have been gathered through correspondence with members of this association and publications of the Asphalt Institute and the Associated General Contractors. An evidence of over design (in the number of traffic lanes, lane widths etc.) as well as the reduction of stop and go traffic and fluctuating speeds (through the construction of overpasses, interchanges, special turn lanes etc.). The use of borrow and waste sites will shorten haul length, and the use of multiple trailers with a single tractor on off-highway haul roads will reduce the number of trips. The use of native soils upgraded through the use of lime, portland cement and other additives, can reduce the excavation quantities and crushing required of mineral aggregates, and the use of lime percentages, and (5) density of compacted asphalt are further suggestions for conserving petroleum products. Reduction of the mixing temperature of bituminous mixtures, reduction of the average moisture content of the aggregate, the use of dryers-drum or turbulent mass type mixing plants for asphalt concrete, reduction of stack temperatures, improved combustion, reduction of the volume of air used in drying aggregates, and the elimination of diesel sprayed in track beds, would all contribute to saving fuel. Project scheduling which would take advantage of warmer weather, and provision of additional coverings (where cold weather operations are unavoidable) will reduce the fuel requirements. Other measures suggested here include the reduction of the number of lifts and allowing thicker lifts (as long as compaction requirements are met) in projects, where full depth or thick bituminous bases and pavement are required, improved communication systems, cost reduction incentive programs, alternate designs and the development of improved specifications.

Suggestions are also included regarding cast-in-place structure, temporary stage work on higher type detours, car pooling, tire pressures and vehicle operation speeds.

Presented at the 1974 Meeting of the Western Association of State Highway and Transportation officials, Portland, Oregon, June 2-7, 1974.

Shumway, PE (Alaska Department of Highways)
Western Association of State Highway & Transp Off Conf Paper June 1974, 7 pp, 4 Ref., 1 App.

2A 261768
GROUND FREEZING TECHNIQUES AT SALERNO
The article describes the construction of the Santa Lucia Tunnel, under Salerno, and considers the use of soil freezing in one tunnel section in detail. A geological section of ground under Salerno is shown; four types of strata present are volcanic, alluvial deposits, and dolomite (tectonic and non-tectonic in origin). Tunnelling difficulties caused by water are discussed. Water and soil cave-ins from the face were stopped by injection. A hydrological study was prepared. Preference of soil freezing over other techniques is discussed. Low temperature brine circulating in freeze pipes causes water in the voids to freeze, giving sealing and stabilization of the soil. The arrangement of freeze pipes is shown. Frost penetration and mechanical properties of frozen soil are considered. The freeze wall conditions of design and practical realisation are discussed. Problems connected with the use of calcites with a preliminary lining of steel beams and reinforced garnite was adopted. Relevant construction data are listed. No settlement of structures on the surface occurred where soil freezing was applied, and the method was cheaper and safer than the chemical injection method. /TRRL/

Braun, B; Macchi. A Tunnels and Tunnelling Vol. 6 No. 2, Apr. 1974, pp 81-89, 4 Fig.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 209603)

2A 261895
DESIGN AND DIMENSIONS OF STANDARDISED BITUMINOUS PAVEMENTS IN THE FEDERAL REPUBLIC OF GERMANY;
DATA, REQUIREMENTS, PERFORMANCE, DEVELOPMENTS
The paper presents a survey of current practice in using standardised bituminous road constructions in West Germany. Data, requirements and wearing qualities of bituminous mixtures and road constructions are laid down in Technical Standards and Guidelines. They permit a large number of different base constructions using hot mixed bituminous material. Methods for classifying traffic and for determining the type and thickness of mixture, and the element needed for each class are discussed, as are the standardised thickness for surface and base courses. The layer equivalencies of different base materials are discussed. The five standard construction types using bituminous mixtures are presented together with the requirements concerning subsoil, subgrade and frost protection course for standardised pavements. The paper further discusses the bearing capacity of road base and surfacing and examines the relation between construction, live-load and road safety. Research work carried out on test sections of standardised pavements is reported as well as theoretical considerations. Suggestions are made for amending and improving some of the standards. /Author/


2A 262077
LIME STABILIZATION OF FROST-SUSCEPTIBLE SOILS
Depending on (1) nature and composition of the soil, (2) curing (time-temperature), (3) lime type, (4) lime percentage, and (5) density of compacted mixture, lime-treated soils display a wide range of engineering properties. Extensive studies have shown that all fine-grained soils react with lime to effect beneficial changes in workability, plasticity and swell properties. The extent to which the lime-soil pozzolanic reaction proceeds is influenced primarily by natural soil properties. The difference between the compressive strengths of the natural and lime-treated soil is an indication of the extent to which the lime-soil pozzolanic reaction has proceeded. Substantial strength increase indicates that the soil is reactive with lime and can.
probably be stabilized to produce a quality paving material (base or subbase). The validity of using initial unconfined compressive strength (0-cycles) as a measure of freeze-thaw resistance was demonstrated in extensive studies. Recent studies of different types of cementitious stabilized materials (lime-soil, soil-cement, lime-flyash) have confirmed that initial mixture compressive strength can be used to predict the cyclic freeze-thaw resistance of a stabilized soil. Factors influencing strength development, influence cyclic freeze-thaw resistance in the same fashion. Studies show that cured lime-soil mixtures with good freeze-thaw resistance can be developed when reactive soils are stabilized with quality lime. The strength required to prevent excessive heaving of cured lime-soil mixtures, approximately 200 psi, compares favorably with the strength required to restrict the heave of cement stabilized materials. Adequate mixture design, construction, and quality control procedures must be utilized to insure the successful utilization of lime stabilized soils in pavement construction.

Thompson, MR (Illinois University, Champaign) *Frost J.ord* No. 10, July 1973, pp 45-52, 6 Fig., 4 Tab., 10 Ref.

2A 262145

**TEST SECTIONS TO CHECK VALUE OF STABILIZED ROADS**

The first phase is reported in the testing of sections of surface treated gravel roads. The test sections are 1,000 ft long and have been prepared and treated according to specifications of the material supplier. Load bearing tests were conducted before and after construction. Three methods of road construction were employed: surface application of dust palliatives intended for only relatively short term improvement; additives were added into the top 4 in of an existing roadway as an interim measure; additive application to a depth of 6 to 8 in. for creation of a high type base course. Although material applications varied according to desires of the manufacturer, the general construction procedure was the same for all materials. The test sections were first scarified by the grader. A partial addition of water was made to facilitate mixing and the additive was placed on the roadbed. The treated roadbed was mixed in place by a soil stabilizer. Water was added into the mix to optimum moisture content and final pulverizing and mixing was done. Dust palliatives were put down with spray-bar equipment at material suppliers recommended dosages. The number and types of test sections as well as the quantities of various materials used are tabulated.


2A 262163

**REINFORCED EARTH-DESIGN AND CONSTRUCTION**

Reinforced earth, which may be used in high quality construction with substantially lower cost and success over conventional methods, is a designed structure whereby a soil is internally reinforced with metal strips so as to form a friction transfer mechanism between soil and reinforcement. This frictional transfer allows the soil-strip mass to exhibit tensile strength under exterior imposed loadings. The basic design of a reinforced earth structure consists of the following considerations: earth reinforcements, foundation stability and settlement, and internal and external drainage. Principally the fill used within the reinforced earth mass is confined (top and bottom) by a layered system of reinforcing strips. Any lateral strain that takes place is that which is taken by the reinforcement, providing that the frictional forces that is mobilized between the strips and the soil is sufficiently large. Hence there is the need for soil exhibiting essentially frictional characteristics. Details are given of the design and construction of reinforced earth structures. An example is given of a wall configuration to be designed for level backfill loading. Shearing stresses due to earth pressure behind the wall must be considered in the design. The reinforced earth structures are categorized in 4 categories: temporary (dry), temporary (submerged), permanent (dry) and permanent (submerged). Submerged structures involve special design and construction procedures. This paper is part of the proceedings of the Ohio River Valley Soils Seminar held in Lexington, Kentucky, October 5, 1973.

Gedney, DS Walkinshaw, JL (Federal Highway Administration) *Kentucky Soil Mechanics and Foundations Group Proceeding* Oct. 1973, pp 9 pp, 10 Fig.

2A 262219

**ANCHORED INCLINED WALLS—A STUDY OF BEHAVIOR**

This paper attempts, in a semi-quantitative manner, to show the differences in behavior between vertical and inclined walls and the rows of prestressed anchors and also to indicate factors which must be considered both during design and construction. The case of a dry, medium-dense, normally consolidated soil is considered with the sand surface horizontal. Small scale laboratory tests are described and details are given of the apparatus. A rigid-flume silt 0.81 m in plan at the top and 0.91 m by 10 m at the base and 0.71 m high, holds the soil and the 0.6 m high downdrain test wall, which was suspended near to the center of the flume. One of the objectives of the tests was to examine a number of different design assumptions. Earth pressure, anchor load, wall movements, sand subsidence, wall base shear and normal reaction, photographic study, and the mechanics of wall behavior are described. Considerations based on the study are detailed. The design of an inclined wall supported by rows of prestressed anchors should incorporate a rectangular earth pressure envelope. As the excavation in front of the retaining wall was deepened, the wall and the retained soil moved. Generally, for positively inclined walls the largest lateral movements were at the top of the wall while with negatively inclined walls the largest movements were at the base of the wall. The sand subsidence behind the wall was the largest adjacent to the wall, the magnitude depending on the wall lateral movements. As construction progressed the individual anchor load varied. Since the mechanics of inclined wall behavior are similar to those of the vertical wall and are controlled by the interaction between the wall and the anchor supports, the forces which act on the wall member must be appreciated. The semiquantitative tests using the two dimensional pin model apparatus demonstrate the mechanics of soil, wall and anchor interaction.

Hanna, TH Ding, AO (Sheffield University, England) *Ground Engineering* Vol. 6 No. 6, Nov. 1973, pp 24-33, 15 Fig., 3 Tab., 18 Ref.

2A 262223

**THE BEHAVIOR OF GROUPED INCLINED ANCHORS IN SAND**

The research is described which provided evidence contributing towards the decision to change the end-result specification to a method specification in the British Ministry of Transport's Specification for Road and Bridge works. Site investigations carried out are outlined. The standard deviations of the test results and the numbers of tests which would have been required to achieve given levels of accuracy in the determination of mean air content of the compacted fill are tabulated. It was concluded that high rates of testing were required for adequate control of compaction of earthworks using an end result specification. Two basic types of nuclear apparatus are described which have been developed for determining the bulk density of surface layers. They are, the back-scatter and direct transmission types. Work, however, has shown that there is little increase in rate of testing by nuclear means and it does not justify the high cost of the equipment. Method specification is discussed in which the compactive effort used to formulate their specifications is that which would achieve a state of compaction of 10 percent air voids at a moisture content slightly lower than the average for each type of soil. Examination of methods of earthmoving (which did not rely upon a high bearing capacity in the soil and which were compatible with vertical-force excavation) and the possible use of overhead ropeways and light railways, indicated that belt conveyors showed the most promise of being economically competitive with conventional methods of earthmoving. The most suitable method of achieving vertical-force excavation to provide material for transportation by belt conveyors was to employ bucket-wheel excavators. Details are given of a feasibility study of the possible use of belt conveyors in read construction and a full-scale trial which followed.

Lamarch, WJ (Bristol University, England) *Ground Engineering* Vol. 6 No. 6, Nov. 1973, pp 34-41, 11 Fig., 1 Tab., 3 Ref.

2A 262224

**ARTESIAN PRESSURE CHALLENGES FILING TECHNIQUES**

The construction is described, of a platform in the sea (sea 105m to 130m deep) from which drilling and production operations (for Oil) will be carried out. Construction will take place ashore in assembly basins and when fully assembled, the basin will be flooded and the structure floated out to the
oilfield using its own buoyancy. Three sections of the work within the basin required the construction of special foundations to carry heavy imposed loads. The first was for the jacket structure (the main structure of the platform) during its construction, the second for the tracks for the two gantry cranes, and the third to support the oil beneath the floating gates for the basin which will replace the temporary bund wall on the seaward side. Four hundred piles varying in diameter from 900 mm to 1500 mm were used. The piles which were designed for both horizontal and vertical loading were founded at about 2 m into the sandstone. During boring, water was encountered in the sandy zones of the clay and artesian pressure was present in the sandstone. The highest groundwater level recorded in the site investigation was 5 m o.d. and water spilled over the top of the casings when pile bores were made. To eliminate the risk of water piping through the unset concrete, each hole was bored and cased to rock, and the drilling was continued until the necessary rock socket was achieved and the casing was filled with water. During this process the water level within the bore was up to the top of the casing, before the artesian water condition was encountered in each case. The base of the bore was then cleared of sediment and the reinforcing cage was lowered into position. Attached to the reinforcing cage and arranged to extend from the bottom of the boring to just above ground surface, were four "bleed" pipes which were later to serve to relieve water pressure at the pile base. Thus the flow of artesian water was channelled away through the pipes away from the concrete. The technique employed to ensure the consistent success of the method is outlined.

Ground Engineering Vol. 6 No. 6, Nov. 1973, pp 18-9, 1 Fig., 4 Phot.

2A 262275

REPORT ON THE CONSTRUCTION AND INITIAL INSPECTIONS OF A FULL-SCALE EXPERIMENT ON ROAD P43/3, ORKNEY-BO'HAVILLE, TO EVALUATE THE EFFECTIVENESS OF VARIOUS TECHNIQUES IN THE APPLICATION OF PVC/TAR SURFACE TREATMENTS This report describes the construction of a full-scale single-hand double-surface treatment experiment in the Northern Orange Free State. The principal object of the experiment is to evaluate the performance of PVC/tars which comply with the NIRR low-volatile specification. The construction variables under study are: double-and heavy and light pneumatic and flat steel-tired rollers, and also the effect of precoring the aggregate. A number of small-scale sections were laid to determine the correlation between the performance of full-scale and small-scale sections. The results of control tests on binder and chipping applications are included as are initial binder and aggregate properties. Assessment of the condition of the surfacings after one, three and six months service are given.


2A 26240Z

SOIL PARAMETERS FOR DESIGN OF MOUNT BAKER RIDGE TUNNEL IN SEATTLE, A DISCUSSION The discussant concludes from the information provided in the paper, that some tension may develop at the inner face of the lining at the crown of the elliptical cross section the permanent lining may be about 199 m2 and the use factor is 0.51. There is a cross-sectional area is about 0.37. This low value indicates a large volume of unproductive excavation. The discussant concludes from the information provided in the paper, that although some tension may develop at the inner face of the lining at the crown of the tunnel, such effects are very local and very small. A discussion of SOIL PARAMETERS FOR DESIGN OF MT. BAKER RIDGE TUNNEL IN SEATTLE by M.A. Sherif and R.J. Strazer, Proc Paper 9511, Jan. 1973 Howells, D.A. (Humfrey, Howard and sons, England) ASCE Journal of Soil Mechanics & Foundations Div Vol. 99 No. 5M10, Proc Paper 10038, Oct. 1973, pp 899-900, 1 Fig., 3 Ref., 1 App.

2A 262467

LIGHTER, ORTHOTROPIC DESIGN REPLACES DETERIORATED DECK An experiment is described in which a 60-ft long section of deteriorated bridge roadway will be replaced with a steel orthotropic deck of two different designs. The purpose of the experiment is to determine the methods and materials to be used when the entire 4,650 ft-long, eight-lane upper deck is rebuilt next year. In an effort to compare costs, the experiment will involve both open and closed-rib designs. While closed ribs provide better torsional stiffness in the transverse direction, open ribs are more economical by about 10 percent, because they require less fabrication and welding. Open ribs require thicker steel plates for extra thickness. When the 6.5-in. thick orthotropic deck sections are bolted to the floor-beams through the existing rivet holes, workmen in another test will weld the plates longitudinally in some areas and bolt them in other areas.

Engineering News-Record Vol. 192 No. 19, May 1974, p 18, 1 Fig., 1 Phot.

2A 262578

COMPACTING-A ESSENTIAL INGREDIENT FOR GOOD BASE PILE PERFORMANCE In this paper, the subject of compaction is briefly reviewed and a "state-of-the-art" of compaction control for unbound graded aggregate materials used in pavement construction is given. Factors influencing compaction of granular materials are discussed and technical data that demonstrate the effect of compaction on specific properties of graded aggregate mixtures are presented. Further, "in-service" compaction of granular materials are compared with densities that are achievable with modern-day compaction equipments. The inadequacy of many current state highway department compaction requirements of unbound granular materials is discussed. Finally, appropriate conclusions based on sound technical data are drawn and recommendations for compaction requirements for unbound granular materials are made.

Marek, CR. Jones, TR., Jr.
National Crushed Stone Association
Mar. 1974, 46 pp

PURCHASE FROM: National Crushed Stone Association 1415 Elliot Place.
NW, Washington, D.C., 20007 Orig. PC

2A 262788

FOUNDATION FAILURE Striking cases of foundation failure are reviewed and the causes of failure are analyzed. A structural failure is described of a post-tensioned concrete mat for a 14-story building and multiple garage basements. The only remedy in this case was to reconstitute the broken area, drill rings of vertical soil anchors into the subsoil at considerable depth below subgrade and vertically post-tension the mat. The necessary addition of the vertical loads to simulate future column loads more than neutralized any economy of the post-tensioned over a normal reinforced foundation mat. The assumption of straight line variations inherent in grid boring has resulted in many foundation failures. Serious masonry cracking in a number of two-story garden apartments were plotted and found to conform to the location of a backfilled creek. Exploration revealed the cause to be that all piles were of the same length based on borings which had missed the creek trough and were driven to the necessary resistance. A program of rock face protection is described in which about 75 percent of the rock exposure to subgrade was covered with timber battens. 5 x 10 ft in area, with a channel wall attached and two sets of 0.5 in post-tensioned cable anchors drilled on a 15 degree slope and grouted into rock. The case of subgrade heave is discussed. Changes in pressure intensity against walls often causes failure, especially in the usual unreinforced concrete basement walls of residential buildings. Ice caused pile distortion is outlined as well as settlements (a condition which structures cannot tolerate). Conditions caused by partly vacant pile filling and faulty piles are reviewed. Minor oversights which cause failures are noted.

Feld, J ASCE Civil Engineering Vol. 43 N June 1973, pp 89-92, 5 Phot.

2A 262990

THE BEHAVIOR OF AXIALLY LOADED SHAFTS IN SAND This study is mainly concerned with analysis of behavior of five full-scale instrumented drilled shafts cast in soil profiles containing sand and test loaded to failure. Two shafts were cast by the dry method and three by the
2A CONSTRUCTION MATERIALS

slurry displacement method. From field observations and measurements taken during construction and load tests, important findings were made concerning the construction and the design of drilled shafts. With respect to construction, the slurry displacement method was found to possess a great potential for future use, but this method must be used with care, to prevent the entrainment of mud and sediments at the tip and sides of the shaft and in the concrete. With respect to design, the measured load transfer was correlated with the properties of the sand measured by dynamic penetrometers. Pressure-settlement curves were obtained for the tips of shafts in very dense sand and sand of medium density. The total side load transfer was correlated with the integral over the periphery of the shaft of the product of the effective overburden pressure times the tangent of the effective friction angle. The coefficient of correlation was found to be about 0.7 for shafts with penetrations in sand not exceeding 25 ft. There were indications that this coefficient decreases with depth and, therefore, care must be exercised when the results are extrapolated to deeper shafts. /AUTHOR/

This report was prepared for the Texas Highway Department in cooperation with the U.S. Department of Transportation, Federal Highway Administration by the Center for Highway Research, the University of Texas at Austin December 1972.

Touma, FT Reese, LC
Texas University, Austin, (176-1) Intm Rept CFHR3-5-72-176-1, Oct. 1972, 259 pp, 79 Fig., 8 Tab., 2 Phot.
Contract 35-5-72-176

2A 263110 CEMENT STABILIZED PAVEMENTS--AN EVALUATION OF THEIR LOAD FATIGUE AND SHRINKAGE PROPERTIES

The purpose of this paper is to describe the present day thinking with regard to the design and construction of cement stabilized pavements and bases, giving emphasis to the areas in which current knowledge is deficient. The areas covered include quality requirements, basic structural properties, load deflection characteristics, fatigue properties, thickness design procedures, shrinkage and cracking. In conclusion it is pointed out that cement stabilized pavements: (1) have been proven viable by the performance of existing pavements; (2) can be rationally designed by reference to empirically derived methods for soil cement as a unique material; (3) while possessing inherent properties of shrinkage and cracking, must appropriately be designed and constructed to minimize the effects of these properties; and (4) offer an economical method for construction which will compete most favorably with traditional flexible pavements.


Ralston, J (New Zealand Portland Cement Association)
National Roads Board, New Zealand Proceeding Vol. 2 1972, pp 534-541, 4 Fig., 6 Tab., 14 Ref.

2A 263174 ROAD EMBANKMENTS ON SOFT FOUNDATIONS

LAUNCESTON, TASMANIA

The provision of a new expressway at Launceston requires the construction of embankments across alluvial mud flats. This paper describes the construction and performance, to date, of three instrumented test embankments having: (a) no sub-soil drainage, (b) vertical sand drains, and (c) vertical cardboard wick drains. Installation techniques for the sub-soil drains are described and a comparison is made of the settlement and pore pressure dissipation for the three embankments. The paper concludes by showing that the effectiveness of cardboard wick and sand drains is comparable and that considerable savings can be made in time and money by the adoption of cardboard wicks where sub-soil drainage is found necessary for accelerated consolidation.

Cooper, ID Meyer, PA (Department of Public Works, Tasmania)
Australian Road Research Board Conf Proc (5th) Vol. 6 No. 14, Paper No 821, 1972, pp 88-108, 8 Fig., 15 Ref.

2A 263175 CHANGES IN THE BEHAVIOURAL AND STRUCTURAL CHARACTERISTICS OF A HYDROSOIL STABILIZED SAND-CLAY

Under the action of repeated loading, pavement materials exhibit complex behavioral and structural changes. This paper reports an experimental examination of these changes in a sand-clay, subjected to repeated triaxial compressive stress. A variety of techniques was employed to study the behavioral and structural changes in the soil. These included the use of mercury instruction porosimetry which enabled alterations in the pore system to be observed. Based on the experimental observations, some of the mechanisms associated with the structural changes were identified.

Shackel, B (New South Wales University /Australia/)

2A 263383 PETROGRAPHIC STUDIES, AREA DISTRIBUTION, AND TECHNICAL QUALITIES OF TUFAS USED AS AGGREGATES IN THE PROVINCE OF BUENOS AIRES

In this paper the geological and economic background information on tufa is analyzed, especially as regards its distribution and characteristics in the province of Buenos Aires. The frequent use of tufa as a material for highway construction is a cause of concern to geologists and engineers, who are conducting studies to define these calcareous materials on the basis of their geological and technological characteristics. The first chapter describes the tufas in Argentina and their regional distribution. Chapter II describes the technical qualities of the materials, samples are described on the basis of tests on absorption, specific gravity, "Los Angeles" abrasion, and permeability. Graphs are appended which show the ratio of calcium carbonate content to absorption, specific gravity to absorption, Los Angeles abrasion to texture, permeability to calcium carbonate content, and permeability to absorption. The conclusions reached from these studies are of a petrographic and technological nature. /Author/


Kilmurray, JO Pan American Highway Congresses Proceedings No. 142, Chapter VI, Topic 8, May 1963, pp 790-803, 4 Fig., 20 Ref.

2A 263397 SOIL MECHANICS TEST METHODS IN ROAD CONSTRUCTION

The aims and applications of the most important test methods for road construction are described. Knowledge of the particle-size distribution in soil facilitates accurate classification of all types of soil and gives information about the characteristic features of the various types. The grain-size distribution indicates the grain-size groups in a specific type of soil in percentages by weight. The particle sizes determined by sieving are designated according to the lengths of the sides of the square perforation of the sieve expressed in millimeters. The classification of coarse or fine-grained soils may be carried out by the grain distribution method. For further identification and classification of cohesive soil, additional test methods are necessary. Methods of determining the liquid limit of the soil, and the lowest moisture content at which the soil is plastic are described. The calcium carbide method of water content determination is outlined as well as the air-pycnometer method. Tests necessary in determining the water content are reviewed. Dry density tests are described as well as devices which determine the density by radioactive isotopes. "K" plate-bearing tests are also described.

Paulmann, G Trends-German Constructional Engineering for Expo No. 31, Mar. 1964, pp 59-64, 14 Fig., 11 Ref.

2A 263481 ASPHALT FINGERTIPING

Under present conditions of crude oil shortages, the quantity of asphalt available for highway construction is likely to be reduced. The extent of reduction is still somewhat uncertain. Equally uncertain is the extent to which the quality of the available asphalt may be affected. Some states may be faced with the necessity of using materials from unfamiliar crude sources or even with modifying their specification. For this reason, it appears that we should take a closer look at the usefulness of the system of cataloging and identifying asphalts that was developed under a Federal Highway Administration (FHWA) Research and Development Contract in 1971. Although the system is not completely definitive, nor foolproof, when
properly employed it can provide valuable guidelines to those faced with evaluating the effects of specification changes or judging the acceptability of new materials. The final report of the research is published in Report No. FHWA-RD-72-18 and is available from the National Technical Information Service. This article reviews some of the background and findings of this work as well as the rationale for the system. It is basically an abridgement of an article "Fingerprinting of Highway Asphalts," published by the Association of Asphalt Paving Technologists (AAPT).

Halstead, WJ Oglio, ER Public Roads Vol. 38 No. 2, Sept. 1974, pp 52-59, 2 Fig., 1 Tab., 20 Ref

2A 263463 IDENTIFICATION OF PROBLEM LATERITE SOILS IN HIGHWAY ENGINEERING: A REVIEW

Some laterite materials are known to be either inferior pavement aggregates or troublesome highway and earth dam construction materials. However, not all laterite soils belong to this group. A criterion for distinguishing problem laterite soils from non-problem ones for highway construction is proposed. Such a differentiation would be a considerable asset to highway engineers in determining the quality and suitability of doubtful laterite soils for highway and airfield construction. Laterite soils range in performance from excellent to poor, and in spite of considerable field and laboratory studies on these soils it is still not yet possible to predict accurately the behavior of these soils in the field. A general criterion based on physical appearance, are nongenetic and are applicable to both naturally and artificially frozen soils. From an engineering viewpoint, a criterion based on significant engineering characteristics, including such genetically inherent properties as sensitivity to drying and remolding, degree of potential swell and self-stabilization, and predominate clay minerals, may be more useful in predicting probable in situ behavior of laterite soils than the existing temperate-zone soil classification systems.

Gidigasu, MD (Building and Road Research Institute, Ghana) Transporta Research Record No. 497, 1974, pp 96-111, 3 Fig., 3 Tab., 126 Ref.

PURCHASE FROM: TRB Orig. PC

2A 263479 DESCRIPTION AND CLASSIFICATION OF FROZEN SOILS

The description and classification of frozen soils is presented as an extension of the Unified Soil Classification System adopted by the U. S. Army Corps of Engineers and the U. S. Bureau of Reclamation in 1952. Descriptions, measured by physical tests are indicated. Also, guides are presented for construction on soils subject to freezing and thawing. The report includes photographic illustrations of frozen soil types; a chart showing relationships between unit dry weight of soil, water content, and ice volume; and an example of graphical presentation of frozen soil data. /Author/

Conducted for Corps of Engineers, U. S. Army.

Linell, KA Kaplan, CW Cold Regions Research and Engineering Laboratory Tech Rpt. TR-150, Aug. 1966, 15 pp, 7 Fig.

2A 263486 INVESTIGATION OF THE USE OF SOFT AGGREGATES FOR SOIL STABILIZATION IN HIGHWAYS

For development of rural areas we need roads which can stand moderate traffic, but their cost of construction should be low. In the present study, attempts are made to study the suitability of the use of soft aggregates for road purposes. Soils with varying sand contents, and soft aggregates in different percentages are used to study the strength variations. 33% of soft aggregate for soils with higher sand contents, and 44% of aggregate for soils with lower sand contents have given maximum strength. 36 long test track with various soil-aggregates mixes was also constructed for field investigations. C.B.R. triaxial and plate bearing tests were conducted to study the strength and stability of various soil aggregates mixes. It has been concluded, that soil aggregate stabilized roads are the cheapest and can be substituted for conventional type of brick paved roads. These roads can later be used as base courses for better type of pavements when more funds are available.

Thatte, PM Roorkee University, India Mar. 1965, p 36

2A 263491 SURCHARGES MINIMIZE POST-CONSTRUCTION SETTLEMENT

The benefits of surcharges and waiting periods in highway construction are predicted by the application of the principles of soil mechanics. The use of these methods of construction minimizes the amount of detrimental settlement subsequent to paving. Time-consolidation data are used to determine the length of waiting periods. Unconfined and quick-undrained triaxial compression test results are used to determine the safe height of embankments. Berms permit construction to greater heights. Time studies and consolidated quick-undrained triaxial compression test data can be used to determine the increase in strength compatible with controlled rate of loading, but interpretation of test data and engineering judgment are significant factors. Comparison of field measurements and calculations based on test data indicate that the predictions of amount of settlement are somewhat more reliable than the predictions of the rate of settlement.


2A 263509 SOME COMMENTS ON THE DESIGN, TESTING AND SPECIFICATION OF STABILIZED SOILS FOR HIGHWAY CONSTRUCTION

Comments on procedures for the design, testing, and specification of stabilized soils are made in the light of recent developments, and some suggestions are made for modifications in current practice. The paper is limited to consideration of cement- and lime-stabilized soils although many practices also apply to bituminous stabilization. The problems of design for a pavement material whose performance is intermediate between flexible and rigid behavior are examined, and the testing of such a material for acceptance and for construction control is discussed with particular reference to mixing, curing and compaction. On this basis suggestions are made for the specification of stabilized soil pavements. /Author/


2A 263680 DEVELOPMENT OF SHOTCRETE FOR METRO CONSTRUCTION IN WASHINGTON

The use of shotcrete in the Washington, D.C. Metro System is reviewed. Shotcrete in this instance is defined as coarse aggregate as opposed to the ACI definition which is broader and includes fine aggregate and non-structural uses. Six-inch shotcrete linings in fair to good rock with moderate overbreak used in conjunction with rock bolting was considered to be an economical solution. Such linings could also be used as temporary supports eliminating steel ribs, and serve as the first step in building up a permanent lining. Prior layers of shotcrete. This paper which outlines basic steps utilized in developing shotcrete, also outlines the experience gained in implementing the specifications. The early set of shotcrete was selected at 500 psi at 8 hours and the 28 day strength was specified to be 5000 psi. The high early and final strength values must be selected for optimum effect and a trade-off has to be made between high early strength and high final strength for durability. The two gradations are presented which were specified for the combined coarse and fine aggregates. In the accelerating admixture needed to reduce rebound, two to 3 percent by weight of cement is used. A maximum of 3 minutes for initial set and 12 minutes for final set for the cement-accelerator paste, and a paste strength of 800 psi in 8 hours are specified. Control aggregate gradation was achieved by selecting two sizes of aggregate with maximum sizes of 0.75 and 0.5 inch were selected. Field trials by nozzlemen, quality control during production and construction testing are also discussed. Of the accelerators tested, Sigunite and Triacasol T-1 confirmed to requirements. Tests were made to determine the compatibility of cements with the selected accelerators and the ability of the combinations to produce the desired early strength.


Bawa, KS (Lorenzi, Dodds and Gunnill) American Society of Civil Engineers, American Concrete Institute Conf. Proc. SP-45. 1974, pp 33-49, 6 Fig.
2A CONSTRUCTION MATERIALS

2A 263687
USE OF SHOTCRETE FOR TUNNELLING IN DIFFICULT GROUNDS

The use of shotcrete in Europe is discussed. Experience in the use of shotcrete in a hydroelectric plan tunnel in Italy is described. Special reinforced shotcrete was used to line the tunnel immediately after excavation. The reinforcement consisted of steel mesh ribs placed at distances varying from 0.5 to 1.20 m and completed by secondary rods and by a large steel mesh behind the steel mesh ribs. Details are outlined of this construction which, subsequent studies indicate, was completely successful. A second project is detailed which consisted of road tunnels which underpassed built-up zones and garden zones. The ground consisted of various types of argillaceous strata, some part of which were greatly decomposed and others totally decomposed. The problems presented in this particular situation could be solved only by the shotcrete system. A section in which the shotcrete ring was the only support of the tunnel up to the completion of the excavation works (2 years later), was continuously tested by survey of bench marks installed from 3 up to 7 on a part of the steel mesh ribs. The maximum subsidence (on single bench marks) were of 0.30 mm after 272 days and of 0.416 mm after 242 days at another point. These data confirm the validity of the shotcrete method. Comparisons are made of the results of the shotcrete method with those constructed according to traditional methods. The successful use of the shotcrete method for the construction of the Milan Subway System (1967-1970) is described.

Curzio, PQ, Barazzoni, G, Nobili, F, Anselmi, A (Quadrio Curzio S.p.A., Italy)
American Society of Civil Engineers, American Concrete Institute Conf. Proc SP-45, 1974, pp 79-95

2A 263763
ROADWAY DESIGN IN SEASONAL FROST AREAS

The study which consisted of a literature review, a questionnaire survey of North American road design agencies, and visits to ten agencies for discussion of their practices, synthesizes current pavement design procedures in seasonal frost areas, as well as construction and maintenance practices and identifies those that are of greatest value. The primary approach for minimizing the detrimental effects of frost action in the subgrade is to deal with soils classified as frost-susceptible during the design and construction process. This may be effected by either removal of such soils to below the level of frost penetration and replacement with non-frost susceptible soils, or accommodation of the frost action during the structural design process by eliminating the discontinuities leading to differential heave and by strengthening the pavement structure. The methods used to acquire soils and materials data (essential for the pavement design process) are: those reliant on pre-existent data such as pedological and geological surveys; indirect assessment such as airphoto interpretation and remote sensing; and direct approaches such as geophysical surveys and direct sampling. The characterization of temperature regime in pavement structures affected by frost action includes such parameters as depth of frost penetration, number of freeze-thaw cycles, and duration of freezing and thawing periods. The sources of water contributing to freezing are separated into the categories of surface water and subsurface water. Drainage is a fundamental feature of the pavement design process. Specific attention to the route where frost-susceptible soils are likely to occur should be identified, investigated, and corrected during construction. Selection grading is a technique for reducing frost action by placing the more frost-susceptible soils in the lower portions of the embankments and the less susceptible materials on the upper portion of the subgrade. The importance is stressed of the inspection of the subgrade, and the achievement of the highest possible density of subgrade and base courses. Other methods used to reduce frost action include soil stabilization, thermal barriers and encapsulation. Spring load restrictions which may be considered as preventive maintenance are also discussed.


Transportation Research Board NCHRP Report No. 64, Aug. 1974, pp 5-9

2A 263784
USE OF COLOR AERIAL PHOTOGRAPHY IN ENGINEERING MATERIALS SURVEYS

The opportunity to use aerial color photographs in a comprehensive construction materials survey presented itself in Yellowstone National Park (area - 2,772 sq. mi.) where a critical construction material shortage existed in certain portions of the Park. This project was undertaken by the Federal Projects Office, Region 9, U.S. Bureau of Public Roads, and was sponsored by the U.S. National Park Service. Strip aerial photographs were taken along the major highway system at a scale of 1:6,000. The aerial reversal color positive transparencies obtained were examined stereoscopically. The color transparencies at this scale proved most effective for the material survey. Special considerations in the procurement of color aerial photography are presented together with descriptions of field and office procedures. The use of aerial color photography for construction materials searches is still limited but is likely to increase due to technological improvements, reduced costs, and a general awareness by potential users of its advantages over conventional photography. Recent significant trends in aerial color films are increase in emulsion speed, a widening of exposure latitude, improvement of color reproduction, and an increase in resolution. Negative aerial color film now provides a greater variety of possible products and thus affords greater flexibility in use than reversal color film processed to a positive transparency. Areas are indicated where research on conventional color films and false color films for aerial photographic interpretation for highways is needed.

AUTHOR/

2A 263844
DETERMINATION OF COMPACTION PROPERTIES AND BEARING CAPACITY CHARACTERISTICS OF VARIOUS SOILS

In the financial year under review, the Road Foundation Department has made studies of the American report on the results of the large-scale road tests at Ottawa, Illinois, U.S.A., known under the name of the AASHO Road Test. In conjunction with these studies, the Department has carried out a relatively detailed investigation of a sample which had been taken from the homogenised layer in the subgrade during the AASHO Road Test. The Department made laboratory tests with the object of determining the road engineering properties of this material, primarily its compaction properties and bearing capacity characteristics. These tests will be described and their results will be presented in a separate report. The above-mentioned investigation formed part of a series of systematic laboratory investigations dealing with the bearing properties of various road construction materials. This series had been started earlier, and was continued in 1963-1964.

AUTHOR/
Statens Vaginstiitut No. 45A, 1963, pp 14-15, 1 Tab
CONSTRUCTION MATERIALS

2A 263965
A REVIEW OF LITERATURE ON SWELLING SOILS
This report, which is based on review of selected literature available to the
authors and added pertinent to the study of expansive clays, may be briefly
summarized as follows: High volume change clays have been encountered in
many parts of the world and frequently have caused severe damage to
structures. Differential movement of these soils may be due to shrinkage
swelling, or cyclic volume changes. Of these, swelling is the most
detrimental. Swelling of soil may result from any combination of increase in
the availability of water, alteration of clay so that its thirst for water is
increased, or reduction of the applied load on the clay. Because of their
electrical colloidal nature, clay particles have a great attraction for water.
The osmotic imbition of water by clay minerals combined with relaxation of
effective stress provides the principle mechanism involved in the swelling
of soils. Identification of high volume change soils can be accomplished by
methods of mineralogical identification or by methods based on volume
change characteristics of the soil. In a complete study of high volume change
soils both types of studies should be made. For many laboratories, however,
some of the specialized mineral identification methods, such as X-ray
diffraction or differential thermal analysis, may prove to be too complicated
and expensive, and identification may have to be based entirely on the
simpler and more practical tests of volume change characteristics. The
quantitative prediction of potential volume change of a clay is essential to
solution of the engineering problems arising from volume change. The use
of the consolidometer, which has proved the most satisfactory means of
predicting potential volume change in clayey soils, has been developed, but
further investigation of the detrimental effects of swelling soils has been the
object of numerous research studies. Probably the most satisfactory single remedial procedure
in use has been the removal of the expansive soil and its replacement with
stable material, but surcharge loads, prevention of ingress of water,
prewetting, and chemical stabilization all have had some success in reducing
detrimental swell. It is evident that investigation into all aspects of swelling
soils has been extensive in the past, but it is not yet understood to the
extent and diversity of published literature. It is also evident that some
aspects of the swelling soil problem have been solved reasonably satisfactorily
from the point of view of the engineer, some aspects are moderately
understood, and some aspects will bear further research. From the point of
point of view of the engineer, clay mineralogy, the behavior of water in a clay
system, and the mechanisms leading to the swelling of a soil are basically
understood. However, the interdependence of the several factors upon which a
particular behavioral relationship depends is not always clear. An example of this is the disagreement noted in this review over the effects of
the combination of stress history and climatic history on the subsequent swelling
of a soil. In regard to identification of swelling soils for engineering purposes,
the qualitative aspect appears essentially solved, utilizing classification test
data as done by Seed, Woodward, and Lundgren. In research work more
complex methods are applicable. The problem of quantitative prediction of
swelling is still being studied. The problem of controlling swell has been studied, but
further research would seem indicated for the use of the consolidometer test
will be profitable. In this regard the double oedometer test appears to
hold promise. The control of swelling of expansive soils appears to be the	largest problem yet to be solved satisfactorily. Control of compacted swelling soils apparently is best achieved by moisture and density management, though further work seems
necessary. Numerous methods of control of swell of undisturbed soils are
reported in the literature, but the efficacy of any method or group of methods
in a particular instance is often speculative until attempted. This is
Colorado Division of Highways 1964, pp 1-65, 17 Ref.

2A 263943
IMMEDIATE AMELIORATION OF WET COHESIVE SOILS BY QUICKLIME
Immediate amelioration of wet cohesive soils by lime, a current practice in
earthworks operations for highway construction in Belgium, is performed
with 1 to 1.5 percent quicklime. Such small doses are effective because they
agglomerate the soil into crumbs that are stable in free water and retain their
individuality after kneading and compaction. Procedures for evaluating the
crumb stability have been developed. Additions of 1 percent quicklime
produce not only the immediate amelioration effects but long-term strength
gains as well. Strontium and barium hydroxides produce the same immediate effects as equivalent amounts of lime but far lower long-term strength gains.
Lime percentage has far less incidence on immediate amelioration than on
long-term strength gains.

Van Gasse, RF (Centre de Recherches Routiere, Belgium); Glenn, GR
(Rutgers University, New Brunswick) Transportation Research Record
No. 501, 1974, pp 42-53, 2 Fig., 5 Tab., 26 Ref.
PURCHASE FROM: TRB Orig. PC

2A 263974
THE VARIATION OF SOIL TEST RESULT IN RELATION TO ROAD FOUNDATION DESIGN
A STATISTICAL analysis of the soil test results of several road projects has
revealed that a large reduction in the number of subgrade samples tested
appears to be warranted. On the other hand, greater attention in the control
of quality of materials used in the subbase and basecourse of roads in South
Africa seems necessary. A simple concept is introduced for the rejection or
acceptance of materials on a section of road based on the sample mean and the
coefficient of variation. The use of soil engineering maps should lead to a
more balanced approach to road foundation design. / AUTHOR/
Proceedings of the Diamond Jubilee Convention, South African Institution
of Civil Engineers, Johannesburg, 1963.

Williams, AAB
National Institute for Road Research, South Africa Proceeding 1963, PP
171-176, 5 Fig.

2A 263980
NUCLEAR EXPLOSIVES IN CIVIL CONSTRUCTION
Nuclear explosives offer a means of reducing both costs and time for some
types of major civil construction projects. Hardrock can be rapidly and
predictably reduced to high-quality aggregate. Linear craters resulting from
five or more simultaneous explosions can be connected to form cuts for use in
highway, railroad, and canal construction. Broken rock for aggregate is
produced in maximum amount by burial of the nuclear explosive deeper than
for focal point explosions; the result is a mound of rubble rather than a
vacuum depression. The size distribution of the rubble depends primarily on
the physical properties of the pre-explosion rock, especially the natural fracture
characteristics. Costs are estimated at 10, per ton for a 10-kiloton explosion.
Multiple charges produce linear craters whose shape, depth, and width
depend on charge yield and spacing. Optimum conditions result in a trench
with scalloping of less than 10 percent of the average width, and rubble at
the trench ends of less than 3 percent of the total ejecta. Seismic shock
problems are minimized by blasting the cut in separate connecting sections.
Current research efforts are directed at obtaining experience and to gaining
better understanding of variable (such as those resulting from surface
topographic irregularities and variable geologic conditions) as they pertain
to problems of crater slope stability and the use of crater fallback as
foundation material. Significant recent cratering experiments in hard rock
include three with nuclear explosives and eight with large chemical high
explosives. / AUTHOR/

Hansen, SM (California University, Berkeley)
Engineering Geology & Soils Engineering Symposium Proceeding 1966, p 18

2A 263988
PAVEMENT DESIGN FOR ROADS IN BANGKOK
An analysis of the subgrade strength for the soil conditions prevailing in
Bangkok is made from considerations of the soil suction characteristics of
crystals, the surcharge of the pavement structure and the water table. It is
shown that this is not likely to be greater than 1.5 percent CBR. On this basis
comparative designs for flexible and rigid pavements are developed using

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three widely used design methods for four levels of traffic. The differences between the pavement thickness given by the different design methods are discussed. It would appear that unreinforced concrete slabs should be marginally more economical than those reinforced, but the additional cost required is simple and the construction lends itself to labor-intensive methods. An experiment is recommended to compare the comparative designs. /Author/

Williams, FHP  Geotechnical Engineering  Vol. 3 No. 2, Dec. 1972, pp 105-126. 5 Tab., 16 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 209559)

2A 264167

FEASIBILITY STUDY OF THE MARKETABILITY OF THE RMI. THERMO-MATIC PLANT FOR RECYCLING PAVEMENTS

In this assessment of the marketability of a newly developed mixing plant through which discarded asphalt pavements may be recycled, consideration is given to the economic, technological, environmental and marketing aspects. The mixing plant consists of a drum mixer so designed that the flame and exhaust from the burner does not come into direct contact with the material being mixed. This allows the recycling of old pavement asphalt by burning in a conventional drum mixer. Provision is made for the addition of a softening agent, and more asphalt if necessary in order to arrive at the proper consistency and amount of asphalt in the recycled asphalt. The plant produces virtually no pollution. This recycle operation has the advantages of lower cost, reduction of the use of scarce natural resources and an improvement in the quality of the environment. There are also indications that a recycled pavement may perform better than one made of virgin asphalt.

Dunning, RL  Dunning (Robert L)  July 1974, 15 pp, 1 Tab., 15 Ref.

2A 264243

ABSTRACTS OF REPORTS PREPARED BY THE ROADS DIVISION

Abstracts are presented of reports relating to traffic planning for smaller towns, road construction and road traffic. A representative sample includes the following: report on Administration of Arterial Road Program; A Study of Highway Construction and Maintenance Operational Management in the Republic of Ireland; The International Road Research Documentation System: Civil Engineering Technicians in the Local Authority Service; Dublin Transportation Study Report; Road Construction with Gravel in Ireland; Nailed Timber Post and Rail Fences; Public Lighting in Ireland; The Influence of Traffic on the Design of Road Pavement in Ireland; A Pilot Scale Experiment to Study the Performance of Small-bore Slotted Plastic Pipes; Stained Wire Fence; Frost Penetration under Roads in Ireland; The Drainage of Rural Roads; Draft Specification for Road Works; Studies to Assess the Implications of Increased Single Axle Loads; A Review of the Regulations for Weights and Dimensions of Commercial Vehicles; Some Guidelines on Road Fence in the Landscape; A Study of Dense Aggregate Gradations Specified for Bituminous Mixtures; An Analysis of Road Asphalt Samples; Coated Chippings in Rolled Asphalt; The Influence of Asphaltic Cement on the Resistance to Skidding of Rolled Asphalt; The Wear and Skid-Resistance Characteristics of Selected Road Aggregates; Accounting Procedures for Local Authority Engineering Services; A review of Analysis Results for Samples of Rolled Asphalt and Coated Macadam; A Study of the Effects of Temperature on Pavement Friction: Polished Stone Values and Engineering Properties of Road-making Aggregates in Ireland; The Use of the Deflection Bow in Indicating the Strength of Flexible Road Pavement; Road Accident Facts: A Computer Program to Analyze SCRRIM Data; Report on Visual Classification Counting on the Arterial Road Network; Road Inventory Manual; Proposed Warrants for the Installation of Traffic Signals at Intersections; Vehicle Number Projections; and A Road Needs Study.

An Foras Forbartha  May 1974, 24 pp, 90 Ref.

2A 264262

ENGINEERING CHARACTERISTICS OF THE LOESSIAL SOILS OF WEST TENNESSEE

The 25 to 30 mile wide loess belt which extends west of the Mississippi River is described, and the data is presented of the analysis of approximately 100 samples in which standard A.A.S.H.O. testing methods were employed. Field moisture content was determined on samples collected from line holes. Field observations were made of cut and fill slopes along existing roadways that cross the loess belt. Test data from eroded roadway cuts were compared with the data from the form more stable vertical to near-vertical slopes. The results of these comparisons, the field observations, and the studies of the design policies of other highway departments indicate that near-vertical slopes are preferable over conventional soil slopes. If near-vertical slopes are chosen, certain construction and maintenance procedures must be followed if the slopes are to remain stable. If the more conventional soil slopes are utilized, slope ratios no steeper than 2-5:1 with immediate sodding or heavy seeding are recommended. The employment of low in embankments at very near optimum moisture content is essential if maximum stability is to be achieved. Whatever type slope design is chosen, proper maintenance is necessary if continued stability is to be insured.


2A 264272

OPTIMUM DENSITY AND MOISTURE CONTENT OF NEW MEXICO CLAYS

Abstracted from the paper which discussed the most beneficial density and moisture content for compacted New Mexico Triassic clay subgrades. Current specifications do not consider environmental changes after the soil is in place under a roadway, and the density required is based on an arbitrary compactive effort. An infinite number of compactive efforts is available and the true problem is to determine which compacted dry density and moisture content will give the highest strength and minimum swell after environmental changes such as shrinkage due to drying before the base and pavement have been installed and by capillary wetting after the pavement is installed and evaporation is prevented. Research results are presented and a different method of specifying compacted densities for New Mexico subgrades is suggested.


2A 264282

MINOR FLAWS IN THE COMPACTION OF BASES PRODUCE MAJOR EFFECTS

It has been found in the construction of certain highway projects that the compaction test methods and compaction equipment currently being used do not ensure that stability of highway bases can be maintained for a period of time, especially if the highway is subjected to fairly high frequencies of heavily-loaded vehicles. The paper presents conclusions concerning the causes of such instability and makes several specific recommendations for overcoming it in future highway construction programs. The principal recommendations concern the use of extremely heavy compaction equipment, a critical study of the stability of various base material, and the inclusion in the construction specifications that projects be opened to traffic for specific periods of time to allow cohesion of materials and the correction of any deformation caused by traffic. /Author/


ACKNOWLEDGMENT: Organization of American States

2A 264283

STUDY OF STABILIZED MATERIALS FOR THE CIENAGA-BARANQUILLA HIGHWAY

This paper deals with the design of soils stabilization for the Cienaga-Baran­ulla Highway, located in the northern part of Colombia. There were two main problems in the construction of this highway: (a) some sectors appeared to have excessive settlements, and (b) the rocky materials for the layers of base and sub-base were very scarce. Because of this reason, it was necessary to stabilize the sandy materials that were found along the road. At the beginning, it was proposed to use a soil cement stabilization of the
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"hard type" or the "modified soil cement." At the same time several tests with liquid asphalt RC-2 (sand-bitumen dense mix) were performed and resulted in the conclusion that it would be more advantageous to use asphalt as a sand additive. At the end of the report some of the conclusions are discussed. This type of stabilization can be found for certain locations where only sandy materials are found. /Author/


ACKNOWLEDGMENT: Organization of American States

2A 264287

RELATIVE DENSITY AS COMPACATION CONTROL FOR GRANULAR SUB-BASE MATERIALS

Relative density has often been used for foundation and earth dam construction control, but it has not been used extensively for compaction control of highway sub-base sub-materials. A review of the principles of relative density indicates its applicability to highway construction and design work, while certain limitations are noticed in the application of the Standard Compaction Test to the control sub-bases. The results of two brief testing programs are presented in which the application of the relative density concept was found useful. It was found that it could be used as a suitable specification for the control of fine sand sub-base materials, and of four gravelly coarse sand materials. Limitations to the tests and lack of standardization prevent the immediate use of this method as a construction control, and these points require further testing. /Author/


ACKNOWLEDGMENT: Organization of American States

2A 264420

MOISTURE-DENSITY RELATIONS OF SOIL-AGGREGATE MIXTURES AS AFFECTED BY THE GEOMETRIC CHARACTERISTICS AND GRADATION OF COARSE AGGREGATES

This paper summarizes the results of a laboratory study concerning the effects of the geometric characteristics and gradation of coarse aggregates on the moisture-density relations of soil-aggregate mixtures. Six coarse aggregate materials with discernible geometric characteristics, including both gravel and crushed stone materials, were used in the investigation. The geometric characteristics of these aggregates were determined by the particle index test and expressed quantitatively as particle index values for positive identification. Each coarse aggregate material was combined with various percentages of fines aggregate and soil materials to form nine different and fully controlled gradations according to a mathematical expression. The moisture-density relations of these mixtures were determined according to AASHO Designation: T-99-57. The results of this investigation show that the percentage of voids in a compacted soil-aggregate mixture of a given gradation increases more or less linearly with increasing values of the particle index of the coarse aggregate; that is, as the coarse aggregate particles become more irregular in shape, angular, and roughly surfaced. For the soil-aggregate mixture containing coarse aggregates of given geometric characteristics, there is an optimum gradation at which maximum dry density is achieved. The optimum moisture content is also a minimum for this gradation. These results indicate convincingly that both the geometric characteristics and the gradation of the coarse aggregate material deserve consideration in the construction control of soil-aggregate road materials. /Author/

Huang, EY
Michigan Technological University 1966, 23 pp

2A 264642

THE FAILURE OF A ROAD CONSTRUCTED ON A COLLAPSING SOIL

The occurrence of damage to buildings founded on certain silty sands and residual granites due to sudden collapse of the soil structure upon inundation has come to be well recognised. It has recently become apparent that these collapsing soils can also cause damage to roads, and a case is reported where extensive settlement failures occurred on a heavily-trafficked road founded on such material. Agreement was found between the observed settlements of four or six inches and the results of computations based on both the increase of density beneath the road and the results of double consolidometer tests. Collapse extended down to a depth of three or four feet. Such soils cover wide areas in Southern Africa, and collapse could constitute an important road problem. The first essential to achieving a satisfactory design is the recognition of the soils and their indeterminate nature. Since this is not guaranteed by normal soil survey procedures, a number of criteria to aid recognition of such soils are given. In construction it is essential that the soil be improved to a considerable depth, and some possible construction procedures are discussed.

Proceedings of the 3rd Regional Conference.

Knight, K. Dehlen, GL

ACKNOWLEDGMENT: CSIR Research Review. South Africa

2A 264688

LATERITIC GRAVEL EVALUATION FOR ROAD CONSTRUCTION

In this closure to the discussion of the paper, the authors comment on durability tests, and state that the selection of the aggregates (0.5 min-0.375 min) for testing was such that the influencing factors would be limited and the significance of the properties of the aggregate to durability may be assessed. The work tried to substi the formation conditions of laterite with performance. The deposition at lower slopes is described of a mixture of pisolithic gravel, pieces of free quartz particles and quartz particles as nucleus with a coating of sesquioxide. Short silicate analysis of the aggregate of this mixture, excluding the free quartz, will give variations in the silica/alumina ratio because free quartz and silica have the same chemical formula. Definitions based on the different properties of laterite are reviewed. Concerning the field performance of pavements, the author agrees that there are factors such as subgrade strength, drainage conditions, and construction techniques which influence the strength of the pavement. Of such factors the strength of the aggregates has a significant influence on pavement performance. Field compaction in developing countries is discussed. The analogy of compression strength of concrete is used to explain why aggregates (0.5 in to 0.375 in) were isolated and mechanical strength conducted on them.


2A 264754

DENSITY OF BITUMINOUS SURFACE COURSES

Research is reported that was designed to determine the probable causes of low densities obtained during construction of bituminous surface courses designed with slag aggregate, and to determine the effect of low densities on the performance and durability of in-service bituminous surface course throughout Tennessee. The research literature in this field is reviewed and the causes of low density are examined. The probable primary causes of low densities in bituminous surface courses were found to be the lack of rolling in the breakdown and intermediate rolling sequences, the low mat temperatures during rolling operations, and the asphalt contents below the design asphalt content. The effect of density on surface performance is discussed and tables are presented of record densities, core densities and ratings from field inspections. As a result of this project more widespread use is being made of nuclear density surface gauges. A large number of tests may be conducted in a short time after laydown and rolling operations and a closer quality control of paving operations may be maintained.


Marks, BD (Department of the Air Force); Ford, HO
Tennessee University. Knoxville Proceeding Bulletin No. 40, Jan. 1974, 6 Fig., 6 Ref.
CONSTRUCTION MATERIALS

2A 264758
SKID RESISTANCE STUDIES IN KENTUCKY (AN OVERVIEW-1974)

Kentucky studies relating to pavement slipperiness are reviewed. Considerable effort has been devoted to the development of better methods of skid resistance testing and to standardization of testing devices. The development and standardization of a trailer test represented significant progress in measurement techniques. Effort was expanded to relate skid resistance data to accident statistics. Relationships between wet-surface and dry skid resistance were established. These indicated that surfaces with skid resistance less than a "critical" value have disproportionately higher wet accident rates. The development of skid-resistant surface courses to operational status has been studied. The development was undertaken of a sand asphalt in which full reliance for skid resistance would be given to hardness, sharpness and angularity of quartz sand. This was an attribute of Kentucky rock asphalt and sandstone aggregates excelling in skid resistance. Pavement design alternatives using indigenous materials appear to be sand asphalts and open-graded friction courses. Aggregate incorporated in these mixes must be angular and resistant to polishing. These aggregates include: crushed quartz gravel, slag, lightweight (expanded) shale, and possibly sandstones.

Prepared for presentation to the 33rd Annual Meeting of SASHTO, October 16-19, 1974, Louisville, Kentucky.

Havens, JH Burchett, JL Rizenbergs, RL

2A 264783
MIX DESIGN METHODS FOR ASPHALT CONCRETE AND OTHER HOT-MIX TYPES

This manual which provides engineering data for the instruction of design and construction personnel in the use of hot-mix design methods, contains information on the latest methods to ensure high performance of asphalt pavements in modern traffic conditions. The application is reviewed of design testing to general construction practice. Testing references and detailed procedures are outlined for routine analysis of materials and paving mixtures. A number of typical examples of routine computations and calculations related to mix design are included in the appendix. Details of the Marshall method and the Hotvem method of asphalt paving mix design are outlined. The method of design and the test criteria are presented free from specification requirements for materials and construction. The objectives of asphalt paving mix design and the evaluation and adjustment of mix designs are described as well as the design method and requirements. The coordination of mix design testing is discussed, and aggregate gradations and fractions are described. Examples are presented to illustrate the application of the design method and the requirements. Analysis procedures are described which apply either to paving mixtures that have been compacted in the laboratory or to undisturbed samples that have been cut from a pavement in the field. Definitions are set forth and a table chart illustrates the influence of type of specific gravity on determination of VMA (voids in the mineral aggregate) and air voids. A procedure for analyzing a compacted paving mixture is outlined and the determination of effective specific gravity of aggregate is described. The maximum specific gravity of mixtures with different asphalt contents, asphalt absorption, effective asphalt content of a paving mixture, percent VMA in a compacted paving mixture, and the calculation of percent air voids in compacted mixture are other aspects covered. Notes are appended relating to the analysis of aggregate gradations and the combining of aggregates to obtain desired gradation.

Asphalt Institute Series No. 2 (MS-2), Mar. 1974, 102 pp, Figs., Tabs., 1 App.

PURCHASE FROM: Asphalt Institute Institute Headquarters, Asphalt Institute Building, College Park, Maryland, 20740 Repr. PC

2A 264868
NOTES ON THE PROBLEMS OF THE INTERNAL STRUCTURE OF SURFACING MATERIALS WITH REFERENCE TO THE VARIOUS MATERIAL COMPONENTS [Anmerkungen zu Problemen der inneren Struktur von Deckenbaustoffen unter Berucksichtigung der Verschiedenen Baustoffkomponenten]

As regards the internal structure of aggregates, information can be obtained from the observation of enlarged coloured slides of rock slices, which provide data on their suitability for bituminous road construction. Individual particles of basalt having a rounded, conical or mixed structure, of gneiss rock having significant layering, of sandstone having quartz particles cemented with siliceous acid, and of quartz rock behave differently when subjected to practical stresses. For example it can be seen the rock slices that sandstone always remains skid resistant but will not for long resist marked stress by studded tyres. With reference to conical basalt particles, the possibility of adding asbestos fibres to the bituminous mortar is discussed. [German]

Brand, W Bauwirtschaft Vol. 26 No. 20, 1972, pp 760-761

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 300852)

2A 264887
RESEARCH PROBLEM STATEMENTS: DESIGN AND CONSTRUCTION OF TRANSPORTATION FACILITIES GROUP

Statements are presented which represent the composite of efforts of seventeen committees whose function it was to identify transportation problems and develop and disseminate research problem statements which will provide guidance to financial sponsors such as governmental agencies, research institutions, industry and the academic community. Each contributing committee identified and presented 2 problem statements. These were then screened and two top priority statements were chosen from the collective efforts of the section. The Standing Committee then reviewed the statements and rated them in three priority categories: (a) top priority statements from each Section, (b) top priority statements from each category A. (c) and all other statements. This publication outlines the details of each problem statement. The scope of each problem is defined and its objectives are set forth. Current activity in the area is reviewed and an assessment is made of the degree of urgency of the problem. The committees contributing the statements in this issue covered the following fields: geometric design: hydrology, hydraulics and water quality; safety appurtenances; shoulder design; pavement design; dynamics and field testing of bridges; characteristics of non-bituminous components of bituminous paving mixtures; performance of concrete (physical aspects); performance of concrete (chemical aspects); mineral aggregates; sealants and fillers; adhesives bonding agents and their uses; lime and lime-flyash stabilization; subbase drainage, exploration and classification of earth materials; environmental factors except frost.

Transportation Research Circular Number 160, Nov. 1974, 79 pp

PURCHASE FROM: TRB

2A 264900
LIQUID SULPHUR

Liquid sulphur, a by-product of the oil and natural gas industries, has given ecologists a king-sized headache in the past because it is so difficult to get rid of, but recent tests by the Ontario Department of Transport and Communications, and Shell Canada, show that it greatly improves the stability of sand-asphalt mixes when added at the rate of 10-15 percent by weight. Contractors may be interested to know that further research by Professor Robert Gallaway at Texas A & M University is aimed at improving mix and thickness design for sulphur mixes. Looks like a good way to build pavements and improve the environment at the same time.


2A 264913
DEVELOPMENT IN QUALITY CONTROL OF CONCRETE DURING CONSTRUCTION

New methods of quality control of concrete during pavement construction have successfully been carried out in Switzerland on all main road projects since 1969. A combined quantitative and qualitative microscopic analysis has been carried out on thin slices of 2-day-old concrete in more than 800 tests. Quantitative analysis determines the frost-salt (F-S) resistance. In addition to the spacing factor, nine other factors are being considered. The evaluation of F-S resistance foresees a subdivision in five groups according to the durability factor. The qualitative, morphological control analysis is done on the same slice and at the same time the quantitative analysis is carried out. The morphological quality control determines precisely the faults in the concrete as well as their causes. It also makes it possible to rectify these faults during further construction. Concrete
CONSTRUCTION MATERIALS

The occurrence of damage to buildings founded on certain silty sands and residual granites due to sudden collapse of the soil structure upon inundation has come to be well recognized. It has recently become apparent that these collapsing soils can also cause damage to roads, and a case is reported where extensive settlement failures occurred on a heavily-trafficked road founded on such material. Agreement was found between the observed settlements of four or six inches and the results of computations based on both the increase of density beneath the road and the results of double consolidometer tests. Collapse extended down to a depth of three or four feet. Such soils cover wide areas in Southern Africa, and collapse could constitute an important road problem. The first essential to achieving a satisfactory design is the recognition of the soils and their inherent danger. Since this is not guaranteed by normal soil survey procedures, a number of criteria to aid recognition of these soils are given. In construction it is essential that the soil be improved to a considerable depth, and some possible construction procedures are discussed.

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Knight, K. Dehlen, GL Africa on Soil Mechanics and Fdn Engineering Conf Proceeding June 1963, pp 31-34

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CONSTRUCTION MATERIALS

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Kentucky Department of Highways Research Rpt. 399, Sept. 1974, 25 pp, 10 Fig., 1 Tab., 18 Ref., 2 App.

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PURCHASE FROM: Asphalt Institute Institute Headquarters, Asphalt Institute Building, College Park, Maryland, 20740

LIQUID SULPHUR

Liquid sulphur, a by-product of the oil and natural gas industries, has given ecologists a king-sized headache in the past because it is so difficult to get rid of, but recent tests by the Ontario Department of Transport and Communications, and Shell Canada, show that it greatly improves the stability of sand-asphalt mixes when added at the rate of 10-15 percent by weight. Contractors may be interested to know that further research by Professor Robert Gallaway at Texas A & M University is aimed at improving mix and thickness design for sulphur mixes. Looks like a good way to build pavements and improve the environment at the same time.

Transportation Research Circular Number 160, Nov. 1974, 79 pp

DEVELOPMENT IN QUALITY CONTROL OF CONCRETE DURING CONSTRUCTION

New methods of quality control of concrete during pavement construction have successfully been carried out in Switzerland on all main road projects since 1969. A combined quantitative and qualitative microscopic analysis has been carried out on thin slices of 2-day-old concrete in more than 800 tests. Quantitative analysis determines the frost-salt (F-S) resistance. In addition to the spacing factor, nine other factors are being considered. The evaluation of F-S resistance foresees a subdivision in five groups according to the durability factor. The qualitative, morphological control analysis is done on the same slice and at the same time the quantitative analysis is carried out. The morphological quality control determines precisely the faults in the concrete as well as their causes. It also makes it possible to rectify these faults during further construction. Concrete...
CONSTRUCTION MATERIALS

2A 264914
VOID PARAMETERS OF CONCRETE CORES FROM A SECTION OF I-64
In the hope of determining whether variables in unit weight were caused by variations in the air void system or segregation of the aggregate, micrometric air void and aggregate analyses were made on 24 core samples from six test sections of I-64 near Charlottesville, Virginia. The test design included paver speeds of 3, 4.25, 5.5, 11, 12, and 14 ft/min (0.0152, 0.0261, 0.0275, 0.0561, and 0.0711 m/s), vibrator frequencies ranging from 130 to 167 revolutions/sec, and slumps from 1 to 2.75 in. (25.4 to 70 mm). Analyses showed that for any particular concrete, the faster the motion of the vibrators through the concrete and the greater the spacing, the less the consolidation will be. Between batches, the greater the slump or workability is, the greater the consolidation achieved by a set of vibrator conditions. Frequencies of the vibrators used covered such a narrow range that no correlation between frequency and consolidation was possible. Insufficient sampling precluded the determination of aggregate segregation. For the type of concrete and kind of vibrators used, data seem to indicate that, if the slump approaches 1 in. (25.4 mm), then the forward speed of the vibrator screed should be no more than 6 ft/min (0.0305 m/s) when the spacing of the vibrators is about 2 ft (0.61 m). Higher speeds will probably produce high-void, low abrasion-resistant areas of pavement.

Walker, HN (Virginia Highway Research Council) Transportation Research Record No. 504, 1974, pp 27-36, 6 Fig., 1 Tab., 7 Ref.

PURCHASE FROM: TRB Orig. PC

2A 265056
STRENGTH COEFFICIENT OF MATERIALS
This study investigates the relationship of strength to thickness and type of material for six different construction materials: two bituminous paving materials, the same two aggregates without asphalt and two gravels typical of those normally used for base or subbase materials. Testing was conducted at a test site where each material was placed in thickness of 3 to 24 inches in 3-inch increments. In addition to normal laboratory and construction test procedures, plate bearing, Benkelman beam and Dynaflect tests were performed. Coefficients of strength were determined for the test materials and examples of design based upon these coefficients are shown. [FHWA/Notice of NTIS Number Pending]

Crawford, RA Anderson, DW South Dakota Department of Transportation Final Rpt. SD 613 (70), Dec. 1973

ACKNOWLEDGMENT: Federal Highway Administration (SO280)
PURCHASE FROM: NTIS

2A 265088
DETERMINATION OF THE PERCENTAGE OF WEAR/LOS ANGELES SMALL SAMPLES OF STONE AGGREGATE FOR USE IN ROAD CONSTRUCTION [Determinazione della percentuale di usura del materiale granulare di un campione di grani granulare di un materiale granulare]

Lancier, F Strade No. 10, Nov. 1973, pp 605-609, 2 Fig., 3 Tab., 6 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 209935)

2A 265101
EXPERIMENTAL SECTION CONTAINING GRAVEL STABILISED WITH PRECRUSHED GRANULATED SLAG [Blanche experimentale d'une grue traitée au laitier granulé préconcus] Difficulties of manufacturing all the granulated slag class 40/60 needed and the problems encountered in the use of granulated slag class 20/25 led to the experiment of using precrushed granulated slag already employed in fields other than road construction. Two experimental sections, 250 m each were built, one containing conventional granulated slag, the other containing the same granulated slag precrushed in a rod grinder, on the national road RN80, just outside Montemias, in the Saone-et-Loire. The sections will be observed by the Autun Laboratory. The aim of the experiment was to study the new method on a very short section prior to a more detailed study due to start in 1972. Details are given of the precrushed granulated slag, of the study of the mix design conducted before laying on the site, and observations carried out during construction. The first conclusions reached by the authors are that the use of precrushed slag does not present any great problems of manufacture and application compared to that of conventional granulated slag. However, it seems that precrushing results in a high-density slag rather sensitive to water. [TRRL/French]

Herrmann, M Colombier G (Laboratoire Regional des Ponts & Chauss C'Autun) Bulletin de Liaison des Lab des Ponts et Chaussées No. 57, Jan. 1972, pp 18-23, 5 Fig., 3 Tab., 5 Phot.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 100253)
PURCHASE FROM: Laboratoire Central des Ponts et Chaussées Repr. PC

2A 265139
ROLE OF UNBOUND AGGREGATE-PAST, PRESENT AND FUTURE
This paper which purposes to indicate a means of determining what may be done in the future relative to pavement construction, suggests how the present concern for energy conservation, or any future socio-economic factors, can be understood and dealt with by those interested in the use of aggregates for flexible pavements. History is considered in the light of its implications for the present and future use of flexible pavements. Economic and social-environmental concerns as well as technological changes that will affect the future of flexible pavements are discussed. The need is indicated at the present time for analyses in which the measures for effectiveness will be much more complex than cost per mile of highway. New analytic techniques and criteria must be developed. The continuing need for construction materials will lead to shortages which will require objective appraisal of how best to achieve the desired pavement performance.


ACKNOWLEDGMENTS: Federal Highway Administration (SO280)
PURCHASE FROM: NTIS

2A 265311

BUILDING EMBANKMENTS WITH SHALES

Indiana Shales (which cover a wide behavior spectrum from hard and durable ones, to those which will rapidly weather into soil, are of relatively low plasticity and do not possess highly expansible characteristics) were studied with a view to assessing their suitability for use in highway embankments. Existing tests were modified and new tests were developed for the engineering classification of shales which ranked them in different embankment use categories. Fifteen sampling sites were selected and the quantity of material varied between 150 to 1,500 lb, depending upon its type and ease in sampling. Shales of three sites were used as embankment material in small dams and shales from four locations were used in highway embankments. The details are outlined of 4 groups of tests: degradation type tests, soil type standard identification tests, compaction and load deformation tests, and miscellaneous tests. It was determined that the shales could be suitably rated with only 4 tests, viz., a slaking test of one cycle in water; a slake durability test on soaked samples; and a modified soundness test. The results (tabulated) of slaking in one cycle of wetting (broken piece of shale was immersed at least 0.5 inch below water surface) revealed that only 2 of the 15 shales were significantly affected. A slake durability test was conducted which measured the weight loss in water which can be expressed as a durability number. The modified soundness test measured the degradation of shales when subjected to five cycles of alternate wetting and drying in a sodium sulfate solution. The performance of the shales is reviewed, and on the basis of 4 simple degradation type tests, the shales are classified into 4 groups. Based upon the experimental data, qualitative statements are made about the strength and durability of these shales in embankments.


2A 2658216

A COMPARISON OF USEFULNESS OF WHEELED AND CATERPILLAR BULDOZERS AT EXECUTION OF EARTHWORKS [Porownanie przydatnosci wycieczek koszyowych i gasciencowych przy wykonywaniu robot ziemnych]

The scope and advisability of application of wheeled and caterpillar bulldozers is discussed particularly as related to technical parameters and efficiency. The results are discussed of tests of a prototype of the wheeled bulldozer and of caterpillar bulldozers. Basic and auxiliary operations for which bulldozers are utilized are listed, and the calculation is described of exploitation effectiveness. The effective capacity of the blade, adherence coefficients for both wheeled and caterpillar bulldozers, the towing power, the coefficient of operational time utilization, the influence of the coefficient of land gradient, and the time of operational cycle are among the factors reviewed. Conclusions drawn on the basis of the study are presented. It is concluded that for a large volume of earthworks on all types of grounds, and particularly in the execution of excavations and embankments, it is advisable to apply caterpillar bulldozers. However, for horizontal displacement of sandy soils at relatively longer distances, for grading of land and for auxiliary works, it is advisable to use wheeled bulldozers.

English Translation of "Przeglad Budowlony"

Pryznodziej, T (Military Technical Academy, Poland) Building Review Vol. 43 No. 9-10, 1971, pp 61-76, 5 Fig., 16 Ref.

PURCHASE FROM: NTIS Repr. PC

2A 2655221

CATERPILLAR BULDOZERS AT EXECUTION OF COLCHESTER NORTHERN BYPASS A 12

Construction details of the Colchester Northern Bypass scheme are given. Sixteen structures are incorporated in the bypass, which is 11.6 km. long. The scheme involves approximately 1.2 million cubic meters of earth moving. The principal soils are glacial gravels, ana loam, and London clay. An embankment, 1 km long and with a maximum height of 13 m, is built across the River Colne Valley. The embankment beams are built where the embankment height exceeds 6 m. The dual carriageway road is drained by French drains located-in the verges and central reserve. Details of the flexible pavement, which is 240,000 sq. meters in area, are included. Construction of the three major bridges is described and illustrated.

Highways and Road Construction Vol. 42 No. 1772, Apr. 1974, pp 11-14, 7 Fig., 6 Phot.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 209571)

2A 2655334

ENERGY CONSERVATION IN PAVEMENT CONSTRUCTION

Effective use of energy in the construction of asphalt pavements can result in lower material conservation and in most cases reduce the cost. Through the planned use of stage construction, the pavement may be developed only as required by traffic growth. Although this does not reduce the total energy requirement, it does result in the energy and cost being spread over a longer period of time and used only if demanded by traffic. Paving should be planned for completion during the summer months, which will also result in a lower energy demand for preparation of hot-asphalt mixes because aggregates in most areas will contain less water and require less heat for drying at that time. Use of the drum mixer so that lower mixing temperatures may be used will also reduce energy requirements as will use of emulsified asphalt, obviating the need to heat or dry the aggregate.


2A 265415

VBW COMMUNICATIONS 43 [VBW Mededelingen 43]


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 209819)

2A 265565

WATERTIGHT CONCRETE CONSTRUCTION

The booklet discusses the factors which a designer should consider when preparing a design for a watertight structure, and the practical problems which must be foreseen by those on site concerned with the supervision and actual construction. It is not a manual, and reference is made to other publications for theoretical treatment and to codes of practice. Types of construction considered are service reservoir structures which have to retain water without leakage, basement structures in water bearing ground, which have to be water retaining to prevent ingress of water, and retaining walls, particularly those associated with highway works, which have to be constructed so that ground water cannot percolate through cracks of joints and thus cause disfiguring stains on the concrete surface. Large mass concrete structures, such as gravity dams, are not included. Materials, design construction, and jointing materials and linings are described.


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 207616)

2A 265581

MANUFACTURE, SUPPLY AND SUPERVISION OF READY-MIXED CONCRETE IN THE FEDERAL REPUBLIC OF GERMANY [Herstellung, Lieferung und Uberwachung von Transportbeton in der Bundesrepublik Deutschland]

The author describes the development of ready-mixed concrete and requirements as regards delivery, construction materials and the ready-mixed concrete itself. The execution of quality control and testing on site is also outlined. [German]
CONSTRUCTION MATERIALS

2A 268599
PORE STRUCTURE, MODULUS OF ELASTICITY AND MEASUREMENT OF DEFORMATIONS IN A COLD STATE WITH A VIEW TO DETERMINING THE RESISTANCE OF CONSTRUCTION MATERIALS TO FROST [Structure des pores, module d'elasticite et dilatometrie au Froid en vue de la determination de la resistance au froid des materiaux de construction]

Based on the knowledge of the frost behavior of water in capillary systems and the filling process of capillaries with water, it is possible to accept the fact that only pores of average size can be held responsible for the damage to materials caused by frost. Thus if a satisfactory understanding of the frost behavior of a material is to be obtained, analyses of pore distribution must be conducted and supplemented with microscopic studies of the shape of the pores. On their own, the mechanical properties of a material give little information on the resistance of a material to frost, but it is possible to assess this resistance by studying the variations in the modulus of elasticity, especially in the case of repeated stresses caused by frost. [French]

Lehmann, H; Rauschenfelds, E. *Industrie Ceramique No. 643, Sept. 1971, pp 635-648, 5 Fig., 24 Ref.*

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 100114)

2A 268666
PLANNING OF ROAD PROJECTS-EARTHWORKS, FINLAND

The principle is described of the Finnish Digital Terrain Model which has been developed for the comparison of different alignment and gradeline alternatives. In order to ensure that the use of DTM is as efficient as possible, a model process analysis of the road planning project has been prepared which contains the different phases of planning and construction. In a study of the swelling of soils from 5 different construction sites, the permanent swell was calculated (i.e. the ratio of the unit weight in the compacted state to the unit weight in construction). The results revealed a distinct grouping according to different soils. Studies are reported which were planned to determine the angle of internal friction of stone materials. The effect of particle shape, angularity, density, percentage of fines and moisture content were also studied. Determination of the friction angle carried out in laboratory conditions show that the shape of the gradation curve has a noticeable effect on the friction angle in the relative small area specified for the base course. Other factors of importance are density, particle shape and angularity, moisture content, and to some extent the percentage of fines. A survey was made to clarify the adequacy of lightweight aggregate as embankment fill under certain conditions. The importance is emphasized of knowing the unit weight of material, its behavior at the stage of embankment construction, variations in unit weight resulting from moisture in course of time, and the need of strengthening the upper part of the embankment or the required pavement thickness. Lightweight aggregate has proved a suitable material in many construction projects where it has provided adequate stability and prevented uneven settlement. Investigations are reported of 4 different insulation materials concerning their ability to protect the subgrade from freezing, and their long-term behavior in operation.

Presented at the XIVth World Road Congress, Prague, Czechoslovakia, 1971.

Hakala, J; Eerola, M; Hailikari, T; Kankare, E; Orma, R; Ylöjoki, M. *Permanent International Association of Road Congr. Book I-7, 1971, 31 pp, 17 Fig., 1 Tab.*

2A 268669
PLANNING OF ROAD PROJECTS-EARTHWORKS, HUNGARY

A new Hungarian soil classification system is described and the results are presented of compatibility tests. Intermediate soils (soils which fall between sands and clays with a fine average granularity) are perfectly elastic above a critical moisture content in the course of compaction and their voids can only be decreased slightly. The examination of the changes of state which have taken place during compaction has made possible the definition of states of developed soil and the field of the critical state. Research in permanent and elastic deformations and resiliometric tests have contributed to an understanding of the critical field. Compaction tests on sands have proved that the shape of the granulometric curve exerts a very important effect on the value of the dry density of the soil, measurable in a slightly warped state. The stabilization is discussed of the upper layers of foundation soil with cement and the results are presented of the amount of cement and the effect of the amount of lime. Experimental results of the study of the infiltration of the mix are reviewed. Experiments are reported of drainage of the foundation layer under a concrete pavement. Details are outlined of a technique of embankment construction on compressible soils.

Presented at the XIVth World Road Congress, Prague, Czechoslovakia, 1971.

Kezdi, A (Polytechnic University of Hungary); Gasper, L (Institute of Road Research, Hungary); Janoshegi, F (Faculty of Road Railway Research); Matus, E; Mihalyfi, A (Roads Department, Hungary); Nagyvazi, B (Polytechnic University of Hungary)

Permanent International Association of Road Congr. Book I-11, 1971, 31 pp, 26 Fig., 3 Tab.

2A 268673
PLANNING OF ROAD PROJECTS-EARTHWORKS, MEXICO

The reactivation of faults by the construction of a road is described, and the application is discussed of soil and rock mechanics to problems arising from the great masses of moving soil at km 15 500 on the Tijuana-Ensenada highway. Strategically placed measuring devices and the correct interpretation of values corresponding to the deformation were important in the foreseeing of critical situations. Various alternatives for stabilization are proposed and the one selected was a filtering adit designed to reduce the pressure of the water and thereby increase the stability of the slope. Photographs, graphs and diagrams are presented which illustrate the various aspects of the project.

Presented at the XIVth World Road Congress, Prague, Czechoslovakia, 1971.

Romano, JD Rodriguez, AR; Oceoro, GM; Altmirana, GG. *Permanent International Association of Road Congr. Book I-16, 1971, 15 pp, 10 Fig.*

2A 268677
PLANNING OF ROAD PROJECTS-EARTHWORKS, PORTUGAL

Methods of photographic surveying and electronic calculation which were used in motorway and main road projects, have now been extended to projects for roads of low traffic volume. Efforts are described which have been designed to make aerial photographic survey an economic process. Instead of plotting topographical plans on a medium scale, photographic plans were plotted whenever possible on scales of 1/5000 and 1/10,000, mounted on general photographs on a scale of 1/25000, and, if they exist, on maps of the layout of the countryside on scales of 1/5000 and 1/2000. An experiment is reported which was carried out in mountainous area based on the aerial photographic coverage described and from which a 1/2000 scale plan was plotted. A check of the volumes of cutting and embankment made during the course of the works indicated that there was a difference of approximately 9 percent. In the area of earthworks, greater use is reported of geotechnical studies supported by geology and geophysics. Soils are classified in accordance with characteristics of grading obtained by summary analysis, liquid limit, plastic limit and sand equivalent. A study is also made of the ground on which embankments will be constructed. Types of ground are classified in terms of cutting strength or internal of the need to make use of explosives. The best soils having a sand equivalent greater than 10 are used for the top layers. The treatment of the upper layers of earthworks and the construction of earthworks are briefly reviewed.

Presented at the XIVth World Road Congress, Prague, Czechoslovakia, 1971.

Pinto, JR Boavida, JDCG; Veloso, MMR; Castilho, AN; Silva, NP; Dias, MFM. *Permanent International Association of Road Congr. Book I-20, 1971, 10 pp*
coefficient is described, recommendations are presented for the improvement of overworn clay soils by the addition of quicklime and cement, and the problem is considered of the evaluation of the general and local stability of slopes of high fills and deep cuts as well as of ensuring the required stability. Data on predicting the design characteristics of roadbed soils by the use of electronic computers are given. The need is emphasized for strengthening the underlying soil of a road which is exposed to the repeated action of traffic. The characteristic features are discussed of fill construction at low temperatures, planning and constructing roadbeds in severe climates, road construction in peat bog areas, as well as using soils with specific properties which are conditioned by their chemical and mineralogical composition. The methods of design and construction are described of frost-protective layers. The possibility of using local soils in such layers was investigated. The properties of local swelling soils were improved by addition of cement. Positive results were obtained by the use of synthetic porous materials such as foamplast. Measures are outlined for the draining of the upper part of the roadbed and so increase the stability of sections where the underground water is close to the ground surface.

Presented at the XIVth World Road Congress, Prague, Czechoslovakia, 1971.

Motylev, YL (All-Union Highway Research Institute, USSR)
Permanent International Association of Road Congr Book 11-25, 1971, 28 pp. 11 Fig., 9 Tab., 13 Ref.

2A 265684
FLEXIBLE PAVEMENTS, BELGIUM
The development is reported of a practical method of pavement design and attention is drawn to the importance of the probability factor in any design method. A synthesis of the characteristics of vehicles and traffic to be used in pavement design is drawn up, and it is shown that it is possible to use a pseudo-elastic approximation for the calculation of the stresses in visco-elastic multilayer systems. Considerable experimental research has been undertaken into the systematic determination of mechanical properties under repeated stress (fatigue) and for compression of various types of road making materials (fine soils, lean concretes, granular and bituminous bound materials). Systematic observations and comparisons were made of the behavior of 4 bituminous and macadamised base courses. Changes are reported of the characteristics of 18 types of bitumen recovered from an experimental asphaltic concrete road built in 1958. Base courses of stabilized materials and stress fatigue phenomena of lean concretes and bituminous coated materials are discussed, as well as thin surfacings such as sand asphalt, slurry and tacky coats.

Presented at the XIVth World Road Congress, Prague, Czechoslovakia, 1971.

Reichert, J (Road Research Centre, Belgium)
Permanent International Association of Road Congr Book II-2, 1971, 40 pp. Tabs.

2A 265687
FLEXIBLE PAVEMENTS, FINLAND
Waxy bitumens are less suitable for road bitumen purposes, especially owing to their weak resistance to the effects of water and poor stress-straining properties at low temperatures. On the other hand, road oil derived from waxy crude oil and used with a proper adhesive agent is quite suitable for, e.g. cold-mixed oil gravel pavements. The use of studded tyres increased rapidly in Finland so that by February, 1969, 75 per cent of the total road traffic travelled on studded tyres. The average wear sustained by asphalt pavements has been about 2A256691

FLEXIBLE PAVEMENTS, GREAT BRITAIN
In an effort to make a realistic assessment of the theoretical approach to pavement design (both in its own right and as a means of evaluating field concentrated on the fatigue and deformation characteristics of road materials, including the soil foundation. Investigations into the properties of bituminous binders are reported. Epoxy bitumen used in conjunction with artificial aggregates of high PSV, is now being increasingly used to treat pavements in areas of specific traffic hazard, where the high cost can be justified. Attention has been given to continuous methods of test to ensure the compliance of bituminous materials with specification. The increasing use of coated materials has led to developments in mixing and laying plants, particularly in the direction of automation and line-guidance. Procedures are being developed to help the engineer to decide when maintenance is required and its necessary extent.

Presented at the XIVth World Road Congress, Prague, Czechoslovakia, 1971.

Law, WM (Asphalt and Coated Macadam Association, London)
Permanent International Association of Road Congr Book II-10, 1971, 22 pp. 9 Fig.

2A 265689
FLEXIBLE PAVEMENTS, IRELAND
This paper describes the methods evolved for input of non-linear stress-strain relationships in finite element analysis of multilayer systems. Functional relationships for behaviour of pavement materials subjected to transient stresses are formulated. Parameters in these relationships are interpreted from the standpoint of repeated load triaxial compression tests. The displacement field for a typical pavement configuration is determined on the basis of the non-linear materials' responses. The computer program is based on direct stiffness matrix, axially symmetric stress distribution and continuity of strains across layer interfaces. In addition to handling stress dependent moduli, there is provision for dealing with non-tensile layers and axle load repetitions. Separation of the displacement field into recoverable land permanent components is achieved in the program. The digital computer program, DYNASTCO, was developed at The Computer Laboratory, C.S.R., University of Dublin. /Author/

Presented at the XIVth World Road Congress, Prague, Czechoslovakia, 1971.

Glynn, TE
Permanent International Association of Road Congr Book II-12, 1971, 18 pp. Figs., Refs.

2A 265694
FLEXIBLE PAVEMENTS, SWEDEN
The problems of design and choice of materials within the framework of a highway and motorways network are discussed, as well as problems relating to the maintenance and strengthening of the surfaces of the road network. The construction of flexible pavement of an average or heavy type with surface layers of bituminous concrete is described. The interpretation of pavement behavior under traffic and atmospheric conditions is also reviewed. Possible solutions are suggested to the phenomenon of fatigue in coated bituminous materials. Calculations and checks, deflections and strengthening are other aspects considered. The characteristics of bituminous binders in respect of methods of manufacture are considered. The revising of standards and research programs, the use of additives to improve binders, and properties of bituminous binders are reviewed. A discussion of pavement structure covers such aspects as cement-gravel, the control testing of gravel, and the control testing of the compaction of bituminous courses. Physical and rheological characteristics of bituminous concrete, the choice of aggregates, and spreading and compaction processes are also considered. The maintenance of pavement courses is briefly reviewed.

Presented at the XIVth World Road Congress, Prague, Czechoslovakia, 1971.

Anderson, O, Rosengren, A, Lilja, B (National Swedish Road & Traffic Research Institute)
Permanent International Association of Road Congr Book II-22, 1971, 19 pp. 11 Fig., 1 Tab.

2A 265709
CONCRETE PAVEMENTS, BELGIUM
Innovations are described in the field of concrete surfacing, particularly in the field of design, reinforced and non-reinforced pavement, materials and

Niemi, A (State Institute for Technical Research, Finland)
Permanent International Association of Road Congr Book II-6, 1971, 10 pp. 1 Fig., 1 Phot.

340
manufacture, and maintenance. The principal pavement designs used in Belgium are outlined, and the results are presented of theoretical and experimental research in regard to design which relate to quality criteria, vehicles and traffic, theory of multi-layer systems behavior, mechanical properties of the materials, and the influence of seasonal weather conditions. Jointing problems in reinforced and non-reinforced pavements are discussed, as well as the composition of concrete for slip form pavements and rural roads. The surface treatment of cement concrete pavements for improvement of the coefficient of skid resistance is also discussed. A review of maintenance covers such aspects as the repair of cement concrete road surfaces, restoring the rugosity of cement concrete roads, surface damage caused by chemical solutions, and the measurement of scaling.

Presented at the XVth World Road Congress, Prague, Czechoslovakia, 1971.

Doyen, A (Ministry of Public Works, Belgium) Permanent International Association of Road Congr Book III-2, 1971, 39 pp, 13 Fig., Tabs.

2A 272008 PAVEMENT DESIGN: THE FATIGUE SUBSYSTEM

This paper develops the framework for the symposium on the technology necessary to design airfield and highway pavements to minimize fatigue distress. The paper summarizes the steps required to determine whether a particular pavement section will be subject to fatigue from a series of traffic loads (applied during some specified time period). The diagram of a fatigue subsystem is presented in which each aspect is considered in a stepwise progression. An example is included to illustrate the application of the procedure to determine the potential for fatigue cracking in an existing pavement consisting of an asphalt concrete layer and a base and subbase composed of untreated granular material. The traffic information necessary for highway pavements and airfield pavements is outlined and the methodology for estimating traffic is discussed. The lateral distribution of aircraft on both taxiways and runways should be considered to ensure an economical design. The distribution of temperature within layers containing asphalt-bound materials should be determined, as well as the influence of environment as it influences the water contents (or effective stresses) of materials constituting pavement sections. The construction requirements and effects are outlined and the design of the design of the structural section is discussed. Materials consideration is reported and the structure analysis and fatigue property determination are reviewed. The aspect of fatigue life estimation is covered. An example is presented here of a pavement designed for a 10-year life) which demonstrates the feasibility of design to preclude fatigue, and illustrates many of the concepts described in detail in the symposium papers.


Monismith, CL (California University, Berkeley) Highway Research Board Special Reports No. 140, 1973, pp 1-19, 11 Fig., 6 Tab., 6 Ref.

PURCHASE FROM: TRB Repr. PC

2A 272049 ANALYSIS OF QUESTIONNAIRE ON AGGREGATE DEGRADATION

A tabulated summary is presented of the results of a questionnaire survey which was conducted to evaluate the extent and seriousness of the problem of aggregate degradation in highway construction in the U.S. and Canada. The results of the survey are analyzed and the interrelationships between these questions are considered. It was determined that certain conclusions may be drawn regarding the relationship between such factors as (1) the type of aggregate and the seriousness of degradation (2) the various combinations of quality control tests utilized and the degree of protection provided against acceptability of poor quality material. It is concluded from the findings that when comparing physical degradation versus chemical, the physical degradation problem is the more troublesome. The relative seriousness of the various forms of degradation is influenced by the type of aggregate. Sixty-two percent of those states reporting problems with volcanic aggregate attributed difficulties to both chemical and physical degradation. Repeats also indicated that uncoated aggregate is the major problem in respect to degradation. Data indicates that an abrasion test should be combined with either a soundness or wet abrasion if confidence in the testing program is to be achieved. Aggregate users indicate that the greatest need is in the area of methods of aggregate evaluation and secondly in assessing the severity of a particular use.

Hendrickson, LG Shannon, RD Highway Research Circular No. 144, July 1973, 9 pp, 5 Fig., 1 Tab., 1 App.

PURCHASE FROM: TRB Orig. PC

2A 272052 LANDSLIDE INSTRUMENTATION FOR THE MINNEAPOLIS FREEWAY

In 1967 a landslide developed along a section of freeway under construction in Minneapolis. The following procedure was undertaken to ensure the stabilization of the landslide and completion of the project: Instruments were installed to detect the depth and rate of movement, and exploration was undertaken to determine the properties of the material in the failure zone; a temporary buttress was placed to control the movements while corrective treatment was being designed; additional instruments were installed to monitor movements during construction of the permanent treatment; and, after completion, all instruments were maintained and additional instruments were installed to monitor post-construction movements, if any. The corrective treatment consisted of a series of slit-trench concrete buttresses anchored into limestone below the failure plane. Details of exploration, instrumentation, testing, and design are included in the paper.

Wilson, SD (Shannon and Wilson, Incorporated) Transportation Research Record No. 452, 1974, pp 30-42, 9 Fig., 1 Tab.

PURCHASE FROM: TRB Orig. PC

2A 272108 MINIMIZING PREMATURE CRACKING IN ASPHALTIC CONCRETE PAVEMENT

Based on an extensive review of available information from research and field experience, a series of recommendations have been prepared related to material specifications, mix design, structural materials selection and construction requirements that are intended to reduce the possibility of premature cracking of asphaltic concrete pavement. The recommendations assume that the pavement designer is using a suitable design method for selecting the thickness of various pavement layers to provide structural adequacy for the traffic, subgrade support, and climatic conditions. Possible procedures are reviewed for verification of the recommendations for minimizing premature cracking and suggestions are made for an approach to a more extensive future verification program. The recommendations which are suitable for immediate implementation, have been subjected to limited case history and analytical verification, and appear to confirm and quantify recent trends in the field of asphaltic concrete pavement design. The project findings are listed and discussed by type of cracking: fatigue cracking, low temperature cracking, and reflect cracking. Suggestions are made regarding implementation of the recommendations for minimizing premature cracking of asphaltic concrete pavement. Individual highway agencies can evaluate the recommendations against current practice and adopt any changes that are judged to be adequately verified in the report. Possible observations of performance would indicate the effect of the changes.

Individual modify, or expand specific recommendations. It is also suggested that a nationwide verification investigation be initiated based on Bayesian decision statistics. Two approaches to verifications are discussed: that involving the design of a factorial experimentation program and monitoring of performance using statistical analysis for evaluation of variables; and verification of an analytical model using a small experimental program and case histories of in-service pavements. The recommendations dealing with (a) asphalt content and void content of asphaltic concrete, (b) density of unstrated aggregate base courses, and (c) subgrade drainage where accumulation of water is a problem, appear to be well documented and suitable for immediate implementation.

An NCHRP staff digest of the essential findings from the final report on NCHRP Project 9-4, "Minimizing Premature Cracking of Asphaltic Concrete Pavements" by P.N. Finn, K. Nair, and J. Hilliard, Materials Research & Development, Oakland, Calif.

Highway Research Board NCHRP Digest No. 58, Mar. 1974, 8 pp, 1 Fig., 4 Tab.

PURCHASE FROM: TRB Orig. PC

2A 276022 LOW COST ROAD CONSTRUCTION

The publication contains the following reports: Low Cost Roads in the Service of Agriculture, by Browne, WA; Experiences in the Planning of the
Agricultural Road Network in Hungary, by Gaspar, L; Design of the Longitudinal Section of Agricultural Roads, by Hernandez, JL; Notes on Farm Roads, by Hruza, J; The Recent Planning and Traffic Loading of Agricultural Roads with Reference to Modern Agricultural Machines, by Klempert, B; The Quality of Agricultural Roads, by Kyritsis, S; Specification and Construction Method for Agricultural Roads Treated with Calcium Chloride, by Laporte, JO; Study of the Design of the Agricultural Road Network, by Lecerque, J and Therasse, R; The Stress on Agricultural Roads, by Moeser, H; Rationalization of Agricultural Road Construction, by Ott, R; Low Cost Road Construction—Diagnosis, Forecast, Therapy, by Seidel, J; Erosion at the Edges of Roads and in Fine-Grained Subsoil with Particular Reference to Victoria, Australia, by Turner, AK; and The Contribution Made by Agricultural Roads in a Catchment Area, by Wilson, TV and Lignon, JT. /TRRL/

Schriftenreihe d Dts Nationalen Komitees d Inter No. 4, 134 pp, Figs., Tabs.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 300442)
CONSTRUCTION EQUIPMENT AND METHODS

3A 025673
PREFabRICATION IN HARBOUR CONSTRUCTION WORKS—WITh SPECTAl REFERENCE TO CONDITIONS IN GREENLAND

Up to now most harbour works have been planned using prefabrication to a large extent but mostly with manufacturing of the elements in a plant in connection with the harbour site. The use of this method in arctic areas would require a much longer period for the construction than normal in warmer regions. To reduce the construction period it would be natural to move as much of the works as possible to factories in more industrialized regions and that the procedure on site would be a pure assembling of prefabricated elements. Prefabrication in this way combined with a really good planning of the constructing procedure would make works in the arctic less complicated and lower the costs. Due to short summer the construction period even small jobs last 2 or 3 years. The service functions in the villages are bad. The workers available are still not developed enough to make complicated craft. The materials all have to be transported from other parts except for the aggregates for the concrete. All those points invite the use of prefabricated elements from industrialized countries in the work, because the transport is more or less the same whether the elements are made or going to be made on site. The need for imported skilled workers is much less and the construction period shorter, so that the jobs can be completed in one summer. A problem with prefabricated constructions is always the joining of the elements and the fixing in the seabed. Under arctic conditions this problem however is even bigger due to the ice-pressures which can occur and because of the very often occurring lack of sediments overlaying the rock, so that it is difficult to fix the structures in the bottom. All those problems have to be taken into account, but it is possible to solve them. Our moderate experiences in the field of harbour engineering in the arctic area are for Danish engineers limited to harbour works in Greenland. The paper presents some examples of prefabricated harbour structures which during the latest years have been applied in Greenland. Also presented are some examples of standard prefabricated elements which already exist on the market and which can be used in the harbour construction in arctic areas.

Abstract of paper delivered at the First International Conference on "Port and Ocean Engineering under Arctic Conditions" held at Trondheim, Norway, August 23-30, 1971

Steenfos, HP; Rodevang, B (Biganu and Steenfos)
POAC Conference Aug. 1971
ACKNOWLEDGMENT: Arctic Institute of North America
PURCHASE FROM: Technical University of Norway Conference Chairman, Trondheim, Norway Orig PC

3A 037198
CHEMICAL GROUTING FOR PARIS RAPID TRANSIT TUNNELS

Special problems in the construction of subsurface structures for a new rapid transit railroad line in Paris, France. Consolidation of soils was provided by chemical grouting. Grouting technique was also used to consolidate the foundations of a bridge, over the tunnel. Silicate and resin grouting provided the consolidation without recourse to compressed air or dewatering. A classification of modern chemical grouts is given with their limits of injectability. Elaborate grouting procedures prove their efficiency in supplementing or replacing modern tunneling methods.

ACKNOWLEDGMENT: EI (EI 70 38532)
PURCHASE FROM: ESL Repr PC, Microfiche

3A 039240
A SYSTEMS STUDY OF SOFT GROUND TUNNELING

A fundamental investigation of soft-ground tunneling operations was made to identify and assess the potential technical and economic feasibility of new tunneling system concepts. Quantitative estimates were made of costs and rate of advance of different candidate system concepts relative to an assumed set of tunneling conditions. The magnitude of R and D effort required to achieve cost reductions and performance improvements over the 1970 to 1985 time period was estimated. The study concludes that the major restraints to reducing costs and increasing performance in soft ground tunneling over the 1970 to 1985 time period will result from the lack of any effective method for handling boudery ground and from the lack of a method for rapid installation of the permanent tunnel liner continuously and concurrently with the advance of the face. With a 15-year R and D effort of $35 to $70 million, these problems could be substantially overcome and current tunneling costs could be expected to decrease by 40-65% and advance rates could be expected to increase by a factor of from 4 to 8. Cost differences among the more promising alternative system concepts were found to be small relative to the range of uncertainty associated with the cost forecasts. (Author)


Brandt, CT; Stone, RB; Smith, AR; Willis, BH; Pastuhov, A (Femin and Scisson Incorporated Final Rpt DOT-FRA-OHSST-231, May 1970, 439 pp)
Contract DOT-FR-9-0034
ACKNOWLEDGMENT: NTIS (PB-194769)
PURCHASE FROM: NTIS Repr PC, Microfiche
PB-194769, DOTL NTIS

3A 041554
CONSTRUCTION OF SAN-YO SHINKANSEN

On March 15, 1972 a section of the San-Yo Shinkansen, the high-speed railway network of Japan, was completed linking the cities of Shin-Okasa and Okayama. Trains now travel the 165-km distance in exactly one hour. Many aspects of the construction of this section which took 4 1/2 years to complete are described including: the techniques used to break through the faults and fractured zones and moistened soil at the 16.25-km long Roku kok tunnel, the boring machine at the Saisho tunnel, the big john for the whole section boring at the Takatsuyama tunnel, the elevated track structure designed to reduce noise and vibration, the Kakogawa bridge where the cantilever block method was resorted to for construction, and the slab track that has drawn world-wide attention as an epoch-making track structure.

Kindara, H; Kamada, S (Rail International No. 6, June 1972, pp 349-360, 5 Tab)
PURCHASE FROM: International Railway Congress Association 17-21 rue de Louvain, 1000 Brussels, Belgium Repr PC

3A 041827
SHIP TRANSFER SYSTEM REDUCES BUILDING COSTS

Sea Transport Engineering has produced a ship transport system devolving on a Takraf Land-Transport system. It permits the movement of block sections or complete ships in a vertical plane without the use of gantry cranes. This transportation system is mainly by rail in a longitudinal and transverse direction, thus optimizing material flow while reducing equipment usage per ton of steel ratio. This system is mainly for ships up to 10,000 tons, providing a longitudinal slip for 1,000 tons, and a transverse slip of 3,500 tons. Sea Transport Engineering confirms that at least a 25% saving in man hours is possible, and considerable flexibility in contrast to a fixed production line is achieved.

Shipbuilding and Shipping Record Vol. 119 No. 18, May 1972, pp 23,25
ACKNOWLEDGMENT: United States Merchant Marine Academy (N-521)

3A 048064
SHIPBUILDING, VOLUME 15, NUMBERS 5-6 1970

The problem of building ships by assembling them from parts in a dry or floating dock arose in the mid-fifties with the increased demand for large ships. The majority of ships built this way are constructed in two 'halves' or longitudinal and transverse direction, after the foreship has been launched as the second part of the two, both parts are joined in a dry dock. Dry docks can also be used for building hulls of ships with parameters exceeding those of the dry dock. In such cases the hull of a ship is built either without the bow part or without the bow part and side tanks.


National Marine Fisheries Service 1973, 84 pp
ACKNOWLEDGEMENT: NTIS (TT-70-55126/5-6)
PURCHASE FROM: NTIS Repr PC

3A 007990
NEW “WORK UNIT” SYSTEM IN SHIPBUILDING
In order to retain efficient shipbuilding operations, from the point of view of both the safety of the workers and efficiency in the execution of the works, a new system was developed called the “work unit”. In this article a general explanation of the “work unit” is made, along with a description of the new shipbuilding system using the device under study. The development of this system, as well as example of the system including construction of the “work units” and the new working cycle, are also included in the article.


ACKNOWLEDGEMENT: National Maritime Research Center, Kings Point (N-870)
PURCHASE FROM: Japan Association for Technical Information 4-7-107, Yamazaki-cho, Machida City, Tokyo 194-01, Japan Repr PC

3A 008570
ADVANCING FORMWORK
THE ARTICLE DESCRIBES A SYSTEM OF ADVANCING GIRDER AND FORMWORK DEVELOPED IN EUROPE FOR MULTI-SPAN BRIDGE CONSTRUCTION. THE SYSTEM IS SUITABLE WHERE INTERMEDIATE SPANS AND CROSS-SECTION PROFILE ARE CONSTANT. GROUPS OF HEAVY-DUTY STEEL GIRDER BRACED TOGETHER SUPPORT ONE SPAN, ONE END, CONTROLLED BY HYDRAULIC JACKS, BEING SUSPENDED FROM THE UNDERSIDE OF THE PREVIOUS SPAN, AND THE FORWARD END CANTILEVERED QUARTER SPAN PAST THE NEXT SUPPORT COLUMN. THE POSITIONING OF HYDRAULIC JACKS, ROLLERS AND MACHINE SKATES AT THE SUPPORTS IS DESCRIBED. CLOSE JOINTED BOARDING IS SUITABLE FOR FORMWORK AND CAN BE HINGED TO ALLOW CLEARANCE AT THE SUPPORT COLUMNS WHEN GIRDER GROUPS ARE REPOSITIONED. CONCRETE IS PLACED IN ONE CONTINUOUS POUR TO FULL WEIGHT, STARTING AT THE LEADING CANTILEVER NOSE. VARYING AMOUNTS OF RETARDER ARE INCORPORATED INTO THE MIX TO ALLOW THE GIRDER TO CHANGE SHAPE DURING POURING AND TO INSURE UNIFORM INITIAL SET. STRESSING IS APPLIED AS SOON AS THE CONCRETE STRENGTH PERMITS. AFTER JACKING DOWN ONTO THE ROLLERS AND MOVING SIDEWAYS FOR CLEARANCE, THE GIRDER AND FORMWORK ARE WINCHED FORWARDS AND REPOSITIONED FOR THE NEXT SPAN. THE CONSTRUCTION OF THE ROMBERGSHOLZ VIADUCT IS DESCRIBED TO ILLUSTRATE THE USE OF THE SYSTEM.

Turner, CF Knight, JF Civil Engineering No. 814, Apr. 1974, pp 22-25, 2 Fig.

ACKNOWLEDGEMENT: Transport and Road Research Laboratory (IRRD 209951)

3A 008701
TWO TECHNIQUES FOR THE CONSTRUCTION OF CONTINUOUS PRESTRESSED CONCRETE BRIDGE DECKS ON TALL SUPPORTS
THE PAPER DESCRIBES TWO TECHNIQUES FOR THE CONSTRUCTION OF CONTINUOUS PRESTRESSED CONCRETE BRIDGE DECKS RESTING ON TALL SUPPORTS. ONE OF THEM INVOLES PRECAST SEGMENTAL CONSTRUCTION USING A SERVICE GIRDER, AND THE OTHER A THREE-UNIT CAST IN SITU METHOD USING TEMPORARY TRESTLES AND ERECTION-SPANS.

Raina, VK Indian Concrete Journal Vol. 48 No. 1, Jan. 1974, pp 26-27, 2 Fig.

ACKNOWLEDGEMENT: Transport and Road Research Laboratory (IRRD 210216)

3A 008702
PIPE JACKING-A TECHNIQUE FOR SOFT GROUND TUNNELLING
THE PAPER DEALS WITH PIPE JACKING, A TECHNIQUE WHICH IS DESIGNED FOR THE CONSTRUCTION OF SEWER LINES, PEDESTRIAN SUBWAYS, IRRIGATION CONDUITS, ETC., BELOW GROUND WITHOUT DISRUPTING THE SURFACE AMENITIES. THE METHOD IS PARTICULARLY APPLICABLE TO SOFT GROUND WHERE TRADITIONAL MINING AND TUNNELLING PROCESSES MAY BE DIFFICULT. THE PAPER ALSO INCLUDES BRIEFLY SOME PROJECTS WHERE THIS TECHNIQUE HAS BEEN EMPLOYED SUCCESSFULLY.

Basu, NK (Cementation Company Limited) Indian Concrete Journal Vol. 47 No. 9, Sept. 1973, 8 pp. 2 Fig., 6 Phot., 9 Ref.

ACKNOWLEDGEMENT: Transport and Road Research Laboratory (IRRD 210210)

3A 008814
THE TRANS-ALASKA PIPELINE PROJECT
Innovative methods and equipment are described which are utilized or being developed for utilization in the Trans-Alaskan project. These include special trenching machines, chain saw rock cutters, pipe bedding and padding compactors, protection systems for workmen, tie-in positioning clamps, lift platforms, and warming equipment for pipes. Backhoes that dig pipe trench, bridge wings that support pipeline and installation methods that adapt to site requirements are reviewed. Thirty eight innovative drills and vertical support members set by coordinated machine lineup are also described. The following unusual features are outlined: installation unit, cement placement unit, sand slurry placement unit, sand-cement transport, sand transport and water transport.


3A 008826
SYSTEMS APPROACH TO FLEXIBLE PAVEMENT DESIGN AND MANAGEMENT
A project is reported which resulted in the improvement of the computer program, SAMP5, to an operational program, SAMP6, which provides a basis for selecting flexible pavement design and management strategies with the lowest predicted total cost over a prescribed analysis period when considering such cost elements as initial construction, routine maintenance, periodic rehabilitation, interest on investment, salvage value, and roadway user costs. The SAMP6 program uses the AASHTO Interim Guides as its structural subsystem and the predicted decreases in servicesability with time and traffic as developed at the AASHO Road Test. The SAMP6 is capable of considering all aspects of the systems approach to pavement design and management except those of the cost of seal coats and the cost of skidding accidents. The program requires 12 classes of input variables: program control and miscellaneous variables, environmental servicesability, traffic and reliability; constraint; traffic delay; maintenance; cross-section, cost-model, shoulder; track coat, prime coat, bituminous materials; wearing surface; overlay; pavement material; and shoulder material variables. The output of the SAMP6 program is provided in three parts: Summary of the input data; summary of the best design strategy for each material and layer combination; and a summary of the 80 best design strategies in order of increasing total cost per square yard of traffic lane. The results are given in a limited sensitivity analysis conducted to provide an indication of the influence of the individual variables on the output. As an illustration of the application of SAMP6, a comparison is described of the economics of staged construction and planned rehabilitation versus the "no-overlay," or a strong initial construction approach. Another illustration involved the effect of fluctuating material costs on optimum design.

An NCHRP staff digest of the essential findings from the final report on NCHRP Project 1-10A, "Systems Approach to Pavement Design Implementation Phase," by R.C. Lytton and W.F. McFarland, Texas Transportation Institute, College Station, Texas.

Transportation Research Board NCHRP Digest No. 62, July 1974, 8 pp. 1 Fig., 1 Tab.

PURCHASE FROM: TRB Publications Off Repr. PC
BOSPHORUS BRIDGE, ISTANBUL

This article describes the building of the Bosphorus Bridge and the use of high-pressure sodium lamps for its lighting. The historical background of the 1074m long suspension bridge is given. The bridge floor is of box-girder construction and is suspended from four 165m steel towers. The road surface comprises a mixture of concrete & asphalt. Dimensions of the bridge, which has 6 motor lanes and a lower footpath, are included. The bridge has tapered sides to reduce wind pressure to a minimum. Lighting is provided by 400W sodium lamps mounted on 92m high masts placed on the median strip. The 66 lighting columns are spaced at 27m. Luminance and illuminance on the road surface are 3.5 CD/M2 and 45 Lux respectively. High-pressure sodium lamps provide lighting for the approach roads and the toll waiting area. The towers are floodlit by mercury lamps. Photographs illustrate the lighting system.


Acknowledgement: Transport and Road Research Laboratory (IRRd) 210220

DIAPHRAGM WALLS AND ANCHORAGE. A REVIEW OF THE ICE CONFERENCE PAPERS: PART 1

In this article—the first of a two-part summary—a review is given of 13 of the 26 Papers presented at the international conference on diaphragm walls and anchorages. These Papers are presented during the first three sessions of the conference and are all related to diaphragm walling. Paper I listed the wide range of applications of the diaphragm wall technique, and then went on to describe the practical limitations of the method in highly permeable strata, in very soft soils, in hard strata or where there is a high water table. Paper 2 described four cases in the UK where diaphragm walls have been used to construct self-stable structures. Various shaped load bearing diaphragm wall elements were considered in Paper 3, where their use was compared with concrete cast-in-place piles formed in temporary casings. Paper 4 described the advantages of slurry trench diaphragms as cut-off walls and for remedial measures in dams. Paper 5 considered the properties of bentonite slurries used in diaphragm walling. Paper 6 presented a method of designing multi-tied diaphragm type walls. Paper 7 described the design and construction of diaphragm walls as temporary and permanent retaining walls for the basements of a complex structure. Paper 8 discussed the studies carried out on load-bearing diaphragm walls at Kensington and Chelsea Town Hall. Paper 9 discussed the proposed design for a multi-storey underground car park in Amsterdam incorporating a circular diaphragm wall 0.8m thick. The principles of the diaphragm wall technique and the different types of equipment which may be employed, highlighting their effect on vertical and horizontal tolerances, were described in Paper 10. The Prefab system of diaphragm wall construction in which the slurry trench is excavated by normal diaphragm wall technique using bentonite suspension for support of the sides was described in Paper 11. Paper 12 described the construction of diaphragm walls and slab piles for the A13 motorway in Paris. Paper 13 reviewed the method used for the support of a basement excavation 16.5-20.5 m deep and having a plan dimension 154 m by 122 m, at the Centre Beaubourg, Paris.

Hanna, TH (Sheffield University, England); West, AS (Federation of Piling Specialists) Ground Engineering Vol. 7 No. 6, Nov. 1974, pp 27-30, 3 Fig., 3 Tab., 1 Phot.

NEW CONSTRUCTION EQUIPMENT AND TECHNIQUES FOR AIRPORTS

This paper discusses some of the new techniques and equipment used to construct the mammoth Dallas/Fort Worth Airport. As a background to this discussion, the author gives some of the advantages and disadvantages in using new equipment. To give an indication of the magnitude of the Dallas/Fort Worth Airport project, the author relates some of the quantities of materials used on the project. He goes on to mention some of the problems in meeting the contract specifications and tells how they were resolved.

Presented at the 6th Summer Meeting of the Transportation Research Board in cooperation with the Washington Department of Highways, August 6-8, 1973, Olympia, Washington.

Cloud, BB (Zachry (HB) Company) Transportation Research Board Special Reports No. 148, 1974, pp 57-64, 6 Fig., 7 Tab., 4 Ref.

NEW CONSTRUCTION EQUIPMENT AND TECHNIQUES FOR AIRPORTS

This paper describes slip-form construction techniques for widening and resurfacing, curb and gutter building, single-lane concrete paving with integral curb, and concrete safety barrier. Formerly, most of this type of construction was done by using forms and hand tools. Labor requirements were high, and production rates were low. In recent years development of specialized slip-form equipment by contractors and equipment manufacturers has revolutionized this type of concrete construction. The authors describe some of the equipment available and the wide variety of equipment that provides for interchangeable mules or forms to shape concrete to almost any cross section. The paper presents some recommendations on suitable concrete mixes and finishing techniques for this type of work.

Presented at the 6th Summer Meeting of the Transportation Research Board in cooperation with the Washington Department of Highways, August 6-8, 1973, Olympia, Washington.


PURCHASE FROM: TRB Publications Off Repr. PC

NEW CONSTRUCTION EQUIPMENT AND TECHNIQUES FOR AIRPORTS

This report covers the initial main-line installation of a posttensioned concrete pavement in Pennsylvania. A pavement thickness of only 6 inches was possible through the use of posttensioned strands in the slab. The installation was a single slab 500 feet in length and 24 feet wide. It rests on 3-in. bituminous concrete base and a 9-in. subbase, with a slip plane provided between the base and slab. There are 10 longitudinal strands in the slab as well as transverse reinforcement. The construction methods used and details of placement and materials are discussed. Concrete was placed over the slabs by conventional slip-form paving equipment. Hydraulic jacking was used to apply tension in two increments during the curing period. Posttensioning promises to provide a crack-free pavement structure, thereby eliminating a source of deterioration and need for maintenance. It is too soon to make conclusions on the performance of this installation, although cracks have not appeared. The future of posttensioned pavement will depend mainly on cost of construction and benefits in relation to other pavement types.

Presented at the 6th Summer Meeting of the Transportation Research Board in cooperation with the Washington Department of Highways, August 6-8, 1973, Olympia, Washington.

Graham, WL Brunner, RJ (Pennsylvania Department of Transportation) Transportation Research Board Special Reports No. 148, 1974, pp 57-64, 6 Fig., 7 Tab., 4 Ref.

PURCHASE FROM: TRB Publications Off Repr. PC

A REVIEW OF FIELD APPLICATIONS OF FIBROUS CONCRETE

The use of fibrous concrete as an overlay or resurfacing material has been conducted of fibrous concrete resurfacing on airport taxiways, urban expressways, arterials, residential streets, and bridges, and the results of some of these tests are discussed.

Presented at the 6th Summer Meeting of the Transportation Research Board in cooperation with the Washington Department of Highways, August 6-8, 1973, Olympia, Washington.

Yrvijanson, WA (American Concrete Paving Association) Transportation Research Board Special Reports No. 148, 1974, pp 69-79, 13 Fig., 3 Tab.,
CONSTRUCTION EQUIPMENT AND METHODS

3A 080986 COOLING OF HOT-MIXED ASPHALT LAID ON AN INSULATED BASE

The cooling of hot-mixed asphalt laid on an insulated base was studied to determine the feasibility of using thin insulation to permit cold-weather paving of thin mats on an existing pavement. A computer program was developed to predict the temperature distribution in the mat, insulation, and base. Bench-scale laboratory tests were conducted to verify the validity of the computer program. The computer program was then used to simulate cold-weather paving for field conditions. The results were analyzed statistically to determine the variables that significantly affect the time available for compaction. A step-wise multiple linear regression program was used to develop equations that would give the time available for compaction as a function of these significant variables and their interactions. In addition, a nomogram was constructed to predict the time available for compaction graphically. The results of this study indicated the possibility of using thin insulation for cold-weather paving.

Presented at the 6th Summer Meeting of the Transportation Research Board in cooperation with the Washington Department of Highways, August 6-8, 1973, Olympia, Washington.

Shah, ND Dickson, PF (Colorado School of Mines) Transportation Research Board Special Reports No. 148, 1974, pp 106-112, 7 Fig., 1 Tab., 5 Ref.

PURCHASE FROM: TRB Publications Off Repr. PC

3A 080987 PREFABRICATED SANDWICH PANELS FOR BRIDGE DECKS

Based on the generally recognized superior strength-weight characteristics of sandwich panels, a study program was carried out to test a new type of compositely acting steel-concrete sandwich panel for use in bridge decks. Basically, the sandwich panel consists of two thin-faced plates of steel joined by a series of round shear-spacer studs welded to their inner surfaces. The core between the plates is made of lightweight concrete using expanding cement to induce a small prestress into the system. Laboratory tests were made on 10 small-scale panels, some loaded with a concentrated load and others with a uniformly distributed load. Mathematical theories developed for this type of panel show a generally satisfactory correlation between tests and theory. A number of solutions that take into account practical fabrication and erection problems are offered to illustrate how such panels can be bolted or welded, either longitudinally or transversely, across standard steel bridge girders. A comparative investigation indicated that these panels are substantially stronger and stiffer than normal reinforced concrete slabs that use the same quantity of concrete and steel.

Presented at the 6th Summer Meeting of the Transportation Research Board in cooperation with the Washington Department of Highways, August 6-8, 1973, Olympia, Washington.

Zuk, W (Virginia Highway Research Council) Transportation Research Board Special Reports No. 148, 1974, pp 115-121, 16 Fig., 1 Tab., Photos., 6 Ref.

PURCHASE FROM: TRB Publications Off Repr. PC

3A 080988 USE OF PRESTRESSED, PRECAST CONCRETE PANELS IN HIGHWAY BRIDGE CONSTRUCTION

A beam and slab bridge that makes use of precast, prestressed panels was investigated. For this type of bridge, both the panels and the beams are precast and prestressed in the casting yard. In the bridge structure, the panels span the transverse distance between beams and serve as forms for the cast-in-place portion of the deck. They remain in place to become an integral part of the continuous structural slab. Composite action is obtained when the deck elements and the beams are bonded together by the cast-in-place concrete. Tests were made to determine the ability of this type of bridge to distribute wheel loads in a satisfactory manner and to behave as a composite unit. A full-scale, simple span, prestressed panel concrete bridge was constructed and structurally tested in the laboratory. The bridge was subjected to cyclic applications of design loads and finally to static failure loads. It performed satisfactorily under all load conditions. Several bridges of this type have been in service in Texas for 10 years and have performed well.

Presented at the 6th Summer Meeting of the Transportation Research Board in cooperation with the Washington Department of Highways, August 6-8, 1973, Olympia, Washington.

Butlcr, E Furr, HL Jones, HL (Texas Transportation Institute); Butler, HD (Texas Highway Department); Toprac, AA (Louisiana Department of Highways) Transportation Research Board Special Reports No. 148, 1974, pp 122-135, 13 Fig., 7 Tab., Photos., 8 Ref.

PURCHASE FROM: TRB Publications Off Repr. PC

3A 081051 THE "NEW MIDLANDS ROAD" TO SOUTH WALES, MACHINE LAID UNREINFORCED CONCRETE CARRIAGEWAYS

Details are given of the design and construction of the third section of the New Midlands Road. This five-mile-long section starts just north of Raglan and ends east of Usk. The line of the road follows an abandoned railway track. Dual two-lane unreinforced concrete carriageways are provided to near motorway standard and vehicular access is limited to the two-level interchanges at Usk and Raglan. Attention is drawn to the construction methods and equipment used.


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 58032)

3A 081064 UTILISATION OF PLANT ON A ROADWORKS CONTRACT

The author discusses three methods commonly used for programming roadworks: the bar chart, the critical path network, and the time/location chart, and points out the advantages and disadvantages of each. Various operations involved in a roadworks contract, i.e. site clearance, earthworks, drainage, sub-base, road base and surfacing construction, kerbing, bridge construction, are briefly described together with the construction equipment needed for each operation. Brief mention is made of the maintenance of plant.


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 59665)

3A 081108 DETAILING FOR STANDARD PRESTRESSED CONCRETE BRIDGE BEAMS

THIS BOOKLET GIVES INFORMATION ON THE DETAILING OF REINFORCED CONCRETE BEAMS THAT ARE MADE TO A
SERIES OF STANDARD SECTION SHAPES FOR BRIDGE CONSTRUCTION. ITS OBJECT IS TO GIVE METHODS WHICH AVOID DETAILING HAVING AN UNDESIRABLE EFFECT ON PRODUCTION, EFFICIENCY OR SUBSEQUENT PERFORMANCE. SEPARATE SECTIONS OF THE BOOKLET GIVE INFORMATION ON THE VARIOUS FEATURES OF BEAM CONSTRUCTION. THE FIRST DEALS WITH THE CONCRETE USED AND INCLUDES NOTES ON STRENGTH REQUIREMENTS, COMPACTION, DEFECTS INCLUDING CRACKING, AND CURING METHODS. THIS IS FOLLOWED BY THE DETAILING OF PRE-TENSIONED STEEL, INCLUDING DATA ON STRAND PATTERN DEBONDING AND DEFLECTION, AND THE EFFECT OF DEBONDING GEOMETRY. SECONDARY REINFORCEMENT IS THE SUBJECT OF THE NEXT SECTION INCLUDING NOTES ON VERTICAL STEEL AT BEAM ENDS AND STIRRUP LOCATION AND FIXING. PALLETS AND SOFFIT AND SIDE FORMWORK ARE DEALT WITH, TOGETHER WITH THE DETAILING OF SKEW; A TABLE GIVES INFORMATION ON RATIONALIZED SKEW ANGLES. THE USE OF CAMBER TO OFFSET LONG TERM DEFLECTION, THE REDUCTIONS OF BOWING AND THE EFFECT OF DEBONDING SKEW BEAMS ARE DISCUSSED. THIS IS FOLLOWED BY NOTES ON LIFTING POINTS AND EDGE BEAMS. THE BOOKLET CONCLUDES WITH NOTES ON THE SITE ERECTION PROCEDURES WHICH HAVE A BEARING ON DETAILING.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 100120)

3A 081174
SCALE MODELS FOUND GOOD ROUTE TO SOIL
The use of scale models is discussed, and it is observed that they are well suited to basic studies of soil-machine relationships, and to comparative tests of configurations and operating conditions. Scale-model testing can afford greater control over test conditions, and experience proves it is feasible to make scale models of earth-moving equipment to yield reliable data for application to practical earth-moving. Correctly set up and operated model earthmoving machines have proved superior to full-scale equipment for observing basic soil phenomena. Scale-model testing for the scraper is outlined.

Sullivan, RJ (Caterpillar Tractor Company) Society of Automotive Engineers Nov. 1964, 1 Fig.

3A 081230
DEFINITIONS
Definitions are set forth and the procedure is described which must be followed on subsurface investigations for highways and structures. Pilot borings (cut sections, fill sections) and design borings are covered. A discussion of the specifications for subsurface explorations covers such aspects as scope, affidavit of non-collusion, certificate of authorization, laws to be observed, permits and licenses, insurance requirements, boring samples and reports, wage rates, lines and grades, duration of contract, and protection of property. Observations are also made on supervision and formal qualification. General remarks are made on construction methods.

Mohl, HA Boston Society of Civil Engineers Oct. 1964, 25 pp, 2 Fig.

3A 081240
PUMPING OF CONCRETE [Le pomage des betons]
A detailed description is given of pumping techniques for concrete. The factors influencing the pumping of concrete are reviewed: laitance, grading composition, consistency, water/cement ratio, admixtures, mixing, pipes, blowing, influence of atmospheric conditions, and prevention of blockages in the equipment. [French]

Acknowledgment: Transport and Road Research Laboratory (IRRD 53312)

3A 081375
SPC5S FOR YOUR FILES. EARTHMOVING PART II
A comparative earthmoving equipment specification chart is presented covering off-highway haulers, off-highway dump trailers, motor graders, rubber-tired rollers, steel rollers and vibratory rollers (self-propelled and towed). Data are presented of general features (maximum carrying capacity, overall length, ground clearance, shipping weight etc.), weight distribution, body, engine, transmission, and tires. Different models are considered of the various makes which include Athey, Caterpillar, Euclid, International Harvester, Iaco Oine/Eject-All, Mack, Terex, Unit, V-Con, Wabco, Challenger-Cook, Fruehauf, Garwood, Hobbs, J.H. Holland, and Hyster.

Construction Methods and Equipment Vol. 56 No. 12, Dec. 1974, 16 pp, 6 Tab.
CONSTRUCTION EQUIPMENT AND METHODS

3A 081477
AMSTERDAM IS FIRST IN CONSTRUCTING A CONTINUOUSLY REINFORCED CONCRETE PAVEMENT WITH A SLIP-FORM PAVER [Amsterdam Legering En Berghouding van zelfslopende grofrendez en met een Slipformpaver]

A continuously reinforced concrete pavement, total area 21,000 sq. m, thickness 18cm, was constructed on a section of a dual-carriageway road. The width of each carriageway is 7.50m. On a roadway of sand cement, thickness 20cm, a 5cm basecourse of gravel-sand asphalt was laid in order to improve the evenness of the base and to obtain a uniform thickness of the concrete layer. The reinforcement, composed of 350 steel bars, diameter 16mm, was assembled on the site. The transverse bars were placed at an angle of 60deg. with the alignment. The percentage of reinforcement is 0.75. The concrete was laid by means of a slip-form paver. Details of the construction method are described and some related aspects of concrete technology are discussed. It is concluded that the experimental use of a slip-form paver for this purpose has been successful. [Dutch]


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 209818)

3A 081556
AFTER THE CONSTRUCTION OF THE OLERON AND NOIRMOUTIER VIADUCTS, ANOTHER VIADUCT 975M LONG IS BEING BUILT BETWEEN THE TREMBLADE AND MARIEGUN IN THE DEPARTMENT OF CHARENTE-MARITIME [Après cet ouvrage et de noirmoutier, un viaduc de 975M de long est en cours de construction entre la tremblade et marennes en charente-maritime]

Details are given of a toll viaduct being built over the river La Seudre in the Department of Charente-Maritime. The structure, which should be opened to traffic at the end of the 1972 tourist season, is 975M long with access roads 3.5KM and 1.6KM long. The prefabricated curved deck consists of a tubular girder of trapezoidal shape which supports two cantilevers. The segments are transported on a truck running on rails and positioned by means of a launching beam. They are glued together and held with prestressing cables. The structure rests on 12 piers four of which are on footings, and eight on piles. The pavements of the access roads consist of a 20CM sand-bitumen layers, 8CM bituminous layer and 4CM asphaltic concrete layer. Observations are made on the segments and on the difficulties arising from variations in height. Mention is made of a study conducted to accelerate setting and speed up handling. Costs are quoted. [French]


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 100117)

3A 081640
CONCRETE SLURRY GUNS [Bombs de Hormigon-(Casos Para la Proyeccion del Hormigon.]


Cardoso, JL Materiales Maginaria Y Metodos Para la Construc No. 67, Dec. 1969, pp 877-87, 10 Fig., 14 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 100397)

3A 081654
EXPERIMENTAL STRETCHES OF ROAD [Les Sections D'Essai De Chaussees.]

A number of experimental stretches of road, approximately thirty in all, was built in all regions in France. This article describes the conditions under which the experimental programme was established, the various construction techniques represented in the experiment and the main results obtained. The necessity of having a thorough knowledge of the pavement before strengthening and of the manufacturing conditions for materials and in-situ operational conditions was shown to be a first requirement. Measurements were taken of deformability, and the deformation of longitudinal and transverse profiles; the lightweight vibrator was used together with core boring for evaluating the pavement structure and its evolution. The importance and effects of heavy traffic were studied. [French]

Sauterey, R. Siffert, M. Bulletin de Liaison des Lab des Ponts et Chaussees No. 63, Jan. 1973, pp 83-91, 4 Fig., 1 Tab.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 101045)

3A 081693
USE OF DUALITY IN ELASTICITY. ADDITIONAL DATA ON THE REISSNER ENERGIES. EQUILIBRIUM OF A LAYERED ELASTIC SLAB RESTING ON A LAYERED STRUCTURE [Utilisation de la Duality en Elastique-Complements sur les Energie de Reissner-Equilibre d'une dalle Elastique Reposant sur une Structure Stratifiee.]

BY USING DUALITY IT IS POSSIBLE TO REDUCE TO A NUMBER OF FORMULAE PROBLEMS OF VARIATION FOUND IN ELASTICITY. SOME OF THESE FORMULAE ARE WELL ADAPTED TO NUMERICAL CALCULATION. FOR EXAMPLE, IT IS DIFFICULT TO NUMERICALLY MINIMISE BY COMPLEMENTARY ENERGY AS DIFFICULTIES OCCUR WHEN THE FINITE ELEMENT METHOD IS USED TO MAKE DISCRETE THE STRESSES WHICH VERIFY EQUILIBRIUM CONDITIONS. THE USE OF DUALITY ENABLES THIS DIFFICULTY TO BE SOLVED. THE EQUILIBRIUM OF A CONCRETE SLAB RESTING ON THE SOIL WAS STUDIED BY MEANS OF ANALYTIC FUNCTIONS. THE SLAB CAN SOME WAY FROM THE SOIL UNDER THE ACTION OF APPLIED STRESSES (IN PARTICULAR STRESSES CAUSED BY TEMPERATURE). WITH DUALITY THIS PROBLEM CAN BE SOLVED NUMERICALLY. THE DATA USED IN THE CALCULATIONS ARE ON THE ONE HAND THE GEOMETRIC AND MECHANICAL PARAMETERS OF THE SLAB AND THE SOIL. ON THE OTHER THE APPLIED STRESSES. THE RESULTS ARE THE DISPLACEMENTS. THE STRESSES IN THE SLAB AND THE SLAB/SOIL CONTACT ARE. ARE AN UNKNOWN. FROM NUMERICAL RESULTS AGREE WITH EXPERIMENTAL MEASUREMENTS. SOME EXAMPLES ARE PRESENTED. [IRRL/ [French]


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 100529)

3A 081742
CONSTRUCTION OF BITUMINOUS PAVEMENTS WITH A DEGREE OF EVENNESS AND A MINIMUM QUANTITY OF MATERIAL

Owing to the requirement that paved surfaces should be smooth and even, and still have a specified minimum thickness, new plans are constantly being devised to improve the surface quality of newly constructed surfacing. In this paper the problem is discussed with reference to the construction of bituminous overlays on existing airport pavements. It is shown how to deviate from a theoretically perfect plane to a plane deformed within certain tolerances without decreasing the serviceability. Thus the quantity of material required may be considerably reduced with corresponding financial benefits. Particulars of the method with respect to surveying, tolerances, the computer program, plans and construction techniques are given. [IRRL/ Conference held on July 28-Aug. 1, 1969.

CONSTRUCTION EQUIPMENT AND METHODS

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 58387)

3A 081743
ASPHALT CONSTRUCTION TECHNIQUES
A detailed description is given of the techniques required for asphalt construction with particular reference to Durban's Southern Freeway. The advantages of this type of construction for South African conditions are also considered and the contractor's problems discussed. /TRRL/

Conference held on July 23-Aug. 1, 1969.


ACKNOWLEDGMENT:

3A 081759
BITUMINOUS PAVEMENT PRACTICE IN QUEENSLAND
This paper describes bituminous pavement design and construction practices both for lightly trafficked rural roads and for motorways and heavily trafficked urban roads in Queensland. Brief reference is made to pavement performance studies being currently carried out. /IRRD/

Murphy, HW Asphalt Pavements for So Africa Conference (1st) Proceeding 1969, 10 pp, 4 Fig., 2 Phot., 10 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 58387)

3A 081762
THE CONSTRUCTION OF DURBAN'S SOUTHERN FREEWAY
This paper is an account of a freeway constructed under difficult conditions. A deep strength asphalt design was adopted since the method of construction offered many advantages for design engineer and contractor alike and has been used extensively both in Europe and in the United States. Details are given of the pavement and asphalt mix designs, the methods used for quality control at the plant and in the field, and the construction techniques employed. /IRRD/

Beadle, DJR Asphalt Pavements for So Africa Conference (1st) Proceeding 1969, 14 pp, 3 Fig., 3 Tab., 2 Phot., 4 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 58387)

3A 081766
WHERE DO CONCRETE ROADS STAND?
The author gives details of concrete road contracts in Great Britain for 1970 and reviews rigid pavement construction methods. /IRRD/


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 61726)

3A 081770
MOTORWAYS IN NORTHERN IRELAND
There are at the present time 56 miles of motorway completed and opened to traffic in Northern Ireland, a further 7 miles under construction and a further 47 miles at the project stage. These motorways are similar to those in Great Britain except for the mound barrier on the central reservation, special curbing along each side of the pavement, and a continuous 4.5 ft-wide paved strip next to the fast lane of the pavement. Details are given of aggregates and materials utilized, concrete bridge design and construction, motorway lighting systems, and preliminary survey works. Costs are quoted. /IRRD/

This article is based on a paper presented at the Institution of Highway Engineers National Conference: Northern Ireland, July 5-7, 1971.

Allen, GWH Roads and Road Construction Vol. 49 No. 584, Aug. 1971, pp 278-281, 1 Fig., 1 Tab., 1 Phot.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 61955)

3A 081775
PUMPED CONCRETE THE KEY ON M5 BRIDGE BUILDING
Details are given of the methods and equipment used for the construction of 41 prestressed and reinforced concrete bridges on the 26.5 km stretch of the M5 motorway in Gloucestershire. /IRRD/


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 42447)

3A 081809
ROAD CONSTRUCTION IN THE CARIBBEAN
Details are given of the 14.1-mile main highway under construction between Chaguanaas and San Fernando in Trinidad. It will provide two 24-ft pavements, 15 steel and reinforced concrete bridges and four underpasses, and seven miles of frontage roads. The works include earthworks, drainage, sub-base, bridges and culverts for both pavements, and the gravel base and asphaltic concrete for one pavement only. Mention is made of the soil along the route, earthmoving and compaction equipment. /IRRD/


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 42448)

3A 081917
BITUMINOUS STRUCTURAL SEALS WHICH RESIST WATER PRESSURE
Developments in methods of protecting engineering structures from the effects of ground water are discussed, with particular reference to bituminous seals and the necessary adaptation of specifications. Mention is made of experience gained in the protection of alpine tunnels in Switzerland, particularly the use of machines to place the seal, and the advantages and disadvantages of the different machines are explained. Details are given of various other projects in Germany where sealing was carried out. /IRRD/

Technical University of Munich, West Germany 55 pp, 98 Fig.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 300551)

3A 081918
MASTIC SURFACINGS STABILIZED WITH CHIPPINGS AND PLACED ON OKTA ADHESIVES AS SURFACINGS FOR ORTHOTROPIC BRIDGE SLABS
Practical experience has shown that the durability of surfacings on orthotropic decks can only be guaranteed if the surfacings are firmly bonded to the metallic base. They must also withstand thermal and traffic stresses and have sufficient stability at high temperatures. A satisfactory method of construction consists in placing an adhesive on the bridge deck and covering it with a mastic layer and a further protective layer. A new method which has been developed combines the advantages of a mastic layer and the protective action of gussasphalt in one layer. The mastic layer contains chippings which are twice crushed and screened and rolled in with a static roller and also has an admixture of high polymers to improve the adhesion strength. Gussasphalt, fine asphalt concrete or asphalts can be used as a top course. An important role is played by the Okta adhesive which also gives protection against corrosion. /IRRD/

Werdinger, J Veroffentlichungen No. 18, 1974, pp 99-105, 8 Fig., 10 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 300548)

3A 081919
SELECTION OF THE BEST SURFACE PROTECTION LAYER TO GO ON TOP OF BITUMINOUS WEARING COURSE
The author briefly considers the need for surface protection courses and describes methods of constructing these courses and their advantages and disadvantages. An evaluation of the courses under present day conditions shows that: 1- Treatment of a surface with a binder which has maximum adhesion and strength is sufficient for light and average traffic; 2-Speeds limits for two to three days and laying during warm weather are recommended; 3-Bituminous slurry may be used for roads carrying light to average traffic; And 4-binders currently available in the German Democratic Republic are such that traffic should not be allowed on the road immediately after the slurry has been laid. /IRRL/

Linemann, K Straße Vol. 12 No. 3, Mar. 1972, pp 121-124, 6 Fig.
CONSTRUCTION EQUIPMENT AND METHODS

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 300539)

3A 081932
USE OF AN ELECTRONICALLY CONTROLLED, TRACKED, GUSSASPHALT LAYING TREN DURING THE RECONSTRUCTION OF A SECTION OF MOTORWAY IN BAVARIA

One machine, which was developed especially for laying gussasphalt, has four tracked units carrying a frame which may be hydraulically raised and lowered, and may be electronically positioned by means of guiding sensors. Widths of material varying from 3 to 15.25 m can be laid. A special roller was developed for grooving the material after it had been laid; this also runs on tracks and is controlled electronically. Both machines came up to expectations on a motorway reconstruction site; advantages include the fact that they are not rail-bound, and that they can be used on cement-stabilized gravel. /TRRL/

Kurek'Sa, VJRRK Teerbau Veröffentlichungen No. 18, 1971, pp 38-41, 2 Fig.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 300522)

3A 081932
COMPOSITE STEEL AND CONCRETE CONSTRUCTION
THE DEVELOPMENT AND ECONOMICS OF COMPOSITE STEEL AND CONCRETE CONSTRUCTION ARE DISCUSSED. ITS ENGINEERING APPLICATIONS ARE DEALT WITH UNDER THE FOLLOWING CHAPTER HEADINGS: FUNDAMENTALS OF COMPOSITE ACTION; CONSTRUCTION METHODS; SHEAR CONNECTION; OTHER TYPES OF COMPOSITE CONSTRUCTION; COMPOSITE CONSTRUCTION IN BUILDINGS; COMPOSITE BRIDGES.

Knowles, PR

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 308787)

3A 081933
THE REGULARITY OF CONCRETE FLOOR SURFACES: A SURVEY OF CURRENT KNOWLEDGE
AN EXAMINATION OF ARTICLES, ADVISORY PUBLICATIONS, CODES OF PRACTICE, STANDARDS, TRADE LITERATURE AND RESEARCH REPORTS YIELDED VERY LITTLE INFORMATION ON THE SURFACE REGULARITY OF CONCRETE FLOORS. A VALUABLE ASSESSMENT OF CURRENT VIEWS WAS, HOWEVER, PROVIDED BY A SEMINAR OF PEOPLE CONCERNED WITH FLOOR CONSTRUCTION, AND USEFUL DATA WERE OBTAINED FROM A SURVEY OF SURFACE REGULARITY CARRIED OUT ON 13 CONCRETE FLOORS USING A BEAM PROFILOMETER DEVELOPED BY THE CEMENT AND CONCRETE ASSOCIATION. VARIOUS METHODS OF SPECIFYING AND CHECKING SURFACE REGULARITY ARE EXPLAINED. THE STANDARDS OF SURFACE REGULARITY AT PRESENT ATTAINED ON DIFFERENT TYPES OF FLOOR ARE Seldom KNOWN BUT RECENT EVIDENCE SUGGESTS THAT THE TOLERANCES RECOMMENDED IN CP 204 MAY BE THE CLOSEST WHICH CAN REASONABLY BE EXPECTED ON MOST FLOORS. THE MOST COMMON TYPES OF IRRREGULARITY OCCURRING ON CONCRETE FLOORS ARE DISCUSSED. RECOMMENDATIONS ARE MADE FOR IMPROVING SPECIFICATIONS FOR FLATNESS, FOR THE PROVISION OF LEVELLING DEVICES ON EQUIPMENT, AND FOR THE USE OF CONSTRUCTION TECHNIQUES WHICH MINIMISE SURFACE IRREGULARITIES. IT IS ALSO RECOMMENDED THAT FURTHER WORK SHOULD BE CARRIED OUT TO ESTABLISH THE DEGREE OF SURFACE REGULARITY REQUIRED ON DIFFERENT TYPES OF FLOOR AND TO DETERMINE THE EFFECTS OF VARIOUS CONSTRUCTION AND FINISHING TECHNIQUES. THERE IS A NEED FOR IMPROVED METHODS OF SPECIFICATION AND FOR ADVISORY LITERATURE IN ACCORD WITH CURRENT OPINIONS AND PRACTICES.

Chaplin, RG
Construction Industry Research & Information Assoc Series No. 48, Jan. 1974, 33 pp, 9 Fig., 5 Tab., 2 Phot., 23 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 208775)

3A 081934
MOBILE PLANT COSTING
THE PAPER CONSIDERS IN DETAIL THE VARIOUS COST FACTORS ASSOCIATED WITH MOBILE PLANT USED BY THE SURFACE EXCAVATIVE INDUSTRY. IT IS STATED THAT THE AIM SHOULD BE TO ACHIEVE LOWEST UNIT COST OF OPERATION AT THE OPTIMUM REQUIRED OUTPUT; IF THE OUTPUT POTENTIAL IS FIXED, THE OPTIMUM ECONOMIC WORKING LIFE CAN BE ESTIMATED BY CAREFUL CONSIDERATION OF THE FACTORS INVOLVED. THE FOLLOWING FACTORS ARE DISCUSSED IN DETAIL: COST OF OWNERSHIP, INCLUDING CAPITAL COST, INTEREST CHARGES AND DEPRECIATION; RESIDUAL VALUE AFTER USE WHICH VARIES WITH THE WAY IN WHICH IT IS SOLD; COST OF MECHANICAL MAINTENANCE AND OVERHAUL WHICH SHOULD BE LESS THAN THE OWNERSHIP COSTS BUT IF MISMANAGED CAN BE THE GREATEST SINGLE COST FACTOR (NOTES ARE GIVEN ON WAYS OF REDUCING MAINTENANCE COSTS); COST OF REPLACING WEARING PARTS SUCH AS EXCAVATOR BUCKETS AND WIRE ROPE; COST OF FUEL AND LUBRICANTS-ATTENTION IS DRAWN TO THE INCREASED COST WHEN PAYING DUTY ON FUELS WHEN THE EQUIPMENT IS USED ON A PUBLIC HIGHWAY; COST OF LABOUR; COST OF THE MAINTENANCE DEPARTMENT INCLUDING STORES AND WORKSHOPS; AND FINALLY, COMPANY OVERHEAD CHARGES WHICH VARY WITH DIFFERENT COMPANIES. THREE APPENDICES GIVE DETAILED EXAMPLES FOR TWO SIZES OF DRAVLINGE AND A LOADING SHOVEL.

Crane, J (Hoveringham Gravels Limited)

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 308726)

3A 082752
THE DESIGN AND CONSTRUCTION OF JOINTS IN CONCRETE PAVEMENTS
This report reviews the various types of joints used in concrete pavements in Great Britain, and gives recommendations on their design, which is related to the method of pavement construction employed. The recommendations are based on the results obtained from a comprehensive programme of laboratory tests and site studies carried out jointly by the Transport and Road Research Laboratory and the Cement and Concrete Association. Standards for the rigidity of transverse joint assemblies are discussed, and a relaxation in the tolerances for alignment of dowel bars is suggested. The report also discusses simple procedures for site tests on joint assemblies before concreting to ensure satisfactory performance both during the construction and the subsequent life of the road. /Author/TRRL/

Parmenter, BS

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 208228)

3A 082758
TSING YI BRIDGE
This brief article gives an outline of the planning and construction of the bridge which will link Ising Yi Island to the Chinese mainland at the Kwok Tai Peninsula, Hong Kong. This bridge will serve motor traffic and accommodate electricity cables and oil and other service pipes. A post tensioned reinforced concrete bridge design on the principle of balanced cantilevers was chosen in preference to a suspension bridge because of the prevalence of typhoons, five 200 ft. cantilevers giving four spans of 400 ft and two of 200 ft. After describing the negotiations that preceded

Chaplin, RG
Construction Industry Research & Information Assoc Series No. 48, Jan. 1974, 33 pp, 9 Fig., 5 Tab., 2 Phot., 23 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 208775)
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construction, the author gives some details of the construction of the piers and of the structure itself. He also describes the precautions that were necessitated by the prevalence of typhoons. The bridge is the second longest of its type in the world. The consultants, contractors, engineers and others who participated in the project are cited.


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 207966)

3A 082760 SECOND PHASE CONSTRUCTION OF THE TOKYO EXPRESSION ROUTE NO. 3

This article gives an account of the design and construction of the Tokyo Expressway route no. 3 which links the Tokyo-Nagoya Expressway to the city's business center. After giving a brief introduction which includes a diagram of the Tokyo Expressway network the author describes the general scope of the project, which involved the simultaneous construction of an elevated highway and a subway tunnel. The tunnel was constructed by the cut and cover method and the piers for carrying the highway were mostly constructed with the tunnel. Steel box-girder construction was used for the elevated highway. Details are given of the design of the structure including the methods of stress analysis that were used. This is followed by an account of the actual construction work, particular reference being made to measures that were adopted to overcome environmental problems. These include an Auger method for sinking the piles to eliminate noise and vibration, and timing the operations to reduce disturbance to traffic flow. After an account of the ways in which engineering difficulties were overcome, the author concludes with details of the construction costs.

/KTRRL/

Konura, T (Tokyo Expressway Public Corporation) Civil Engineering in Japan Vol. 11 1973, pp 51-60, 8 Fig., 3 Tab., 4 Phot.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 207919)

3A 082778 A GLANCE AT THE CONSTRUCTION OF MANY KINDS OF BRIDGES IN JAPAN

After a general introduction outlining the scale of bridge construction during recent years, the author discusses the materials that have been used. He refers particularly to high tensile steels, weather-proof steels and the increasing use of lightweight aggregates in concrete. Reference is also made to measures that were adopted to overcome environmental problems. These include the use of high tensile steel bolts instead of rivets and the increase in the proportion of concrete bridges, which although more prone to problems resulting from earthquakes, are quieter. The remainder of the article gives details of a number of specific bridges which have been constructed recently. These have included girder steel bridges, truss bridges, arch bridges, suspension bridges, cable-stayed bridges and concrete bridges.


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 207914)

3A 082779 PAVING MATERIALS FOR MOTORWAYS AND TRUNK ROADS

The article describes the progress made in the concrete paving of motorways and major trunk roads-a tenfold increase in the proportion of road length built in concrete. The Department of Environment now prepares alternative designs for both flexible and concrete paving. Concrete roads are now 10 to 15 percent cheaper than before. This is due to the recommendation of the then Road Research Laboratory that unreinforced concrete be used as an alternative construction material on motorways and trunk roads at the same thickness as was specified for reinforced concrete on these roads. The article also compares the advantages and disadvantages of concrete paving and flexible paving and suggests that the competition between the two types might lead to a drop in the cost of roads.


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 208003S)

3A 082787 PLYMOUTH CAR PARK STRADLES RAILWAY LINE

This article briefly describes a multi-story car park for 310 cars built over a section of the London-Plymouth Main-Line Railway. The three-storey car park is built on a bridge of precast prestressed concrete beams that span 16m between in-situ columns and beams on either side of a cutting on the railway line. Details are given of the costs, design, concrete mix and construction methods.


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 205787)

3A 082788 QUICKER BY TUBE TO THE JETS!

Details are given of the 5.6km long extension of the Picadilly line tube from Hounslow west to the center of Heathrow airport, scheduled to be opened in 1976. The construction work in progress is in three parts: the cut-and-cover section from Hounslow west to a new station at Hatton Cross on the airport perimeter, the mainly deep tube section from Hatton Cross to Heathrow central, and the terminal station at Heathrow central. Construction is mainly of secant pile wall type with some reinforced concrete boxes, and open cut where the line rises to cross the river Crane over a reinforced concrete bridge. Mention is made of the special track deck used in the covered way between Hounslow west and Parkway, which is mounted on 102mm thick rubber bearings. Costs are quoted.


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 205788)

3A 082794 GUNITING ADDS STRENGTH UNDERNEATH THE ARCHES

To match the load capacity of the newly opened London bridge, a program of guniting has been carried out to strengthen the arches that support its southern approach roads. Details are given of the placing of the gunite on the wall faces and arch soppits, the reinforcement used, and equipment utilized. To further improve the load-bearing properties of the soil beneath the foundations, injections of sodium silicate and calcium chloride were used. Costs of the guniting operations are quoted.


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 205764)

3A 082800 SYNTHETIC RESINS FOR CONCRETE REPAIR [Kunstharsen Bij Betonreparatie]

A survey is presented of the various types of synthetic resin used for concrete repair. The properties of the resins, resinous compounds and mortars are discussed. The application methods and repairation techniques are described, and several problems, especially with respect to the adhesion of fresh concrete to old concrete and repair of cracks, are outlined.

/Bassie, W Cement No. 25, Jan. 1973, pp 1-2, 12 Fig., 3 Tab., 8 Phot., 14 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 206059)

3A 082804 LEAN CONCRETE USED AS A BASECOURSE MATERIAL [Magerbeton som Baerelag I Veler]

The construction of a test section using a 12 cm layer of lean concrete as a basecourse is described. The test section is incorporated in a new road
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constructed in 1972 by the city of Oslo, Department of Roads and Streets. Details of the water/cement ratio and the aggregate size distribution are given together with methods of placing, compacting and curing the concrete. Results of tests on concrete core samples are presented, and the economic advantages of using lean concrete are briefly discussed. /TRRL/ [Norwegian]

Wistrom, T. Bygg Vol. 39 No. 8, Oct. 1972, p 26, 1 Fig., 2 Phot., 1 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRR D 206073)

3A 082805
PROBLEMS IN THE CONSTRUCTION OF WESTERN AVENUE EXTENSION
The paper deals with some of the practical aspects of the construction of the elevated sections of Western Avenue extension. Throughout its length it runs over and alongside railways, electrified lines of the London Transport Board, water ways and local urban roads. The paper concentrates on some of the special problems which entailed variations to the standard construction techniques. /Author/TRRL/


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRR D 206020)

3A 082809
ROADHEADERS PROGRESS STEADILY UNDER LIVERPOOL
The underground railway system being constructed in Liverpool is outlined, and details are given of the construction of the tunnels for which a rotary boom roadheader, chosen because of its flexibility, was used. /TRRL/

New Civil Engineer No. 39, May 1973, pp 32-35, 2 Fig., 6 Phot.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRR D 206031)

3A 082816
THE USE OF BITUMEN EMULSIONS IN THE CONSTRUCTION AND MAINTENANCE OF ROADS
The types and grades of bitumen emulsion available to road authorities in South Africa and their properties are described. Recommendations are made on the correct handling and application of bitumen emulsion in road construction practice. This document gives details of the types of construction where bitumen emulsion was found to give satisfactory performance, together with some of the most common road construction and maintenance specifications. /Author/TRRL/

South African Council for Scientific & Indus Res Standard June 1972, 36 pp. 1 Fig., 10 Tab.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRR D 205982)

3A 082839
HOW TO BUY, RENT OR LEASE THE TOOLS OF CONSTRUCTION
A contractor has many equipment acquisition choices. Cash purchases, various installment plans, rental plans, and a number of different leases and loans are available to contractors who want to get equipment. In total dollars spent, the least costly equipment financing method is the cash purchase; the most expensive is renting. In addition to outlining these choices, this article presents other costs to consider: costs imposed by missed tax deferrals and deductions, costs of lost profits from work missed due to lack of funds or bonding capacity, and costs of lost dollar value because of rock pressure, may be calculated. The influence of the method of working and of the distance between heading and point of installation of support is suggested. The method of calculation may be applied to the foundation of the world's tallest free-standing tower. It is concluded that stage post-tensioning will play an important role in the future growth of the prestressed concrete industry.

Slater, WM (Conenco International Limited) Prestressed Concrete Institute, Journal of Vol. 20 No. 1, Jan. 1975, pp 14-27, 14 Fig.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRR D 206073)

3A 082870
STAGE POST-TENSIONING—A VERSATILE AND ECONOMIC CONSTRUCTION TECHNIQUE
The author, whose company has been a prime developer of stage post-tensioning, describes the mechanics and structural advantages of this new and powerful prestressing technique and discusses its application to several major high rise structures. Some of the structures include large girders (of minimum depth) over subways and supporting high rise buildings, girders in nuclear facilities, girder ties in buildings with sloping columns, and in the foundation of the world's tallest free-standing tower. It is concluded that stage post-tensioning will play an important role in the future growth of the prestressed concrete industry.

Muller, J (Bernard (Compenon) Design & Construction Engineers) Prestressed Concrete Institute, Journal of Vol. 20 No. 1, Jan. 1975, pp 28-61, 25 Fig.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRR D 206073)

3A 082898
AN INTEGRATED PAVEMENT DESIGN PROCESSOR
An integrated pavement design processor has been developed as a strategic approach to the design and management of construction and rehabilitation of pavements. The modular processor is a comprehensive decision framework with a capacity to drive different optimization routines at the user's command through interactive queries between the computer and the design engineer. The multi-option arrangements enable the design engineer to consider both rigid and flexible pavement systems simultaneously. The processor can be used for new pavement construction or existing pavement rehabilitation. In addition, three options for flexible pavement design are included to describe the structural subsystem desired; one based on AASHO structural number, another based on Dynaflect deflection, and the third based on linear elastic theory.

Research Study sponsored by Texas Highway Department and FHWA.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRR D 205982)

3A 083162
DIMENSIONING OF TUNNEL LININGS WITH REGARD TO CONSTRUCTIONAL PROCEDURES
It is shown that by using a computer of the characteristic curves for rock, rock core and installed structures, the point of equilibrium, i.e. the effective rock pressure, may be calculated. The influence of the method of working and of the distance between heading and point of installation of support structure is demonstrated, and a procedure for the evaluation of these influences is suggested. The method of calculation may be applied to the control of rock pressure and deformation properties of tunnel linings.

Lu, DJ Shib, CS Servinr, FH Lyttton, RL

1-8-69-123

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRR D 205982)

3A 083162
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Lombardi, G. Tunnels and Tunnelling Vol. 5 No. 4, 1973, pp 340-351, 13 Fig.


1-8-69-123
CONSTRUCTION EQUIPMENT AND METHODS

3A 083166
CONCRETE ROADS-DEVELOPMENT OF NEW TECHNIQUES
This article describes the new techniques which have been developed during the past three years, following the publication of Technical Memorandum H3/69 which approved the use of unreinforced concrete slab construction without expansion joints provided the work was carried out between April 21 and October 21. The techniques were used in three road construction projects: (1) The A-12 4Km-long Margaretse By-pass in Essex in which the principal innovation in slip-forming was the successful positioning of dowel bars in the transverse contraction joints, which are spaced at 5M centers without the need for prefabricated joint assemblies set ahead of the paver; (2) The A449 New Midlands Road, an unreinforced concrete structure with dowelled construction joints at 20 ft intervals, and (3) the Gerrards Cross Motorway Bypass, for which the Erupt CXC plastic grooving machine for producing anti-skill texture on new concrete roads was used for the first time. Details are given of the slip form pavers used, formation of transverse contraction joints and longitudinal joints, concrete mix design and laying, and grooving techniques and equipment. /TRRL/
Highways and Road Construction Vol. 41 No. 1762, 1973, pp 13-17, 1 Fig., 11 Phot.
ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 206674)

3A 083204
PREFABRICATING SMALL CROSS SECTION TUNNELS THE DUTCH WAY
The article discusses methods developed in the Netherlands for the construction of underwater tunnels from prefabricated concrete sections. The tunnel sections, which are usually from 60-120m long, are sunk in dredged trenches and provided with concrete ballast. To ensure that joints are watertight, "Gina" compressible rubber profile seals are used, while the problem of shrinkage cracks is usually overcome by applying a bituminous lining. Details are given of a number of methods developed to minimize the number of structural joints and shrinkage cracks. /TRRL/
Glerum, A Tunnels and Tunnelling Vol. 5 No. 4, 1973, pp 366-371, 4 Fig., 3 Phot.
ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 206695)

3A 083318
CRACKING AND SPALLING OF THE CONCRETE COVER OVER STEEL IN REINFORCED CONCRETE IN MARINE ATMOSPHERES
This information sheet presents some operational guidelines intended to reduce the risk of cracking and spalling in reinforced concrete structures exposed to marine atmospheres. The recommendations concern (a) the design and siting of the structure; (b) materials; (c) composition of the concrete mix; (d) compaction; (e) curing; and (f) placing of the reinforce­ment. /TRRL/
Council for Scientific and Industrial Res, S Africa 1972, 2 p
ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 207440)

3A 083330
SOME CONSIDERATIONS ON THE PLANNING OF ENGINEERING STRUCTURES IN RELATION TO THE VARIOUS PHASES OF CONSTRUCTION AND TO THE STRUCTURE WHEN IN SERVICE [Quelche Considerazione Sulla Progettazione di Operedi Ingegneria Civile in Rapporto alle Varie Fasi di Esecuzione e a Quella Finale di Esercizio]
In addition to its operational function, the planning of a civil engineering structure is determined by the technical means used for its construction. This gives rise to a preference for certain constructional solutions in relation to particular economic conditions. The prevalence of cantilever over arch bridges, due to the prohibitive cost of centering and scaffolding, is cited as an example, and the planning of constructional stages is discussed with a view to minimising the effects of secondary stresses and delayed deformation in cantilever structures. /TRRL/ [Italian]

3A 083351
BUDAPEST: A NEW TYPE OF CONSTRUCTION ADOPTED FOR UNDERGROUND RAILWAY STATIONS [Un Nuovo Tipo di Costruzione Adottato per le Stazioni Nelle Ferrovie Sotterranee]
Details are given of the design and construction of a new type of underground station, built on the first Budapest underground line. The station (at Astoria) consists of twin tunnels or a combination of several tunnels with a supporting structure of top and bottom girders, in turn supported by concrete filled steel columns, spaced 4m apart. Since the station and the line tunnels are of the same diameter, the design ensures the continuous operation of the driving shield, without the need for dismantling and reassembly. The type of construction described will also be adopted for the Kossuth and Bethyony stations. /TRRL/ [Italian]
Rozsa, L Bervalner, J Strade No. 5, 1973, pp 269-299, 15 Fig.
ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 207350)

3A 083327
DIFFICULTIES ENCOUNTERED IN THE CONSTRUCTION OF THE BRIDGE ACCROSS BASSEIN CREEK
Details are given of the difficulties encountered during construction of the 555 meter long prestressed concrete, box-girder bridge across Bassein Creek near Ghotbander, Bombay. Beside describing the usual difficulties of tilts and shifts in the foundation caissons, and the methods of their rectification, the article outlines the solutions adopted to solve special problems of very heavy tilts and leakage joints in concrete well steinings. In order to get over the difficulty of non-availability of roller bearings in time, the special arrangements made for constructing the deck of the bridge at a higher level than designed and subsequently lowering it on the roller bearings when they were received are also detailed. Difficulties usually encountered in the cantilever method of construction are discussed. /TRRL/
Phadke, RK Shennolikar, GM Indian Roads Congress Journal of Vol. 35 No. 1, Paper No. 293, 1973, pp 87-137, 4 Fig., 2 Tab., 14 Phot.
ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 207313)

3A 083330
JACK-UP PLATFORM SINKS UK'S BIGGEST DRIVEN PILES
Brief details are given of the piling operations during the construction of the 29-span, composite plate girder oose bridge, near Goole, Yorkshire, part of the m62 motorway. The ground conditions of the flood plain favored the use of reinforced concrete step taper-type driver piles for the 26 approach spans of the bridge. The end-bearing piles were driven using a steel mandril; they are designed to take high lateral forces, contain reinforcing bars, and use high slump concrete which does not need vibration. Large diameter piles are being driven under water for the 3-span river section. 1.53m diameter steel tubed piles are being driven to a depth of 20m. The first 10m of soil inside the casing is removed by high pressure jetting and pumping and is replaced by high slump concrete containing 40mm diameter reinforcing bars. 50x50mm shear rings are welded into the casing, and are used to transfer the vertical load from the concrete to the pile casing. /TRRL/
New Civil Engineer No. 55, 2 Fig., 8 Phot.
ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 207334)

3A 083361
UNISSEN PILES CUT CONSTRUCTION TIME
This brief article gives an account of the use of Unissen Piling in the Construction of a Bridge at Shrivenham to Allow the Road to Pass Under the Railway at a Former Level Crossing. The use of the piling eliminated almost all of the temporary works which are required in a conventional reinforced concrete construction and the work was also speeded up because the Unissen section performed the dual function of sheet pile and bearing
CONSTRUCTION EQUIPMENT AND METHODS

NESS OF FINISHED SURFACE) THAT HAS BEEN ATTAINED UNDER DIFFERENT SOIL CONDITIONS. PARTICULAR REFERENCE IS MADE TO THE RELATIONSHIP BETWEEN EXCAVATION TIME AND GROUND CONDITIONS. THE NEXT PART OF THE ARTICLE IS CONCERNED WITH THE DIFFERENT APPLICATIONS OF THE METHOD. PARTICULAR REFERENCE IS MADE TO THE TBW PROCESS WHICH HAS BEEN USED IN JAPAN BECAUSE OF THE ADDITIONAL NEED FOR A DIAPHRAGM WALL TO FUNCTION AS A SEISMIC WALL. ASPECTS OF DIAPHRAGM WALL TECHNOLOGY ARE NEXT DISCUSSES. THESE INCLUDE THE USE OF A NEW STABILIZING AGENT "TELMACH" & RESEARCH ON DIAPHRAGM WALL MEASURING APPARATUS. THIS IS FOLLOWED BY FURTHER DETAILS OF THE USE OF THE TBW PROCESS. THE AUTHOR CONCLUDES BY MAKING REFERENCE TO AREAS WHERE FURTHER INVESTIGATIONS ARE NECESSARY.

IIkuta, Y ( Takenaka Technical Research Laboratory) Ground Engineering Vol. 7 No. 5, Sept. 1974, 2 pp, 1 Fig., 1 Tab., 12 Phot., 4 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 211515)

3A 083883
INTERIM REPORT ON COMPACTION OF SOIL IN ARID AREAS, PART 1 LITERATURE SURVEY

This interim report draws on information obtained from literature on compaction generally, but special reference is made to the problems of compaction in arid areas. A bibliography of 178 references is included. A brief review is given of the theory behind the need for compaction to increase the load carrying capacity of the soil as well as to reduce the future deformation which might occur under the effects of repeated loading. The possible advantage of vibrating compactors is explored. Minor water to give maximum density is pointed out, and the factors affecting loss of water from the soil layers are considered. It is concluded that the object of further research should be to investigate or find methods which will ensure high strength and resistance to deformation with as little water as possible, to apply the necessary water in the most effective manner, and to use procedures and construction methods which will reduce evaporation losses to a minimum.

Vie Vol. JG6 No. 1, Mar. 1966, pp 5-6

3A 083901
FULL-DEPTH CONSTRUCTION TYPE [Asphaltoberbau]

THE AUTHOR DESCRIBES THE INCREASING USE OF A NEW FLEXIBLE PAVEMENT CONSTRUCTION METHOD. FULL-DEPTH CONSTRUCTION, IN WHICH THE STANDARD ROADBASES (PART OF WHICH CONSISTS OF A THICK LAYER OF UNBOUND MATERIALS) IS REPLACED WITH A THINNER BITUMINOUS LAYER. ACCORDING TO THE AUTHOR THIS NEW TYPE OF CONSTRUCTION SHOULD NOT BE INDETERMINATELY SELECTED. THE MAIN ADVANTAGE, WHICH IS REDUCED THICKNESS, IS CANCELLED BY THE FACT THAT HIGH-PERFORMANCE, VERY COSTLY AGGREGATES MUST BE USED TO ENSURE THE STRENGTH OF THE THINNER LAYER. FURTHERMORE, BECAUSE A ONE-COURSE SYSTEM RESTS DIRECTLY ON THE SUBGRADE, THE RIGIDITY OF THE PAVEMENT STRUCTURE IS NOT GUARANTEED AND THE SUBGRADE MUST HAVE ADEQUATE BEARING CAPACITY.

[German]
Luecke, H Naturstein-Ind No. 5, May 1972, pp 5-6

ACKNOWLEDGMENT: Laboratoire Central des Ponts et Chausées (LCPC11026E), Transport and Road Research Laboratory (IRRD 100625)

3A 084088
THE FOUNDATIONS OF THE PORT MANN BRIDGE, PART 2: CONSTRUCTION

This paper deals with the various phases of the construction of the foundations and describes, in varying detail, the work to be performed and the construction methods. Work of construction types not referred to briefly and the more uncommon are dealt with at length. Work described in detail includes (a) the preboring of holes up to 200 ft. deep in sensitive material, the placing and driving of piles in these holes and the grouting of the annular space between the driven pile and the sides of the hole; (b) the construction, bracing and dewatering of cofferdams; (c) underwater excavation and compaction by Vibroflotation; (d) underwater injection concrete work and (e) the manufacture, locating, and sinking of brush mattresses for scour protection.

Davie, WG Engineering Journal (Canada) Vol. 47 No. 3, Mar. 1964, p 51

3A 084532
DESIGN FOR CHANGE: THE IMPACT OF CHANGING THREATS AND MISSIONS ON SYSTEM DESIGN PHILOSOPHY

Our highly formalized acquisition program has caused the Naval Architecture Community to evolve to a 14 year development cycle. In this cycle the combat system is proved in the first seven years, prior to the last seven of platform definition and construction. Inflation and accelerating rates of change of both threat and technology force the Navy to alter platform characteristics during these final years, causing a complex and costly "integration after" problem in every new combatant. This paper discusses the naval ship system peculiarities; ship modernization/ conversion cost; modularity feasibility; current Navy weapons systems acquisition; modularity cost review; recommendations for modularity and the future of naval architecture.

One of 24 papers contained in the April 1975 issue of the ASNE Journal available at $5.00 from ASNE. Reprints of single articles $1.50 for members and $2.00 for non-members.

Simmons, IL Naval Engineers Journal Vol. 87 No. 2, Apr. 1975, pp 120-125

ACKNOWLEDGMENT: American Society of Naval Engineers

PURCHASE FROM American Society of Naval Engineers 1012 4th Street, NW, Washington, D.C., 20005

3A 084686
FIFTY-YEAR DEVELOPMENT: CONSTRUCTION OF STEEL ARCH BRIDGES

During the past 50 years there have been major changes in the engineering, fabrication, and construction of steel arch bridges. The later surveying instruments, high-strength steels, numerically controlled driling, welding, and high-strength bolts have all had tremendous impact on lid construction. The methods of erecting have also vastly improved the efficiency, time, and safety of bridge construction. Erection methods vary from supporting the arch by falsework or wire rope tiebacks to jacking large heavy spans several hundred feet above river level. Fifty years ago, falsework was made of square timber formed into bents supported by wooden pile. Today, it is made from lightweight steel sections. Large floating derricks are used to lift heavy pieces, often eliminating the need for travelers motored on the bridge.


3A 084647
FIFTY-YEAR DEVELOPMENT: CONSTRUCTION OF STEEL SUSPENSION BRIDGES

During the past 50 years there have been changes in the construction of steel suspension bridges. The design of bridges with longer spans has had an impact on the methods used for construction. The methods used for tower erection have changed with the use of heavier and taller towers. Longer spans have resulted in larger diameter cables. This has affected the design and erection of catwalks and the methods and equipment used for cable spinning, stiffening, truss erection, and cable wrapping. The development of the methods used to erect the towers, main cables, and suspension bridges is traced by reviewing the construction of notable suspension bridges built in the United States.


3A 090075
PRESTRESSED CONCRETE PAVEMENTS, VOLUME II: DESIGN AND CONSTRUCTION PROCEDURES FOR CIVIL AIRPORTS

The volume of this report recommends practices and procedures for design and construction of prestressed concrete pavements for civil airports. For the
CONSTRUCTION EQUIPMENT AND METHODS

3A 090676
THE FLATHEAD TUNNEL. A GEOLOGIC, OPERATIONS, AND GROUND-SUPPORT STUDY, BURLINGTON NORTHERN RAILROAD, SALISH MOUNTAINS, MONTANA
The 7-mile Flathead Tunnel located in the central Salish Mountains of northwestern Montana was constructed between 1966 and 1969. With the contract awarded April 19, 1966, tunnel excavation began September 30, 1966, and was completed June 21, 1968, in 488 tunnel driving days. Peak advance was 66 feet per day. On June 27, 1969, 53 weeks following ‘holing through’, all tunnel concrete lining was completed. Average wall and arch concrete placing rates exceeded 1700 cubic yards daily. Much of this outstanding tunneling progress can be directly attributed to specialized construction equipment. Operations were distinctly conducive to seasonal construction and decidedly influenced job schedules. The Flathead Tunnel was successfully completed within contract time, with major cost savings in concrete tunnel lining achieved through a value engineering clause in the contract.
Skinner, EH
Bureau of Mines Burmnes-IC-8662, Feb. 1975, 114 pp
ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
AD/A-003477/7ST

3A 090680
CONSTRUCTION EQUIPMENT (A BIBLIOGRAPHY WITH ABSTRACTS)
Construction equipment used in roadbuilding, mining, earth handling and general construction are described and analyzed in these Government-sponsored research reports. Translations of foreign literature are not included. (Contains 174 abstracts.)
Supercedes COM-73-11378.
Habercom, GEJ
National Technical Information Service Biblog May 1975, 175 pp
ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
PB-240682/5ST

3A 090759
THE D-645-2 COMPLEX OF EQUIPMENT FOR PREPARING ASPHALT CONCRETE MIXES
The D-645-2 complex is intended for preparing asphalt concrete and bitumen-mineral mixes which are used in road building and for other types of construction. It is designed so that when necessary the formula for the mix can be changed easily. The article gives the order of preparation of the mixes and describes the various units of the complex. The equipment was tested under unfavorable weather conditions and proved to be entirely satisfactory. Its adoption in industry will effect large economic savings.

Trans. of Stroitelnye i Dorozhnye Masbiny (USSR) n7 p8-11 1972.
Bardeev, SV Zabolotnyi, VM Mendeleev, Al Gurbanov, IM
Army Foreign Science and Technology Center PSTC-HT-23-11092-73, Apr. 1973, 9 pp
ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
AD/A-005952/7ST

3A 090789
DS-70 AGGREGATE FOR CRUSHING SOIL
The DS-70 aggregate is additional equipment for the D-709 soil-mixing installation and is intended for crushing weak (kaolinite) clays with moisture of up to 12%. The aggregate contains a bar screen, a mill, and a conveyor. When changing to different soils, the aggregate need not be removed from the D-709 installation.
Trans. of Stroitelnye i Dorozhnye Masbiny (USSR) n8 p2-3 1972.
Kazakovskii, Y
Army Foreign Science and Technology Center PSTC-HT-23-1394-73, July 1974, 7p
ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
AD/A-005447/5ST

3A 090801
REVIEW OF CONSTRUCTION EQUIPMENT AND METHODS FOR PAVEMENTS
The investigation reported herein was conducted to review methods and equipment being used by industry in the construction of pavements and to recommend changes to Corps of Engineers guide specifications to incorporate new methods and equipment. Literature reviews were conducted, and visits were made to construction sites and equipment manufacturers. Observations and measurements were taken on pavements constructed with slip-form pavers, and a separate report was written on the results. As a result of the overall investigation, the pertinent guide specifications will be revised to allow the use of slip-form pavers for portland cement concrete pavements in the design procedure, the basic load-stress relationships were developed from small-scale model tests employing static loadings. Stresses computed from Westergaard's theory for elastic behavior were adjusted by moment correction factors to reflect the redistribution of moments resulting from partial hinges that develop under the load. Effects of repetitive moving loads were examined both in small-scale models and in full-scale prototype test pavements. The design procedure permits integrating magnitude of loading, load repetitions, flexural strength, subgrade conditions, pavement thickness, slab dimensions, and magnitude of prestress. Consideration is also given to the effects of elastic shortening, creep, and shrinkage of concrete, relaxation in steel tendons, anchorage systems, tendon friction, subgrade restraint, and temperature changes. Construction procedures and alternatives are examined based on a study of prototype test pavements and operational prestressed facilities constructed in the US and abroad.
See also Volume 1, AD/A-000 456.
Odom, EC Carlton, PF
Waterways Experiment Station, Federal Aviation Administration Final Rpt. Nov. 1974, 77 pp
Contract DOT-FA71WAI-218
ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
AD/A-003477/7ST

3A 090829
TUNNEL COST ESTIMATING UNDER CONDITIONS OF UNCERTAINTY
Of all areas of heavy construction, tunnel projects are subject to perhaps the greatest degree of uncertainty from the standpoint of predicting cost and progress. Sources of uncertainty include the unknown nature of geologic conditions along the tunnel alignment, and the difficulty of estimating the performance of men and equipment within the narrow confines of the tunnel. In this report a method is presented for explicitly reflecting these uncertainties in estimates of the time and cost of tunnel construction.
Also pub. as Tunnel Construction-5.
Rine, CL
ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
AD/A-005007/0ST

3A 091175
TUNNEL. A GEOLOGIC, OPERATIONS, AND GROUND-SUPPORT STUDY, BURLINGTON NORTHERN RAILROAD, SALISH MOUNTAINS, MONTANA

3A 091758
THE PROBABILISTIC ESTIMATION OF CONSTRUCTION PERFORMANCE IN HARD ROCK TUNNELS
This report concerns the development of a computer-based simulation model which can be used to evaluate costs and risks associated with hard rock tunneling. This report is the 4th in a series of reports dealing with this
CONSTRUCTION EQUIPMENT AND METHODS

subject. The report examines conventional cost estimating procedures and concludes that there are two major inadequacies which exist: (1) the inability to account for the uncertainty in suspected geologic conditions at the tunnel depth; and (2) the inability to quantify the effect of uncertain geology and the effect of the additional uncertainty in productivity of men and equipment on the performance of a construction strategy. The model employs techniques of probability and simulation to avoid these two shortcomings.

Minott, CH
Massachusetts Institute of Technology, National Science Foundation Tech. Rpt. R74-47, July 1974, 198 pp
Grant NSF-G1-34029
ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
PB-242427/1ST, DOTL NTIS

3A 092551
TUNNEL COST MODEL: PROFESSIONAL PAPERS, 1974
This collection of four papers describes the completed first phase of the research project—the organization and scope of the model; its technical content, assumptions, capabilities; and directions for its future development and use. These papers are presented to several reports and theses produced over the last year, and highlight the important characteristics of the model and its potential applications.
Report no. 3 in a series on 'Tunnel Construction.' See also report dated Jun 74, PB-242 598.

Moavenzadeh, F Einstein, HH Markow, MJ Wyatt, RD Vick, SG
Massachusetts Institute of Technology, National Science Foundation Tech. Rpt. P74-4, P74-5, July 1974, 121 pp
Grant NSF-G1-34029
ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
PB-243253/2ST, DOTL NTIS

3A 092552
TUNNEL COST MODEL: A STOCHASTIC SIMULATION MODEL OF HARD ROCK TUNNELING, VOLUME 1. SUMMARY REPORT
This report describes the completed 1st phase in a project to develop a tunnel cost model—the organization and scope of the model; its technical content, assumptions, and capabilities; and the relation of the model to various exploratory and tunneling practices. The report consists of three volumes: a Summary Report, a Technical Report, and the Appendices. The tunnel cost model was developed in an attempt to improve the assessment of uncertainty in tunnel cost estimates, with enough detail and accuracy to aid in preparing estimates or bids. The scope of the model is limited to hard rock tunneling. A working version of the model has been obtained and trial runs of selected example problems have been run and are discussed in this report. This report is the 1st in a series relating to the tunnel cost model to document the work continuing under the research project mentioned.
Report no. 1 in a series on 'Tunnel Construction.' See also report dated Jun 74, PB-242 598.

Moavenzadeh, F Einstein, HH Markow, MJ Lindner, EN Minott, CH
Grant NSF-G1-34029
ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
PB-243252/4ST, DOTL NTIS

3A 092588
AIRFIELD PAVEMENT CONSTRUCTION: SLIPFORM PAVING METHOD [Final rep. Jul 71-Jun 73]
This report presents the results of a study conducted to evaluate the use of slipform paving equipment for the construction of airfield pavements. Nine construction projects were observed and smoothness measurements made on eight of these projects. Currently used equipment and construction practices are presented and analyzed; problem areas and corrective measures are discussed. Results from the smoothness measurements are presented and considered in terms of current construction requirements and the effect of the surface smoothness on the functional performance of the pavement. Although the elimination of fixed side forms is the most appealing feature of the slipform method, it also causes the most complications.

Parker, FJ
Army Engineer Waterways Experiment Station, Vicksburg Miss 5-18
AEWES-Misc-Paper-S-7, 18, June 1975, 76p
ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS NTIS Price, /MFS$2.25
AD-A012769/6ST

3A 092596
RESEARCH PROGRAM PLAN FOR MEETING TOMORROW'S NEEDS IN TUNNELING AND EXCAVATION
This report presents the results of a study performed by Bechtel Corporation for the National Science Foundation, Research Applied to National Needs (RANN). The purpose of the study is to develop a recommended long range research program plan in tunneling and excavation for RANN. The objective of the RANN tunneling and underground excavation research program is to achieve technological improvements that would enhance the quality of life in urban areas through more economic and effective utilization of the underground space.
See also PB-242 742.

Grant NSF-C841
ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
PB-242777/1ST, DOTL NTIS

3A 092597
RESEARCH PROGRAM PLAN FOR MEETING TOMORROW'S NEEDS IN TUNNELING AND EXCAVATION. EXECUTIVE SUMMARY
This report presents the summary of a study performed by Bechtel Corporation for the National Science Foundation, Research Applied to National Needs (RANN). The purpose of the study is to develop a recommended long range research program plan in tunneling and excavation. The results of the study, which are delineated in the main report and accompanying appendices, contain supporting evaluations.
See also PB-242 777.

Bechtel Corporation, National Science Foundation NSF/RA/T-74-086, Feb. 1974, 34 pp
Grant NSF-C841
ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
PB-242742/5ST, DOTL NTIS

3A 093223
SLURRY SEAL SURFACE TREATMENTS
This report prepared to aid the facilities engineer in prescribing and constructing slurry seals. The report identifies the potential areas of slurry seal application and discusses material requirements, field construction processes, and techniques to assist the facilities engineer in placing good quality slurry seals. A summary of a recommended laboratory design method for proportioning the materials of the slurry seal mixture and a modified version of construction guide specification CE-807.23 for emulsified asphalt slurry seal surface treatments are also presented herein.

Godwin, LN
Waterways Experiment Station Final Rpt. AEWES-Instr-S-75-1, June 1975, 64 pp
ACKNOWLEDGMENT: NTIS
PURCHASE FROM: NTIS Repr. PC, Microfiche
AD-A014164/8ST
CONSTRUCTION EQUIPMENT AND METHODS

3A 093434

SPlicing OF PRECAST-PREStRESSED CONCRETE PILes

A broad range of splices for precast prestressed concrete piles were evaluated based largely upon information furnished by fabricators, designers, and proponents of the various splices. Basic considerations included size range, field time for splicing, approximate cost, availability, and construction usage. Data on the strength of the splices was obtained from tests during the study, from experience and tests conducted by others, and from theoretical and analytical studies. The cement-dowel splice was tested under hard and soft driving conditions. Results indicate that the Hercules splice, the Anderson sleeve splice, and the cement-dowel splice would be most effective in fulfilling the needs of practical applications for highway and bridge construction in Louisiana.

Prepared in cooperation with Louisiana Dept. of Highways, Baton Rouge. Research and Development Section, Rept. no. 71-5C.


ACKNOWLEDGMENT: NTIS

PURCHASE FROM: NTIS Repr. PC, Microfiche

PB-245605/IST. DOTL NTIS

3A 093742

TUNNEL COST MODEL: USERS' MANUAL [Technical rept. no. 6,
Apr 74-Jun 75]

This User's Manual provides the guidelines required to implement the Tunnel Cost Model (TCM) and its file structure, to prepare input data, and to operate the system. It also aids in identifying several interrelationships among data structures and program flow that affect the TCM results.

Sec also report dated Jul 74, PB-245 253.

Reynoso, SS Gray, DJ


Grant NSF-CH-34659

ACKNOWLEDGMENT: NTIS

PURCHASE FROM: NTIS NTIS Price, /MF$2.25 PB-245835/IST

3A 093817

ENERGY USE IN THE CONTRACT CONSTRUCTION INDUSTRY. APPENDIX A. STUDY METHODOLOGY

This report contains data describing the activity of the contract construction industry expressed in terms of the dollar value of construction. A prime requirement of the methodology employed was the development of a traceable relationship between the dollar value of construction activity and the type of construction, geographical area of construction, and the energy consumed during construction. The basic methodology used to estimate fuel and energy use for representative construction projects involved the following:

1. Postulating representative construction projects of at least three
2. Determining energy-consuming equipment required for each project and determining fuel and energy consumption rates for each equipment type;
3. Estimating hours of operation for each type of equipment;
4. Estimating fuel and energy use for each project by combining the results of the above two steps.

Portions of this document are not fully legible.

See also Appendix B, PB-245 424 and Final rept., PB-245 422.


Contract DI-14-01-0001-1664

ACKNOWLEDGMENT: NTIS

PURCHASE FROM: NTIS NTIS Price, /MF$2.25 PB-245423/9ST

3A 095278

PRE-FORMED LININGS IN TUNNELLING PRACTICE

Based on a detailed description of the applications for preformed metallic and concrete segmental lining in Europe and North America paper concludes that the use of pre-formed segmental linings instead of in situ placed linings in tunnels will predominate where the physical characteristics of the ground require the placing of support system quickly after excavation and where economic considerations show that a permanent lining can be achieved in a single process. These linings are more usefully employed in soft ground, possibly water-bearing, varying from sands and gravel through cohesive clays, mudstones and chalks rather than hard rock conditions although even in regard to the latter the choice must depend on the degree of competence of the rock. A reduction is lining thickness in some grounds may be achieved by allowing the newly excavated cavity at a twisted face to redistribute ground stresses before placing the permanent lining.

Because of the time element, and the need to protect the tunnel, either a temporary flexible support is required or pre-formed linings must be devised which will partially collapse through frangible packings to take up the initial deformations of the ground. In the former case a permanent lining would eventually be formed to encompass the temporary work, while in the latter in a single construction perhaps provides the more economic solution.

Tough, SC (Transit and Tunnel Consultant, Incorporated);


ACKNOWLEDGMENT: EI

PURCHASE FROM: American Inst of Mining, Metallurg & petrol Engrs 345 East 47th Street, New York, New York, 10017 Repr. PC

3A 095756

MAINTENANCE OF HYDRAULIC COMPONENTS ON ARMY CONSTRUCTION EQUIPMENT

This paper presents the current status of the Mobility Equipment Research and Development Center's new Hydraulic System Test and Repair Unit (HSTRU). In addition to describing the configuration of the prototype, it discusses the military requirements which led to its development and the analysis of the engineering tradeoffs involved in the selection of its components. Throughout the paper, analogies are drawn between military and commercial needs for the repair and maintenance of hydraulic systems in field mobile construction equipment.

Coyne, WP (Mobility Equipment Research and Development Center)

Society of Automotive Engineers, (SASI) 74-2723 SAE No. 740657, 11 pp

3A 095794

VEHICLE AND MACHINE OPERATOR SOUND DATA ACQUISITION AND REDUCTION SYSTEM

The unaltered, commercially available instrumentation described in this paper provides an accurate (close to Type 1 sound level meter tolerances) and lightweight (total system-5.25 lb) sound recording system. In conjunction with commercially available programmable calculators, this instrumentation enables accurate determination of dosage to various criteria. The paper presents the current status of the Mobility Equipment Research and Development Center's new Hydraulic System Test and Repair Unit (HSTRU). In addition to describing the configuration of the prototype, it discusses the military requirements which led to its development and the analysis of the engineering tradeoffs involved in the selection of its components. Throughout the paper, analogies are drawn between military and commercial needs for the repair and maintenance of hydraulic systems in field mobile construction equipment.

Flint, WH (Caterpillar Tractor Company)

Society of Automotive Engineers, (SASI) 74-2712 SAE No. 740685, 1974, 9 pp

3A 095839

THE ABCS OF RADIAL-OFF-THE-ROAD EARTHMOVER TIRES

The advantages and disadvantages of radial off-the-road earthmover tires are discussed with comparisons to the bias ply tire. The radial tire advantage of "Cooler Running Higher Ton-Mile-Per-Hour" is elaborated. Radical tire design trends and applications are covered with preference given to the sidewall protective Rock Lug designs at all non-skid levels.

Vernie, HR (Goodyear Tire and Rubber Company)

Society of Automotive Engineers, (SASI) 74-2716 SAE No. 740679, 1974, 5 pp

3A 095841

NOISE REDUCTION PROGRAM FOR U.S. ARMY CONSTRUCTION EQUIPMENT

The initial program was to analyze the source of noise, reduce noise at the source, and provide overall noise reduction treatment to reach lowest practical levels. Similar efforts were then accomplished on several special
CONSTRUCTION EQUIPMENT AND METHODS

military vehicles to provide noise reduction retrofit kits. The initial work revealed special needs in the area of hydraulic system noise, and acoustical materials and in-depth studies were initiated to analyze techniques of hydraulic noise measurement and to evaluate material suitability for military use.

Hopper, PD Wehr, SE (Institute of Modern Languages Incorporated) Society of Automotive Engineers, (SASI 74-2679) SAE #740714, 1974, 12 pp

3A 096048
RELIABILITY OF CONSTRUCTION EQUIPMENT VEHICLES
Customer demands for reliability in construction equipment are increasing. Reliability results first from adequate design and second from the capability of manufacturing in executing this design. The ultimate measure of reliability is performance for the customer. Information concerning good or bad performance must be communicated and used to improve new designs and correct existing machines. This can be accomplished effectively with the use of a reliability organization and with final approval of all products shipped.

Czarnecki, J (International Harvester Company) Society of Automotive Engineers, (SASI 74-2721) SAE #740659, 1974, 5 pp

3A 096020
EXPERIENCE WITH CEMENT-BOUND HEAT-INSULATING COURSES [Erfahrungen mit Zementgebundenen Waermemauerzuschichten]
Instead of a frost blanket made of gravelly sand, a styropor concrete heat-insulating roadway can be laid directly on the subsoil. The material for the styropor is brought to the construction site in a compact form and foamed on site into light-weight aggregate by means of steam. Mixing, transporting and laying of the concrete is carried out with conventional equipment. Recognized methods exist for design for heat insulation and bearing capacity. Large-scale technical manufacture was tried out in 1971 on a 1 km long section of the Turunracher Road in Carinthia, Austria. The method is ready for application. /TRRL/ [German]

Sommer, H Zement und Beton No. 70/7, July 1973, pp 5-10, 6 Fig., 5 Phot., 12 Ref.

ACKNOWLEDGMENT: Road Safety Board, Austria, Federal Institute of Road Research, Inzel, W Ger, Transport and Road Research Laboratory (IRR 301334)

3A 096026
MEASUREMENT OF GROUND MOVEMENTS DURING A BENTONITE TUNNELLING EXPERIMENT
The report describes the ground movement and pore-pressure measurements carried out during the construction of an experimental tunnel at new cross, London using the bentonite tunnelling process. The measurements confirmed the ability of this process to limit ground settlements in reasonably dense cohesionless soils to values similar to those produced by conventional tunnelling methods in London clay. /Author/TRRL/

Boden, JB McCaul, C Transport and Road Research Laboratory TRRL LR 653, 1974, 20 pp, 9 Fig., 2 Phot., 4 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRR 211784) Purchase From: Transport and Road Research Laboratory Crowthorne, Berkshire RG11 6AU, England Orig. PC

3A 096027
PIPE LAYING PRINCIPLES
The report indicates the methods of construction that are imposed by design principles and contribute essentially to the strength and efficiency of pipelines. The report is presented under the following headings: (1) trench work- excavation and timbering, construction of bedding, handling, laying and jointing pipes, temporary protection and initial testing, and filling; (2) performance testing; (3) construction in headlands; (4) thrust and auger boring; (5) construction under embankments; (6) special cases; (7) safety precautions. /TRRL/

Clarks, NWB Building Research Establishment R&D Rept. No. 35, 1964, 28 pp, 7 Fig., 7 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRR 211815)

3A 096073
BITUMINOUS SURFACE TREATMENT IN COLD AREAS [Tratamientos Superficiales Bituminosos en Zonas May Frías]
A study is presented of the causes of surface treatment failures which occurred along national highway 3 and provincial highway 320-recommendations are put forward for the selection of the right aggregates and bituminous materials, mix design, binder content with a view to obtaining higher resistance to weathering. The types of failure observed are illustrated and explained. /TRRL/

Lanne, A Comision Permanente del Asfalto Nov. 1973, pp 17-38, 1 Fig., 14 Phot., 3 Ref.

ACKNOWLEDGMENT: Transportation & Soil Mechanics Laboratory, Spain, Transport and Road Research Laboratory (IRR 211823)

3A 096078
MOVEMENT OF MATERIALS [El Mordimiento de los Materiales]
Machines for handling materials on site can be divided into two groups. The first group, dealing with the short-distance continuous transport, comprises fixed conveyors, articulated bucket line chains, screw feeders, pneumatic conveyors and vibratory equipment. The second group comprises earthmoving equipment and vehicles such as trailer-type lorries and dumpers. If the movement is vertical or nearly vertical, lifting machines are used: for example, lifts, hoists, cranes, etc. The operation of the various types of equipment listed is described. /TRRL/ [Spanish]

Garcia, HE ATECOP No. 28, May 1972, pp 11-21, 8 Fig., 7 Phot.

ACKNOWLEDGMENT: Transportaticos & Soil Mechanics Laboratory, Spain, Laboratoire Central des Ponts et Chaussees, Transport and Road Research Laboratory (IRR 100899)

3A 096163
SAND CEMENT [Zandcement]
After having defined some concepts relating to sand cement roadbases the author introduces his subject with a historical review, a description of the present use of sand cement or soil cement in various countries, an explanation of the aim of stabilization and a discussion of the various types and the execution of roadbase stabilization. In the subsequent chapters the properties of sand cement, materials, laboratory tests, construction, quality control and applications are discussed. Some rules for practical use concerning compressive strength and calculation examples are given. /TRRL/ [Dutch]


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRR 211687)

PURCHASE FROM: State Road Laboratory, Netherlands Van Mourik Broekmanweg, Delft, Netherlands Orig. PC

3A 096259
THE CONTRACTOR-LAST LINE OF DEFENSE
Construction procedures produce disruptive effects on human and natural environments. Adverse impacts can be minimized the best of environmentally sensitive planning & responsive designs. Construction project personnel are the last line of defense for environmental engineering. Demonstrated concern and open communication with the public alleviates apprehension for inconvenience and damage resulting from construction. Uniform national standards for environmental protection would enable the construction equipment industry to produce universally acceptable machines and contractors to bid work with confidence.

Emery, AH (New York State Department of Transportation) ASCE Civil Engineering Vol. 45 No. 3, Mar. 1975, pp 87-90, 4 Phot.
CONSTRUCTION EQUIPMENT AND METHODS

3A 096407
ASPHALT PAVING IN 1974
This discussion of the prudent use of asphalt, reviews engineering design considerations, engineering construction methods, techniques and specifications, as well as the engineering of maintenance. Full depth asphalt pavements, planned stage construction, and other designs, with various mixes are discussed. The placement of asphalt mixes in thick lifts will achieve both greater density and fewer lifts. Lower mix temperatures coupled with greater density, can produce high performance pavements. The review of specifications (to pave out mix at 250 deg F and haul it in insulated trucks) and the substitution of other asphalt products for cutback asphalts also require attention. The utilization of the correct maintenance techniques are advocated, and the areas of surface preparation treatment, surface preparation, rejuvenation and hester planning are also considered.

This paper was presented at the Twenty-Third Annual Arizona Conference on Roads and Streets.

Boring, JE (The Asphalt Institute, Phoenix)
Arizona University Proceeding Apr. 1974, pp 102-106
PURCHASE FROM: Arizona University Transportation and Traffic Institute, Tucson, Arizona 740418 Repr. PC

3A 096412
FIELD TESTS FOR COMPACTED ROCKFILL
The limitations of vibratory rolling are reviewed and field tests that are required for the design of rock fills, including test quarries, test fills, field density tests, and design and backfill density tests are described. The chief limitation of the vibratory roller is that the vibrations are applied to the top surface of the layer being rolled, giving the roller a limited ability to compact at depth. Also, it must travel in a forward direction to achieve best compaction. The importance is emphasized of the test quarry in a test program. The separation of spills and sand-size material from the coarse rock by a grizzly operation, has advanced during construction. The equipment used for compaction of rockfill test sections includes a front end loader or power shovel, trucks, a caterpillar tractor with a bulldozer blade, and rollers. The layout of test fills is detailed. Rockfill compaction is evaluated in terms of the percentage decrease in thickness of a layer under repeated roller passes. The procedure for conducting tests is described, as well as the evaluation of data. It is highly desirable to make comparative tests of the merits of the different types of vibratory rollers available, and a method is described that was devised for making direct comparison between a 10- and 12.5-ton roller. Construction control tests, field density tests, maximum density determination, and grain size determination are detailed and typical results are discussed. Specifications for construction control are also discussed.

Bertram, GE
Wiley (John) and Sons, Incorporated 1973, pp 1-15, 17 Fig., 4 Ref.
PURCHASE FROM: Creek Co., Inc., 23621 Greenback Road, Rocklin, CA 95677

3A 096455
WIDE WIDTH PAVING
The introduction of full width paving took place in 1968 with the initial job being done on F. A. I. Interstate 90 By-Pass around Ellensburg, Washington. Following the success of this and other initial projects utilizing full width paving techniques, the first production units of the Blaw-Knox PF-120 paver were delivered to Ohio contractors. These jobs were the subject of intensive testing and evaluation by the Ohio State Department of Highways. Subsequently, Blaw-Knox has introduced two full width pavers in addition to the PF-220. The machine is the PF-180H for paving up to 26 ft. (7.93 m) wide, and the PF-500 which will handle widths up to 25 ft. (7.63 m) wide. In addition to this, two other manufacturers have introduced machines capable of paving full width and full depth. The most important aspect of full width paving is considered to be more efficient placement of material, resulting in reduced costs and a better job.

PURCHASE FROM: Charlotte, N. C. 28202, USA Repr. PC

3A 096478
POLYMER CONCRETES-REPORT OF A CONCRETE SOCIETY WORKING PARTY
The review of the uses of polymer concrete covers polymer impregnation, additions of solid, water-soluble or dispersed polymers and resin-bonded aggregates in concrete with or without hydraulic cement. The effects of polymers on the rheology of the plastic mix are discussed, as well as the development of strength and properties of hardened concrete. Terminology used in the text is defined. The polymerization process and the impregnation process are outlined, and premixed polymer concrete and polymer-bound aggregates are described. The applications reviewed include desalinization plants, bridge dockings and motorways structures, underwater structures, housing applications and concrete piles. Expanded polyurethane aggregate, reinforcement with plastics fibers, woven polymer fabrics and architectural facing mixtures are described. Categories of water soluble polymers are discussed, as well as the use of vinyl acetate and copolymers, and the use of rubbers. Polyester, epoxide and isocyanate resins are considered in a discussion of resin-bound aggregates. Synthetic resins with outstanding properties which have been commercially exploited in the U.K. are epoxides, polyesters and polyurethanes. An extensive bibliography is included.

PURCHASE FROM: Cement and Concrete Association 52 Grosvenor Gardens, London SW1W 0AQ, England Repr. PC

3A 096513
A SURVEY TO DETERMINE THE IMPACT OF CHANGES IN SPECIFICATIONS AND CONSTRUCTION PRACTICES ON THE PERFORMANCE OF CONCRETE IN BRIDGE DECKS
In response to its own research and observations in the early 1960's, the Virginia Department of Highways mounted an intensive and extensive effort to improve the performance of concrete in bridge decks. Major elements of this effort included 1) a training and certification program for Department and industry personnel and 2) improved and upgraded specifications for both materials and construction practices. In 1972 a survey was made of 129 randomly selected bridges constructed after 1966, when all the improvements had been formally instituted. The performance of these bridges was compared with that of a similar sample that had been surveyed in 1961. In addition to the visual observation of performance measurements of electrical corrosion potentials and depth of concrete cover were made in the 1972 survey. Based upon this survey, several conclusions and recommendations were made.

This report was sponsored jointly by the Virginia Department of Highways and the University of Virginia, in cooperation with the U.S. Department of Transportation Federal Highway Administration.

Newlon, Jr., HH
Virginia Highway & Transportation Research Council
VTORC 73-R 59, June 1974, 50 pp. 15 Fig., 6 Tab., 12 Ref., 4 App.
PURCHASE FROM: Virginia Highway & Transportation Research Council

3A 096683
THE BRUSSELS UNDERGROUND RAILWAY, CONSTRUCTION METHODS USED FOR ENGINEERING STRUCTURES [Le metro de Bruxelles, process d'execution des ouvrages de genie civil]
The advantage and disadvantages of the various construction methods used are discussed: metal sheet piles, lined excavation building pits, slurry trench walls, secant piles, shield, semi-elliptic shield, freezing of the ground, false deep wells, etc. A study was also made of the use of the space above the tunnel for a underground parking garage. This paper was presented at the 5th International Congress of Underground Techniques and Town Planning, Madrid, 5-11 October 1969. /TRRL/ [French]

Wotichik, M

ACKNOWLEDGMENT: National Scientific & Tech Res Ctr of Cement Indus, Road Safety Study and Research Fund, Belgium, Laboratoire Central des Ponts et Chaussées, Transport and Road Research Laboratory (IRD 100355)
PURCHASE FROM: Societe des Transports Intercommunaux de Bruxelles 15 Avenue de la Toison d'Or 1050 Bruxelles, Belgium Repr. PC

3A 096685
PILING PRACTICE
This book is divided into two parts. The first describes the main types of piles, construction methods, manufacture, and advantages and disadvantages of each type. The second part reviews the various stages of construction of piled foundations, from the initial survey of the terrain to the completions...
of the work and control tests. The aim of the book is to present data on the
selection of techniques for different conditions and details of the organ-
ation of piling foundation operations. /TRRL/

West, AS
Butterworths & Company, Limited 1972, 114 pp, Figs., Tabs., Phot.,
Refs.

ACKNOWLEDGMENT: Laboratoire Central des Ponts et Chaussées, Transport
and Road Research Laboratory (IRRD 100354)
PURCHASE FROM: Butterworth and Company, Limited 88 Kingsway, Lon-
don WC2B 6AB, England Repr. PC

3A 096782
JACKING IN AT BRENT CROSS
The article discusses the installation of two concrete box unit tunnel sections
under existing embankments at the Brent Cross flyover. London. The two
tunnels are claimed to be the world's largest such units to be installed using
pipe-jacking or thrust boring techniques. Each of the precast concrete units
are 32 ft wide, 22 ft high and have lengths of 33 ft and 45 ft. The rear jacking
capability is provided by a bank of 28 110 ton capacity hydraulic rams.

/ TRRL /

Concrete Vol. 8 No. 12, Dec. 1974, pp 32-33, 4 Phot.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD
212034)
PURCHASE FROM: ESL Repr. PC, Microfilm

3A 096786
THE PROBLEMS OF CHOOSING MACHINERY FOR CONSTRUCTION OF ALL-BITumen (HB) PAVEMENTS
[Mäkmatuvei Probleem viid Bygge av HB-Väg]
The National Road Administration constructed a test road in order to study
the problems in using all-bitumen (HB) pavements, such as strengthening of
the subgrade, choice of plant for spreading the pavement, and suitable
course thickness. The test road is approx. 1 km long, the subgrade being clay
mixed with sand. It was divided into 10 sections, each of which had a
different subgrade, pavement thickness and construction method. It has been found that lime stabilisation of the subgrade is suitable
if this is reasonably uniform and well compacted clay. If composition is
variable, then bituminous gravel (BG) must be spread in such a way that the
formation is not broken up. If the clay is very wet, the surface must be lime
stabilised. It is best to lay BG by a spreader if the subgrade is strong enough,
otherwise a grader must be used. The first course must then be at least 15
cm. The pavement is more even when laid by spreader; 20 cm can however
be spread by grader and remainder by spreader. If the subgrade is strong
enough then it is best to lay 25 cm course with a spreader, while on weak
subgrades 2-3 courses are more suitable. / TRRL / [Swedish]

Lindahl, T
Byggnadsindustrin No. 34, 1974, p 4, 1 Fig., 2 Phot.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD
212472)
PURCHASE FROM: National Swedish Road & Traffic Research Institute
S-11428 Stockholm, Sweden Repr. PC

3A 096788
WARWICKSHIRE SKEW TWIN BOX GIRDER BRIDGE
This article gives an outline of the design and construction of the
Warwickshire skew twin box girder bridge on the Kenilworth By Pass. It is
the central bridge in the 3-level interchange connecting the by pass and the
A45 truck road. The authors briefly discuss the factors that led to the choice of
a single-span skew bridge at this site, rather than three-span structures or
by over-spanning with a single-span structure. They follow this with
details of the bridge itself which involved a displacement of the box girder
units by 3.68M each due to the 30 degree skew. An account is given of the
method of analysis used in designing the structure, which was broken down
into four parts to facilitate the writing and checking of the computer
programs used, and to make it easier to re-run the program until a
satisfactory solution was obtained. The article concludes by giving construc-
tional details. These mainly relate to the freyssinet concrete hinges that
support the legs. The design of which was complicated by the need to resist
torsion about the longitudinal axis perpendicular to the line of the hinges,
in addition to the normal loads. / TRRL /

Knowles, A, Rusbridge, DV (Midland Road Construction University, England)
Concrete Vol. 8 No. 11, Nov. 1974, pp 35-39, 2 Fig., 3 Phot., 5 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD
212031)

3A 096799
A VIADUCT FOR THE ENVIRONMENT
The article discusses the design of and method of construction used for the
E Dale Road Viaduct, Derbyshire, built to replace an existing road bridge
built in 1930 to carry railway traffic from the Associated Portland Cement
Manufactory's Works. Increased rail traffic made it necessary to not
only replace the existing bridge but also to strengthen the Peaks Hole Culvert and to construct a pedestrian footbridge. The constructions required
special attention to their design due to environmental considerations of the
local countryside. The reinforced concrete, box-type viaduct was built
directly alongside the old bridge. the new abutments being located on the
existing embankments. Large longitudinal forces due to traction, braking
and wind loads are carried by reinforced concrete raking struts at the north
end, while the longitudinal reaction is carried by a horizontal plate anchor
at the south end. The transverse reaction is carried by reinforced concrete
foundations in conjunction with a retaining wall. / TRRL /

Butler, AW (Oscar Faber and Partners) Concrete Vol. 8 No. 9, Oct. 1974,
pp 34-35, 3 Fig., 2 Phot.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD
212026)
PURCHASE FROM: ESL Repr. PC, Microfilm

3A 096876
NEW RAILWAY BRIDGES OVER LONDON'S EAST CROSS ROUTE
The east cross route, or London Inner Ring Road System, affects the eastern
region of British Railways at Victoria Park and Old Ford. Two under-line bridges are required at Hackney Depot, and three in the Victoria Park area
including a 7 span box girder viaduct. A major under-line bridge is required
at Old Ford. Site problems required differing forms of structure and different
modes of erection. Problems with respect to the demolition of the old railway
arch arose at the bridge over Wick Road. Special consideration was given to
temperature effects on the Victoria Park viaduct which is on a curve. Old
Ford bridge was a particularly difficult problem due to the high density
electrically driven rail traffic and the presence of London transport tunnels
and sub-station. This governed the choice of thrust bored abutments under
the seven track, single span structure. Design of all bridges was based on steel box
girders, some strong enough to support a single track and others used as a beam
group. Plated or concrete decks were used, and some of the parapet
girders were clad. Waterproofing was by membrane or epoxy resin.
Abutments were generally of reinforced concrete, sometimes on bored piles.

/ TRRL /

Jenkins, AH Holloway, BGR Institution of Civil Engineers, Proceedings
Vol. 56 Nov. 1974, pp 537-557, 9 Fig., 8 Phot.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD
212094)
PURCHASE FROM: Institution of Civil Engineers 26-34 Old Street, London
ECIV 9AD, England Orig. PC

3A 096883
BIRMINGHAM INNER RING ROAD
The authors deal with the development of the Birmingham Inner Ring Road
from its conception in 1917 to its completion as a traffic route in 1971. The
detailed design of the road together with estimates was prepared in the early
1940s and parliamentary powers to carry out the land acquisition and the
construction of the road were obtained in 1945-46. Work started on site in
1957 and the paper deals with the changes that were made to the original
design consequent on new projections of traffic growth. These primarily
consisted of the introduction of grade separation at the junctions. These
changes, however, did not alter the original concept of the road as an
all-purpose dual carriageway with frontage development. One of the changes
was to introduce a 600 M long tunnel and the paper gives details of the
design of this together with information on the ventilation methods used.
The paper, in addition to giving details of the specifications and construction
methods used, deals with the problems associated with carrying out a major civil engineering work in a highly developed city centre area with the consequent disruption to existing mains services and to pedestrian and vehicular traffic movement. Information is given on traffic design capacities of the various sections of the road together with some details of the actual flows on completion. Finally the authors give their opinion on the effect of the construction of the inner ring road on the development of the city centre and conclude with some thoughts on the possible future development of the city centre area as affected by the ring road. /Author/ TRRL /

Cowles, BR Piggott, SG Institution of Civil Engineers, Proceedings Vol. 56 Nov. 1974, pp 513-534, 3 Fig., 6 Phot.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 212093)

3A 096968 TRENDS IN PRESTRESSED CONCRETE BRIDGE BUILDING [Entwicklungstendenzen in Spannbetonbrueckenbau]
The design of multiple span prestressed concrete bridges in the Dresden area is described chronologically (1961-1971) and examples given of completed and projected structures. Principles, elements and technologies which have changed during this period are highlighted and the reasons for the changes are given. Many technical aids such as for example steel scaffolding systems have been tested. As regards production it is suggested that variable building height should not be chosen except for special reasons. Coloration of the concrete and processing are now rarer and natural stone walling is confined to special cases because of the cost. /TRRL/ [German]


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 300956)

PURCHASE FROM: VEB Entwurfs-und Ingenieurbuero des Strassenwesen BT Berlin, Bruehderstrasse 26, 102 Berlin, East Germany Repr. PC

3A 096991 FIFTY-YEAR DEVELOPMENT-CONSTRUCTION OF STEEL TRUSS BRIDGES Construction methods for steel truss bridges, though much refined, have not changed appreciably. Bridge construction gradually shifted priority from the railroad requirements to the highway requirements. This shift was accompa-
nied by replacement of temporary timber trestles and rail-mounted derrick cars or locomotive cranes with steel falsework and derricks mounted on travelers or tower barges. Truss construction is divided into three types—simple, cantilever, and continuous. Procedures for each type are presented by describing major representative structures.


3A 096994 PAST AND FUTURE OF CONSTRUCTION EQUIPMENT—PART I The Industrial Revolution in the 19th Century brought about an expanding economy in a rapidly expanding world. Manual labor was changing to mechanized. Man had to enlarge his physical effort by creating new machines to keep up with his ever-growing needs. This paper traces the various changes in construction tool development from ancient man, through the pre-World War I period, the rapid development prior to the Great Depression of the 1930's, the slowdown during the depression, the tremendous requirements placed on the Construction Industry at the start of WW II, the war itself and immediate post-war periods. Culmination of the paper is the release of the pent up demand which brought on the post-war inflation and boom that laid the ground work for changes in the construction equipment industry during the 1960's and 1970's the like of which the world had never seen.

Larkin, F-J (Dravo Corporation); Wook, S, Jr (Rocky Mountain Area Engineers) 'ASCE Journal of the Construction DivisionProceeding Vol. 101 No. C02, ASCE 11391, June 1975, pp 309-315

3A 097055 GENERAL CONSIDERATIONS ON THE PREFABRICATION OF CONCRETE STRUCTURES [Consideraciones Generales Sobre la Prefabricacion de Estructuras de Concreto] The problem of the prefabrication of concrete structures is studied, especially the advantages and disadvantages of in-situ construction. The field of prefabrication, in which Mexico has the greatest experience, is that of bridge construction, where concrete tables located near the construction site are used for manufacturing prestressed beams while the superstructure of the bridge is being built. /TRRL/ [Spanish]


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 100876)

3A 097062 NEW TYPE OF PREFABRICATED BRIDGE [NUEVO TIPO DE FUENTE PREFABRICADO] Details are given of a type of prefabricated bridge for spanning railway lines. Thanks to prefabrication and maximum lightness, installation is reduced to the simple in-situ excavation of the foundations and erection of the precast units. The project described consists of three semi-continuous spans (elimination of transverse joints) 7.70, 12.60 and 7.70 m respectively. The structure comprises three components: pier, box girder and deck slab. The flexibility of the system facilitates the construction of a wide variety of spans and the erection of one-, two- or three-lane structures. The erection process, equipment needed and calculation assumptions are described. /TRRL/ [Spanish]


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 100813)

PURCHASE FROM: Ultimas Noticias de Hormigon Pretensado Instituto Eduardo Torroja, Madrid 16, Spain Repr. PC

3A 097186 IMPROVEMENT IN THE ADHESION OF BITUMINOUS RUNWAYS BY MEANS OF GROOVING, TESTS ON THE LYON-BRON AIRPORT [Amelioration par Strilage de l’Adherence des Plastes en Eurocires, Essais sur l’Aerodrome de Lyon-Bron] This article describes grooving tests on a 5400 M square surface of asphaltic concrete containing silicious-limestone 0/16 aggregate and 6% bitumen. Grooving was carried out by means of diamond discs under water spraying. The costs of the various operations are quoted together with the coefficients of friction measured before and after grooving. /TRRL/ [French]

Quint, D Lacharme, M Revue Generale des Routes Vol. 42 No. 478, July 1972, pp 31-34, 7 Fig., 1 Tab., 3 Phot.

ACKNOWLEDGMENT: Laboratoire Central des Ponts et Chaussées, Transport and Road Research Laboratory (IRRD 100697)

3A 097336 UNDERPASS THRUST AT BRENT CROSS FLYOVER The thrusting of precast concrete tunnel boxes beneath the three-level flyover approaches at Brent cross is reported and claimed to be the largest thrust in the UK to date. The need for thrust boring was found to be essential, in order to meet the condition that access to the shopping centre should not interfere with the heavy traffic flow at the existing interchange. Details of the excavations required, materials used and methods employed in construction are given, together with diagrams and photographs, and the overcoming of the problem of pockets of soft material located in the line of thrust is described. The work was coordinated by Cementation Projects Ltd., and the other companies that were involved are listed. /TRRL/ Highways and Road Construction Vol. 43 No. 1781, Jan. 1975, pp 10-12, 2 Fig., 3 Phot.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 212067)
CONSTRUCTION EQUIPMENT AND METHODS

3A 097339
FILE ON CONSTRUCTION METHODS [Fichero de Procedimientos para la construcci6n]
The author examines the reasons for low output in the construction industry and concludes that 75% of them stem from a lack of knowledge of suitable construction methods. A file is proposed for construction methods, the aim of which is (1) to present the experience gained up to date in the field of the application of construction methods, and (2) to give clear data for the selection of suitable methods for each case. The file comprises a very large number of sheets classified into (a) normal construction work, (b) specific construction work, and (c) specific civil engineering work. /TRRL/ (German)

Pereral, F Materiales Maquinaria y Metodos para la Construccion No. 86, Nov. 1971, pp 841-846, 3 Fig., 6 Tab.

ACKNOWLEDGMENT: Transportation & Soil Mechanics Laboratory, Spain, Laboratorio Central des Ponts et Chaussées, Transport and Road Research Laboratory (IRRD 100757)

3A 097342
TECHNOLICAL SOLLUTI0NS TO THE CONSTRUCTION OF CONDUTIS [Solucion de canales tecnologicas]
Details are given of the use of precast reinforced concrete slabs for building conduits in various types of industrial installations. Construction techniques for each type are described, and the advantages of the system from the point of view of material and labour saving, are described. /TRRL/ (Spanish)

Roque, R Ingenieria Civil No. 1, Jan. 1972, pp 33-42, 4 Fig., 1 Phot.

ACKNOWLEDGMENT: Transportation & Soil Mechanics Laboratory, Spain, Laboratorio Central des Ponts et Chaussées, Transport and Road Research Laboratory (IRRD 100754)

3A 097345
ROAD PAVEMENTS, WATERBOUND MACADAM [Pavimentos rodoviarios, Macadame hidraulico]
This specification establishes the characteristics and the construction procedure for waterbound macadam pavements. /TRRL/ (Portuguese, French)

National Civil Engineering Laboratory, Portugal Standard E296, Mar. 1974, 3 pp

ACKNOWLEDGMENT: National Civil Engineering Laboratory, Portugal, Transport and Road Research Laboratory (IRRD 211888)
PURCHASE FROM: National Civil Engineering Laboratory, Portugal Avenida do Brazil, Lisbon 5, Portugal Orig. PC

3A 097349
THE STABILIZATION OF COHESIVE SOILS WITH LIME [Verfestigung Bindiger Boden Mit Kalk]
At the Fourteenth World Road Congress in Prague the experiences of several European countries with lime stabilisation were described. It is reported that there is extensive cohesive soil between Belgium and the USSR and that lime treatment is cheaper than exposure. Observations of test sections with various lime additives show good results. Even after many years comparative values of land with and without lime show marked increases of strength. In the Federal German Republic it is proposed that all sections which have been lying for years should be systematically tested for lime stabilisation and practical evaluation made. /TRRL/ (German)

Buergen, W Strassenbau-Technik Vol. 25 No. 18, Sept. 1972, pp 45-52, 7 Fig., 6 Tab., 23 Ref.

ACKNOWLEDGMENT: Research Association for Road Communications, W Gr (BAST21065E), Transport and Road Research Laboratory (IRRD 300965)
PURCHASE FROM: Verlagsgesellschaft Rudolf Mueller Stolberger Strasse 84, D-5000 Koeln-41, West Germany Repr. PC

3A 097370
WINTER CONSTRUCTION [Winterbau]
The publication is a collection of 12 articles presented at a meeting in Magdeburg in 1971 entitled “Methods for Carrying Out Road and Bridge Works in Winter”. The articles describe practical experience in earthworks, massive bridge construction and road construction, and two deal in particular with the methodology of planning construction in winter. /TRRL/ (German)

Beitraege zur Forschung & Praxis im Strass & Bruecke 1971, 28 pp

ACKNOWLEDGMENT: Research Association for Road Communications, W Gr, Transport and Road Research Laboratory (IRRD 300992)

3A 097422
TO SELECT A NEW SCRAPER-GO BACK TO BASICS
Production volume requirements, material characteristics, and haul conditions are identified as the three major variables to consider in scraper selection. The amount of material to be moved and the time available to do the job will determine an "optimum" scraper size. The various aspects are considered of loading, hauling, the disadvantages of large scrapers, and amortization of machines. The best means of determining scraper capacity is either a side-by-side on-the-job comparison, or comparison via a computerized study simulating the earthmoving conditions on project. The effect of loading conditions on scraper scraper selection is illustrated. Tandem-powered 4-wheel drive scrapers, the elevating scraper and push-pull scrapers are discussed. Hauling conditions such as length, grades and rolling resistance will affect selection and have an effect on cycle time and cost per yard. The economics of various scraper usage are briefly discussed. Job conditions that have an effect on earth moving tire expense. Tires normally represent 30 percent of the total owning and operating cost of scrapers. On tandem-powered scrapers, wear can be reduced by deadstick loading to eliminate wheel spinning.

Roads and Streets Vol. 118 No. 3, Mar. 1975, pp 120-122, 1 Fig., 2 Phot.

3A 097600
A STUDY ON PRE-ERCTION SYSTEM IN HULL CONSTRUCTION
The Shipyard lay-out and facilities have been modernized in line with the adoption of the block construction process. In these days the most modernized shipyards have been newly constructed both in Japan and abroad to cope with the increased demand of super large type ships. In the first stage of these new shipyards simply a single building dock each was constructed in view of the then prospect of new ship tonnage to be built and the cost of the dock construction. After that due to the ever increasing demand for super-large ships, it became necessary either to lengthen the dock or to add another new dock in which the after block of the hull containing the machinery space to be pre-erected. Even in this case, it was necessary to float and shift the pre-erected after-shipping dock to peak-shaving the labor manhours is shown. As a result, it is concluded that the mechanical shifting of the pre-erected portion from the pre-erection dock with a suitable length shall be very advantageous to solve the problems. Finally the authors describe the fundamental design of the mechanical moving system.


ACKNOWLEDGMENT: Society of Naval Architects of Japan PURCHASE FROM: Society of Naval Architects of Japan 35 Shiba-Kotohira-cho, Minato-ku, Tokyo 135 Japan Repr. PC

3A 097606
CHINNOR TUNNELLING TRIALS-BACKGROUND & PROGRESS
This article gives the background to the Chinnor tunnelling trials and an outline of the progress that has been made. Because the rate of tunnelling
CONSTRUCTION EQUIPMENT AND METHODS

This article is concerned with the design and construction of the Renfrew motorway sewer, which was built to avoid overloading Glasgow's existing sewerage system. Particular reference is made to the problems created by the presence of underground railway tunnels, poor ground, the depressed motorway profile and the need to minimize tidal effect. After a general introduction the author discusses design criteria and the choice of a suitable route which passed under the underground railway. This includes a discussion of the factors which led to the type and method of construction used. The next part of the article is concerned with the actual construction work, and includes details of the equipment used which included a stelmo shield in the soft ground tunnel and of the tunnel lining. It also includes information relating the blasting methods that were used and the laying and backfilling of the pipes which involved the use of an aliva 300 concrete placing machine. Reference is made to the caulking of joints which was carried out to overcome the problem of containing the compressed air used in the construction in the sheet pile shafts and at the junction with the air deck. /TRRL/

McLean, RD (Scott, Wilson, Kirkpatrick and Partners) Tunnels and Tunneling Vol. 6 No. 6. Nov. 1974, pp 57-59, 3 Fig., 2 Phot.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 212138)

3A 097679 PRACTICAL ASPECTS OF THE COMPACTION OF BITUMINOUS MATERIALS

After a general introduction the authors consider the costs of compaction and conclude that constraints are more likely to be physical than economic. Current equipment and practice are mentioned and the principle of the compaction process is discussed. The practical consequences of applying these principles are examined and the planning of the site operations, which requires consideration of the number and characteristics of the rollers employed, the rate at which the material is laid, the laydown temperature and the rate of cooling. The question of the number of roller passes necessary is studied and the authors put forward the opinion that is best to aim at as many as possible. The effectiveness of different types of roller is also analysed. The next part of the paper, concerned with the evaluation of compaction, makes special reference to gamma-ray transmission techniques and discusses the relative merits of "method" and "end product" specifications. The authors conclude that whilst compaction practice relies heavily on experience, it rarely fails to result in poor performance. They believe that improved compaction technology may be required in the future for mixes which make more economical use of materials, but that in the meantime there is a case for using as many rollers as possible with light rollers immediately behind the paver. For the covering abstract of the seminar, see IRRD abstract no 212145. /TRRL/


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 212147)

3A 097680 GUIDELINES FOR THE APPRAISAL OF STRUCTURAL COMPONENTS IN HIGH ALUMINA CEMENT CONCRETE

This memorandum is primarily concerned with suspended floor and roof structures which are constructed from precast prestressed concrete components made from high alumina cement (hac), where the units are used generally in a simple non-composite form with breeze block or composition non-structural decking. Current field experience is used to outline a rational inspection and appraisal procedure. The process of assessment of the structural condition is described in detail: visual inspection, background information (one-day cube strength of the concrete, water/cement ratio, composition and strength of the cement, method of compaction and curing), non-destructive tests, structural analysis and judgment and recommendations for action. /TRRL/

Institution of Structural Engineers Standard HAC/1/1974, Oct. 1974, 18 pp, 3 Fig., 1 Tab.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 211909)

3A 097836 TESTS ON A HEAVY SINGLE-WHEELED VIBRATING ROLLER FOR THE COMPACTION OF A GRAVEL-SLAG ROADBASE

Results are given of compaction tests on gravel-slag carried out with a single-wheeled vibrating roller at the road testing centre in Rouen. The object of this study was not to compare the performance of this type of roller with that of the types currently used, but only to define the operational parameters of the roller. Results show that the efficiency of the roller in depth is better at resonance frequency than at the maximum permitted frequency. High densities can be obtained if the number of passes is between 6 and 14. /TRRL/ [French]

Morel, G Valeux, JC Chaingne, D Revue Generale des Routes et des Aerodromes No. 481, Nov. 1972, pp 93-96, 7 Fig., 5 Tab., 1 Phot.

ACKNOWLEDGMENT: Laboratoire Central des Ponts et Chaussees, Transport and Road Research Laboratory (IRRD 100706)

3A 097844 CONSTRUCTION OF RIGID PAVEMENTS [Execution des Chaussees en Beton de Ciment]

The author reviews changes in the construction techniques for rigid pavements, in particular the techniques used recently on construction sites...
in France. A study is made of the ingredients (cement, aggregates, admixtures) and of mix-design, manufacture and laying techniques from the point of view of the behaviour of the edges of the pavement, cracking and settlement, and of the long-term behaviour of the pavement (mechanical strength and resistance to wear). Maintenance and strengthening problems, and rigid pavement design. Methods in use in other countries are briefly discussed. /TRRL/[French]

Parry, C (Laboratoire Central des Ponts et Chaussees) Revue Generale des Routes et des Aerodromes Vol. 42 No. 479, Sept. 1972, 14 pp, 1 Fig., Photos., Refs.

ACKNOWLEDGMENT: Laboratoire Central des Ponts et Chaussees, Transport and Road Research Laboratory (IRRD 100910)

3A 097971
DUSK TO DAWN LIFT FOR 1100 Tonne DECK AT MILFORD HAVEN
This article gives an account of the construction and positioning of the final section of the new steel box girder bridge at Milford Haven. It is the biggest lifting operation of its kind (1100 tonnes) to be undertaken in Britain. The author first outlines the collapse of a 70 M cantilever on the south bank in 1970 and the events that led to the adoption of the Swiss Linsinger system to complete the bridge. Four 80 230-tonne jacks were mounted on each of the 13M cantilevers and the section lifted by means of 8 cables formed from 18 stabilised 15.2mm steel strands. The 40 metre high lift was completed in 18 hours at rates up to 5 metres an hour. Details are given of the construction of the 118M long section in a near-by dry dock, it consisted of 17M long box lengths and was floated in position for lifting. This method avoided the joining of two 100M cantilevers which would have dropped over 3M before being connected. Mention is made of the high cost (£5M) of strengthening the bridge which led to an increase in the weight of steel used of 5,000 to 6,000 tonnes. Notes are included on the completion of the structural work together with several illustrations of the project. /TRRL/

Cottrill, A New Civil Engineer No. 120, Nov. 1974, pp 36-39, 1 Fig., 9 Phot.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 212084)

3A 097973
FABRICS FOR ROADS
Monofilaments of Denmark, ICI and Chemie Linz of Austria showed new or recently developed artificial fibre, fine mesh fabrics suitable for separating different layers in road building and for drainage. These polypropylene-based materials can be used to contain tipped material while still permitting drainage. Or, laid beneath aggregate on marshy ground, they can prevent the aggregate sinking into the subsoil, thus producing roads strong enough to carry heavy construction vehicles. Other uses include site stabilisation for car parks and playgrounds, filtration membranes in erosion control, and reinforcement of asphalt in road repair works. /Author/ TRRL/

New Scientist Vol. 64 No. 928, Dec. 1974, p 875

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 212086)

3A 098090
TYRES AND WHEELS. PART I-TYRES-SECTION 3-OF-THE-ROAD TYRES
The specification provides guidance to the use of tyres on earthmoving machinery and mobile cranes in transit on the highway, and recommends maximum loads, pressures, dimensions etc. For various types of use. /TRRL/


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 211932)

3A 098113
ROAD PAVEMENTS, MECHANICAL STABILIZATION
This specification establishes the characteristics of and the construction procedure for mechanically stabilized road subbases, bases and wearing courses consisting of soil, aggregates or any combination of these materials. /TRRL/[Portuguese]

National Civil Engineering Laboratory, Portugal Standard No. 269, June 1973, 3 pp

ACKNOWLEDGMENT: National Civil Engineering Laboratory, Portugal, Transport and Road Research Laboratory (IRRD 211885)

PURCHASE FROM: National Civil Engineering Laboratory, Portugal Avenida do Brasil, Avenida do Brasil, Orig. PC

3A 098474
TOOLS AND RULES OF CONCRETE PLACEMENT
Current methods of concrete placement are examined in terms of both the equipment and the best ways of use of the equipment. The best tools for reaching lower elevations are chutes of flexible steel, or drop chutes (elephant trunks) of rubber or flexible plastic. Concrete buckets adapt to horizontal movement or traverse slopes to 5:1. Different types of manual and powered walk behind units are listed. In general, buckets should have pneumatic, cushion, or foam-filled tires to enhance speed and smoothness and minimize concrete segregation. Different types of buckets are described which are most efficient over vertical distances. Lighter magnesium buckets can be up to 1/4 yd. larger for a given crane capacity. Belt conveyors are especially adapted to long distances and high concrete volumes. Swinging and cantilevering units, swivel on a turntable, retract and extend up to 70 ft. They also cover larger areas. Different kinds of concrete pumps are mentioned. Pumped concrete has gone up to 576 ft., and 200 ft. along horizontal distances. The advantages of pumped concrete are reviewed. Twenty eight rules which establish economies are set forth.

Construction Methods and Equipment Vol. 57 No. 6, June 1975, pp 40-42, 1 Fig.

3A 098960
PREPARATION AND OPERATION OF DIESEL ENGINES IN CONSTRUCTION AND INDUSTRIAL MACHINERY FOR OPERATION IN COLD CLIMATE
This publication contains the summaries of many papers and varying subjects pertaining to cold weather preparation of diesel engines for operation in cold weather and arctic climates. It has been difficult to avoid controversial areas and still present what we hope represents the areas which require attention when operating a diesel engine in cold and/or arctic climates and some of the varying specialized equipment our experience indicates can be helpful. /GMRL/

Bugelski, WG (Cummins Engine Company, Incorporated) Society of Automotive Engineers, (SASI 75-908) SAE #750473, Feb. 1975, 17 pp

3A 099533
ALARM INDICATING DEVICES
The purpose of this paper is to describe the results obtained during some attempts to gain extended engine life by means of warning and information systems. Data will be presented on cylinder head mortality rates since the introduction of the initial rudimentary alarm system. Experience gained from problems encountered with the elementary systems has led to an examination of the purposes and limitations of monitoring systems as applied to earthmoving equipment. This in turn has led to the development of a second-generation system which, it is hoped, will overcome some of the deficiencies of the elementary system without introducing major problems of its own. /GMRL/

Vidovic, HT Murray, CB, Jr (General Diesel and Equipment, Incorporated) Society of Automotive Engineers, (SASI 75-1074) SAE #750562, Apr. 1975, 6 pp

3A 099535
AN "IN-HOUSE" TECHNICAL FORECAST
This paper describes a technical forecasting program that was used at the John Deere Works’ Engineering Department and—though we have not
CONSTRUCTION EQUIPMENT AND METHODS

3A 099536
WORK CAPABILITY FACTORS FOR DOZER AND LOADER TIRES OPERATING IN LOAD AND CARRY SERVICE
Since tire heat becomes a major potential problem in Load and Carry service, a method was required to determine the performance capabilities of Dozer and Loader tires so that optimum tire life could be achieved. This paper covers the need for tire limits; basic Dozer and Loader tire design requirements; the method established for determining tire capabilities in Load and Carry service, and finally the factors differentiating this rating system from the TMPH system which is used for transport type vehicles.

3A 099538
DEVELOPMENT OF A ONE-PIECE RIM FOR EARTHMOVING TIRES
The off-highway, 15 deg bead seat tire and its 15 deg tapered bead drop center rim is a new concept for today's earthmoving vehicles. The drop center rim concept offers significant advantages over the more common removable flange rim in weight reduction, safety, and durability. This paper describes those advantages, as well as the development and testing of the rim and tire design.

3A 099541
THE APPLICATION OF CENTRALIZED LUBRICATION SYSTEMS TO MOBILE EQUIPMENT
Recent developments in centralized lubrication systems have made them more compatible with the operational demands of the construction industry. This system delivers the correct amount of lubrication to each bearing, can warn the operator in the event of a lubrication failure and directs maintenance personnel to the problem area during a scheduled downtime. It has a wide variety of pumping methods, controls and monitors. Safety of personnel, continuous lubrication, reduced downtime, reduced usage of lubricants, longer machine life and higher profits are the results of a good lubrication program.

3A 099601
THE CORNOUILLE BRIDGE AT THE ODET ESTUARY [Le pont de cornouaille a l‘embouchure de l’Odet]
The authors give the reasons for the selection of the site: width of the river reduced to 260m, presence of rock very near the surface, ease of construction of access roads, and details of the design: six-span metal deck orthotropic slab bridge, the total length of which between the outside bearings is 610m; length of spans: 60-65m, 110-200m, 110-65M (the 200m span being the longest in france for bridges of this type). Details are given of the soil Gneiss mass (the upper part of which was weathered), construction of foundations in the river (dry method of construction with the help of cofferdams), land bearings (abutments resting on four reinforced concrete wells). The river piers consisting of a reinforced concrete massive shaft, the stability of which against ship collision was calculated for horizontal stresses of 1000 t. Data are presented on the box girder bridge deck (metal sheets and cross bars). A new construction technique was used: the structure and erection; the deck was entirely precast in the factory per section. Launching was done by bringing the sections to the launching frame by means of a piece of equipment called diplococus. Brief details are given of the structural stability, the deck having been designed as a continuous six span girder. The effect of the wind on the structure was studied for A 100m cantilever.

Protection against corrosion was carried out in the workshop. The internal part of the box girder was sanded and coated with two layers of copon-met-l-pul, and one layer of epoxy-pitch. The external part was sanded, coated with zinc and 5 layers of glycerophthalic paint. The surfacing of the orthotropic slab is 6cm thick, and it was tested on a ring road in Quimper. First, the surface of the slab was brushed and subjected to blowing with compressed air, then a waterproofed course was applied consisting of elastomer on which chippings were spread; the asphaltic concrete wearing course is 4cm thick. Further details are given of bearing devices, expansion joints, footpath edges, parapets, drainage, signalisation, ancillary structures and maintenance.

THURUZEAU, C. Louzeau Moniteur des Travaux Publics du Batiment Vol. 69 No. 34, Aug. 1972, pp 10-18, 7 Fig., 5 Phot.
ACKNOWLEDGMENT: Laboratoire Central des Ponts et Chaussees, Transport and Road Research Laboratory (IRD 100942)

3A 099616
THE PROBLEM OF THE EXHAUST FUMES FROM DIESEL ENGINES IN UNDERGROUND GALLERIES [Le probleme des gaz d’echappement des moteurs diesel dans les galeries souterraines]
It is recalled that all exhaust fumes are dangerous, unless treated or eliminated according to safety requirements. They cause special problems in underground galleries. Diesel engines are most often used in underground construction work, and this article deals more specially with them: nature of exhaust gases, use of ventilation to maintain toxic gases at non-dangerous level, consequences of insufficient ventilation, and treatment of exhaust fumes.

Cahiers de Notes Documentaires No. 69, Oct. 1972, pp 391-396, 7 Fig., 2 Tab., 1 Ref.
ACKNOWLEDGMENT: Road Safety Study and Research Fund, Belgium, Laboratoire Central des Ponts et Chaussees, Transport and Road Research Laboratory (IRD 100952)

3A 099618
COMPACTION OF BITUMINOUS SURFACINGS [Le compage des revetements bitumineux]
This article presents an overall study of the problem of the compaction of bituminous surfacings. It aims at facilitating the application of theoretical principles to practical problems with a view to obtaining optimum compaction taking into account various constraints such as availability of funds, materials, equipment, labour, and environmental conditions. The article is divided into six-parts: definition; aims; factors influencing compaction; thickness of the layers to be compacted, aptitude of the mixture to compaction, rolling equipment, air temperature and temperature of the surface to be covered, rolling temperature, compaction method; compaction due to traffic; typical example of satisfactory compaction; references on the subject.

Hodeotte, J.BK (Laboratoire de Controle et de Recherche, Canada) Bulletin de Liaison des Lab des Ponts et Chaussees No. 63, Jan. 1973, pp 141-147, Figs. 1 Tab., Refs.
ACKNOWLEDGMENT: Laboratoire Central des Ponts et Chaussees, Transport and Road Research Laboratory (IRD 101051)

3A 099619
REINFORCED EARTH IN THE SETE INTERCHANGE [La terre armee dans l’echanger de sete]
The sete interchange is built alongside a canal on highly compressible soil. Because of these conditions, a large number of retaining structures had to be built, most of which were constructed with reinforced earth. The author gives two main reasons for the use of this material: savings in the cost of the project and possibility of uninterrupted traffic flow during construction. The bulk of the project consisted of the design of the foundations of the structures. After briefly recalling the principles governing reinforced earth construction and the technology used, the author describes in detail the design and calculation of the reinforced earth retaining walls.

3A CONSTRUCTION EQUIPMENT AND METHODS

ACKNOWLEDGMENT: Laboratoire Central des Ponts et Chaussees, Transport and Road Research Laboratory (IRRD 101054)
PURCHASE FROM: Laboratoire Central des Ponts et Chaussees 58 Boulevard Lefebvre, 75732 Paris Cedex 15, France Orig. PC

3A 099621
TECHNICAL DAYS DEVOTED TO ROADS IN CORSICA-PART 2-LIGHTLY-TRAFFICKED ROADS [Journees techniques de la route de Corse-Deuxieme partie- Les routes economiques]

This article comments on papers dealing specifically with the construction and administrative problems of lightly-trafficked roads. The first paper by remillon stresses the drawbacks of applying to lightly-trafficked roads pavement design and strengthening methods used for heavily-trafficked roads. Proposals are put forward for the extensive utilization of local materials with a view to realizing large savings in construction costs. The second report by ceintrey recommends the use of non-conventional materials for the construction of low-cost roads, and emphasizes the need for close cooperation between laboratory and in-situ tests when developing new construction techniques. The last two papers by carter and lanoire outline the experience of both authors in the administrative aspects of lightly-trafficked road construction in two departments in france (morbihan and doubs). Discussions of the papers are appended. /TRRL/ [French]

Remillon, M (Viallance); Ceintrey, M Cartier Lanoire Revue Generale des Routes et des Aerodromes Vol. 43 No. 484, Feb. 1973, pp 41-47, Figs., 2 Tab.

ACKNOWLEDGMENT: Laboratoire Central des Ponts et Chaussees, Transport and Road Research Laboratory (IRRD 101054)

3A 099718
HONSHU-SHIKOKU BRIDGE PROJECT

The project to link Honshu and Shikoku Islands in Japan is reviewed, which, scheduled for completion in 1985, will require the construction of three major bridges and road systems at Sakaiminato (route A), Kuji-Naruto (route B) and Onomichi-Ishimabashi (route C). Route A will consist of 81 km of highway and 79 km of railway links, both systems using the same 3-span suspension bridge over the 4 km Akashi Strait. Route D crosses a number of straits of 9400 km total length using 3-span suspension bridges, truss bridges and viaducts. The total length of the highway link is 39 km and the railway 49 km, again with both using the same bridges although separated on land. Route E is a highway-only link of 61 km total length crossing the straits via several islands with various types of bridges of lengths ranging from 300-800 M. Details are given of the structural design standards, construction costs, bridge design, economics and estimates of future public, private and freight traffic volume for the three structures in the project. /TRRL/

Matsuzaki, Y (Honshu-Shikoku Bridge Authority) Civil Engineering in Japan Vol. 12 1973, pp 27-43, 10 Fig., 11 Tab., 1 Photon.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 211959)

3A 099912
DEPTH OF CONCRETE COVER OVER BRIDGE DECK REINFORCEMENT

Fifty concrete bridge deck spans in New York State were surveyed with a pachometer for depth of clear concrete cover. Compliance with a design requirement for a minimum of 2 in. (.51 mm) occurred at 77.3 percent of the locations measured. Spans having a high degree of compliance also tended to have relatively uniform cover depths. The degree of compliance appeared to be related to construction practices. The distribution of cover depths on individual spans was generally not normal, and a construction tolerance of plus or minus 1/2 in. (plus or minus 13 mm) was determined to be reasonable for the type of requirement under which the decks were built.

Amsler, DE Chamberlin, WP (New York State Department of Transportation) Transportation Research Record No. 355, 1975, pp 73-81, 6 Fig., 3 Tab., 11 Ref.

ACKNOWLEDGMENT: PURCHASE FROM: TRB Publications Off Orig. PC. NTIS Repr. PC. Microfiche

3A 122074
CHANNEL FRENCH MINERS FIGHT CASCADE AS BRITISH MOLE BARES TEETH FOR PILOT

The author gives an account of progress that has been made (up to the end of 1974) with the channel tunnel. Progress that has been made by the French near Calais, where trouble has been encountered in the access tunnel (descenderie) through the ingress of 120 litres of water per second is described. Extensive grouting with bentonite and cement has failed to waterproof the tunnel and neither a small alpine roadheader nor a large Demag roadheader has been able to perform satisfactorily. A Robbins mole is now being tested and in order to bring it into use as soon as possible, an additional tunnel is being planned. Details are given of the progress made by the British near Dover, where both access tunnels (one 400m and the other 287m plus a 100m viaduct) and a 180m long assembly chamber have been driven, the latter 40m beneath the channel. The priestley 50m long tunnelling machine has also been assembled ready to commence work. Brief details are given of the proposed 3 phases of construction of the tunnel and the article includes information on the different conditions and policies in France and Britain. /TRRL/

Hayward, D New Civil Engineer No. 126, Jan. 1975, pp 19-22, 2 Fig., 6 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 212673)
PURCHASE FROM: Institution of Civil Engineers 26-34 Old Street, London EC1V 9AD, England Repr. PC

3A 122076
CMI SLIPFORM PAVER MAKES THE GRADE

An account is given of the paving techniques adopted by John Laing construction for the 7.8 km Windover to Funtley section of the m27 in Hampshire, in which the CMI slipform paver is laying two adjacent 7.15 m wide strips to form the three lanes and hard shoulder for 7.68 m wide carriageway. The sub-grade is a gravelly, sandy clay mixture, with the 270 mm thick pavement being constructed on a type 1 crushed limestone sub-base. Joints, which are set out ahead of the paving units, follow a sequence of 3 ranging to 1 contraction joint, all at 5m spacing. The placing and spreading of the concrete, compaction and finishing of the slab, and method of cutting transverse joints, are briefly described. Surface irregularity measurements using a multi-wheeled profilometer, indicate a good to fair standard of finish, so far. Mention is made of the problem of selecting a design sub-base thickness which will be adequate to carry construction traffic. Part of the m27 western carriageway will include a 1.8 km motorway cutting and associated underpass. The new approaches consist of 3 phases of construction of the tunnel, the purpose of which will be to test the real life skidding resistance of concrete made with coarse limestone aggregate. /TRRL/

Walker, M New Civil Engineer No. 129, Feb. 1975, pp 24-26, 1 Fig., 1 Tab., 2 Photon.

ACKNOWLEDGMENT: Transport and Road Research Laboratory

3A 122087
DESIGN AND CONSTRUCTION OF THE WELLESLEY STREET UNDERPASS, AUCKLAND

The Wellesley Street Underpass was the first major motorway structure to be completed in a fully built up section of the central business district of Auckland. It consists basically of a motorway cutting and associated retaining walls, and a traffic bridge over the cutting. A description of the structure includes details of the conventional reinforced concrete construction of approach walls, and the "soldier column and plank" precast walls used over the major part of the cutting. Seismic effects were not considered in the design of the structure, but its performance is being checked against the seismic resistance principles of monobé and okabe. Brief details are given of vibration measurements taken during construction, and of the lighting of the completed structure. /TRRL/

Russell, T New Zealand Engineering Vol. 29 No. 1, Nov. 1974, pp 308-312, 2 Fig., 3 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 212677)
3A 125068
COLD PLANNING ON THE M4
The article describes the surfacing of the M4 for a 1200 metre section spanning the length of Junction 22 Newhouse Roundabout. It is explained that the whole stretch was re-covered, rather than patched, because there was complete loss of chippings and in some areas the surfacing had come away. Limitations such as the maintenance of traffic flow in the summer peak and the need to do the work in frost-free conditions, dictated an autumn work programme which could be carried out quickly. There is a description of the use of the cold planers and the modifications made to maintain an even cut. The speed of cutting and deterioration of the picks are included. The machines used required a separate pick-up operation for the debris: the rate at which the pick-up is achieved limits the speed of the overall operation, and estimates are given of the optimum speed. Alterations to traffic movement are briefly reported: few delays occurred. Finally costings of the scheme are presented, indicating that the scheme was quick and economical. /TRRL/


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 212580)

3A 125099
CRYOGENIC TREATMENT OF SHAFTS AND TUNNELS
One of the geotechnical processes able to contend with unstable or saturated soil conditions in civil or mining engineering, is that of soil-freezing. In this technique, a temporary conversion of the interstitial soil moisture forms a strong and impermeable frozen soil membrane around the excavation zone. With the development of cryogenic techniques, nitrogen is available in liquid form offering a rapid means of soil freezing. Typical applications of the technique include shaft deepening tunnel faces, sealing gaps in cofferdams and wherever temporary structural support is needed. Two examples are given of the use of soil freezing on a sewer tunnelling project in Edinburgh.

/TRRL/

Harris, GP (Foraky Limited) Tunnels and Tunnelling Vol. 6 No. 5, Sept. 1974, pp 69-70, 2 Phot.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 212703)

PURCHASE FROM: ESL Repr. PC, Microfilm

3A 125113
TUNNELLING UNDER MANCHESTER
The article describes the methods used in the construction of the post office communication tunnel system between Manchester and Salford. The tunnel system, being built at a depth of 100-200 ft in bunter sandstone, is designed to connect a number of large diameter apparatus tunnels housing telecommunications equipment and support systems. Access to the concrete lined apparatus tunnels was provided by 23 ft and 18 ft diameter shafts lined with cast-iron bolted rings down to the sandstone level and below that with concrete. The sandstone was found to be very abrasive and to cause rapid wear of handling equipment. /TRRL/

Collins, SP Tunnels and Tunnelling Vol. 6 No. 5, Sept. 1974, pp 30-33, 15 Phot., 2 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 212699)

3A 125147
EVALUATION OF UNIT LOAD HANDLING EQUIPMENT (EMBRACING EQUIPMENT FOR PALLETS, PACKAGED LOADS AND CONTAINERS), A CONFERENCE ARRANGED BY THE MANIPULATIVE AND MECHANICAL HANDLING MACHINERY GROUP OF THE INSTITUTION OF MECHANICAL ENGINEERS
Among the papers presented at the conference were the following: the valuation and selection of fork lift trucks, Carpenter, MJ; Self-Loading Vehicles, Their Mechanical Features and Application, Holt, JB; The Development, use and evaluation of mobile cranes and rough terrain fork lift Trucks used in the Construction Industry, Summers, MJ; The ergonomics of mechanical handling vehicles (with special regard to Fork Lift Trucks) Astley, RW; Review of Trailer Container Units used on British Railways Roll on/Roll off and Container Terminal Operations, Styles, PR; Evaluation of Side Loader Machines, Rundle, M; The Evaluation of Straddle Carriers, Dally, HK and Wilkinson, BE; Long Span Container Cranes, Larkin, JE; Container Cranes on British Rail, Robinson, PJ; Container Spreaders, Bisby, A. 1973. /TRRL/

Institution of Mechanical Engineers Conf Paper No. CP 1/73, No Date, 182 pp, Figs., Tabs., Photos., Refs.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 212911)

PURCHASE FROM: Institution of Mechanical Engineers 1 Birdcage Walk, Westminster, London SW1H 9JJ, England Repr. PC

3A 125181
INVENTORY AND CHARACTERISTICS OF THE MAIN CIVIL ENGINEERING TYPES OF EQUIPMENT [Repertoire et caracteristiques des principaux materiels de genie civil]
This publication reviews civil engineering equipment manufactured in France and other countries, gives the main characteristics of the machines and addresses of suppliers. The equipment is grouped according to the classification of the blue scale, edition 1970, giving the main characteristics and weight of the equipment. Addresses and telephone numbers of the manufacturers and distributing agents are in alphabetical order at the beginning of the book. /TRRL/ [French]


ACKNOWLEDGMENT: Laboratoire Central des Ponts et Chaussees, Transport and Road Research Laboratory (IRRD 101121)

3A 125220
KINGSWAY ISLAND PEDESTRIAN SUBWAYS
This article gives an outline of the design and construction of a subway system which has been constructed at the junction of the Kingsway with Princess Way and other streets. It consists of a sunken island linked with five radial subways and two perimeter subways, designed to provide for a flow of 3400 pedestrians per hour. The author gives a brief account of the main construction work. The first stage of this work, commenced in 1972, involved excavation of the outer grass verges, cutting of the existing concrete road and excavation of the radial subways and placing of 3.1m by 2.6m by 1.2m precast concrete subway units, each weighing 8 tons. The author follows this with an outline of the joining of the radial and peripheral subways, the excavation of the central island and the construction of the ramps and steps. He then gives an outline of the accommodation works and finishing. This involved lining the walls with tiles, the provision of adequate drainage and lighting, the provision of a wall to prevent exhaust gases entering the pedestrian area; the use of coloured paving slabs, trees, bushes and shingle to improve its appearance, and the provision of seats for weary pedestrians. The author reports that good use is being made of the subways, which were opened in 1973. /TRRL/


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 212992)

3A 125340
PIPE INSTALLATION WITHOUT EXCAVATION, THE BADGER SYSTEM [Tendidos de tuberiu sin excavacion. El sistema Badger]
The Badger system is a modern process of installing pipes or cables under the ground without having to excavate trenches. The method can be easily adapted to loose terrain and to the installation of pipes with a diameter between 76 and 300 mm. It requires tracked vehicles equipped with a kind of plough, the role of which is to dig a furrow in the soil. Guiding and levelling devices are also parts of the system. /TRRL/ [Spanish]

Scorpio ATEMCOP No. 25, Jan. 1972, pp 10-12, 3 Fig.

ACKNOWLEDGMENT: Transportation & Soil Mechanics Laboratory, Spain, Transport and Road Research Laboratory (IRRD 101098)
3A 125247

THE CONSTRUCTION OF THE SEIKAN TUNNEL (La construction du Tunnel de Seikan)

The Seikan Tunnel will link the Northern Hokkaida Island to the Main Honshu Island in Japan under the Strait of Tsugaru. It will be the longest railway tunnel in the world. The main characteristics of the tunnel are described: total length (33,850 km), length under the sea (23,300 km), maximum depth of the strait (140 m), depth of the tunnel under the bottom of the sea (100 m), cross-section of the main double-track tunnel (9,60 m), minimum radius of curvature (6,500 M), longitudinal gradients (12 for 100 m, and 3 for 1000). Volcanic rocks lay under the sea for a third of the width and sedimentary rocks from the miocene era for the other two thirds. Site investigations showed three main zones: north side (Hokkaido): tuff (sigma 40 kg/cm2) / south side (Honshu): harder rock (sigma 700 kg/cm2) / to the north and the centre: microcracks and small amount of water; to the south: faults with important import of water. It is not envisaged to take special precautions against earthquakes. An outline is given of the main drilling operations. It is forecasted that progress will be 300 m/month with the Telescopic Atlas Copco drilling machine (4 m cutting diameter; rate of progress: 2 m/h; overall power: 440 kw; total weight 95t). The work carried out 6 days per week, day and night, with three teams enables 1500 m to be completed the first year; the following 500 m took nearly two years. The terrain crumbled easily and necessitated support by means of metal arches and mesh fixed into position with shotcrete placed immediately behind the jacks of the machine. Those arches are placed into position without stopping the machine while it is moving. The first part of the article consists of a brief bibliography, which deals with landslides observed during the last 20 years. The second part describes each failure in detail: nature of the subgrade, conditions of construction, description of the landside, calculation of stability. The third part deals with the form of failure observed, the shear strength of the embankment, and values of the safety coefficient up to failure point. /TRRL/ [French]

Ruffert, G (Torkret GmbH) Trawaa Sous-terrains No. 174, Mar. 1973, pp 25-28, 3 Fig.

ACKNOWLEDGMENT: Laboratoire Central des Ponts et Chaussées, Transport and Road Research Laboratory (IREZ 101065)

PURCHASE FROM: PYC-Edition 254 Rue de Vaugirard, Paris 15e, France Orig. PC

3A 125298

STUDY OF THE FAILURE OF FIVE EMBANKMENTS ON COMPRESSIBLE SOIL (Etude de la rupture de cinq remblais sur sols compremissibles)

This article summarizes five studies of the failure of embankments built on compressible soil observed over the last 10 years either on test embankments or during full-scale tests. The first part of the article consists of a brief bibliography, which deals with landslides observed during the last 20 years. The second part describes each failure in detail: nature of the subgrade, conditions of construction, description of the landside, calculation of stability. The third part deals with the form of failure observed, the shear strength of the embankment, and values of the safety coefficient up to failure point. /TRRL/ [French]


ACKNOWLEDGMENT: Laboratoire Central des Ponts et Chaussées, Transport and Road Research Laboratory (IREZ 101068)

PURCHASE FROM: Laboratoire Central des Ponts et Chaussées 58 Boulevard Lefebure, 75732 Paris Cedex 15, France Orig. PC

3A 125315

IMPROVED SUBGRADE-LOGICAL TECHNICAL DEVELOPMENT OR JUST A CLEVER WORD (La couche de forme-developpement Logique de la technique du artifice de langage.)

The author recalls that the role of the improved subgrade is to ensure the transition between earthworks and pavement. This transition role can be envisaged from different viewpoints which are briefly analyzed: transition between earthworks contract and pavement contract; transition between construction techniques used for earthworks and pavement; transition in time; transition between the average quality of the materials used in earthworks and pavement (quality which is very difficult to forecast); transition as regards the statistical dispersion of the quality of the materials; and transition between materials widely differing in price. The very idea of "improved subgrade" is ambiguous in itself. Depending on the point of view adopted (point of view of the pavement design or that of the execution of the preparation of the subgrade can appear very contradictory. Because of the necessary increase in the quality of the successive pavement layers (average performance of materials, allowance for execution of the work), it is always better to err on the side of great thickness/fairly low quality at the level of the improved subgrade to ensure the quality of the completed pavement. /TRRL/ [French]

Bulleton de Liaison des Lab des Ponts et Chaussées No. 64, Mar. 1973, pp 57-62, Phot.

ACKNOWLEDGMENT: Laboratoire Central des Ponts et Chaussées, Transport and Road Research Laboratory (IREZ 101065)

PURCHASE FROM: Laboratoire Central des Ponts et Chaussées 58 Boulevard Lefebure, 75732 Paris Cedex 15, France Orig. PC

3A 125379

TRIANGULAR DEVICE LIFTS CANTILEVERED GIRDERS TO SPAN PIERs

This article describes a free-adverse erection method employing a triangular lever to lift deflecting cantilevered webs into place. The triangular rig is built of tubular steel in the shape of an isosceles triangle, one corner of which can be set in a recess cast in the side of each pier so that the piers function as a fulcrum. The entire set-up operation takes 1.5 to 2 hours.

Construction Methods and Equipment Vol. 57 No. 7, July 1975, pp 60-61, 1 Fig., 2 Phot.

3A 125380

CANTILEVERED SUPPORTS AND DOLLY-DELIVERED GIRDERS SECTIONS KEEP FREEWAY HIGH AT TOP BUSY CITY

This article describes a method of constructing an elevated freeway above a densely populated area through the use of cantilevered supports and dolly-delivered girder sections. When completed the structure consisted of pairs of box girders set 23 feet apart and supporting the 85-foot wide, 6-lane, 11.8-inch thick reinforced and prestressed concrete roadway. Girder depth ranged from 4 to 11.8 feet, varied according to the length of the free span, from a short 209 feet to a 301-foot maximum. Accuracy of alignment and distance between firders was vital to the construction method.

Hoffmann, P Construction Methods and Equipment Vol. 57 No. 7, July 1975, pp 64-65, 4 Phot.

3A 125381

REVISED OUTFALL CONSTRUCTION METHOD CONQUERS SURF AND SAND

When rugged surf and shifting sand halted construction of an ocean outfall sewer in Rio de Janeiro, a new contractor came in and completed the 2.6-mile job with revised techniques. Methods included powerful boom-mounted dredging pumps and a moveable jack-up barge for pile driving and concrete pipe placement. The major difficulty encountered was dredging and keeping open the surf-zone trench for each 59-foot pipe section. It was found that the use of pipe piles instead of rock bed was a faster and cheaper construction method.

McCrary, E Construction Methods and Equipment Vol. 57 No. 7, July 1975, pp 68-69, 1 Fig., 4 Phot.

3A 125408


The 42-km combles-hordain section of the paris-bruxelles motorway was opened to traffic on 19th december 1972. This section was built in the record time of 18 months. New technological means and very strict planning enabled construction to proceed at that pace. Efforts were made at all levels, and details are given of earthworks carried out in low-quality terrain, construction of concrete engineering structures (one bridge was built every other month) and pavements (use of local materials, use of chippings rolled into the precoated surfacings, spreader capable of spreading over a 10.70 m width, etc.). In spite of the rate at which the motorway was built, quality did not suffer thanks to constant and severe quality control. /TRRL/ [French]
CONSTRUCTION EQUIPMENT AND METHODS


ACKNOWLEDGMENT: Central and Regional Labs of Bridges & Highways, Fr. Transport and Road Research Laboratory (IRRD 10160)

3A 125615
CONSTRUCTION OF ROAD BRIDGES OVER THE JHELUM & SUTLEJ RIVERS, PAKISTAN

The paper describes the construction of two prestressed concrete road bridges in Pakistan. The first on the jhelum river at jhelum, 90 miles north of lahore on the grand trunk road to peshawar about 770 miles from karachi at the coast. The second on the sutlej river near bahawalpur, 420 miles north of karachi and 260 miles by road south of lahore. (figure 1). Construction of the jhelum bridge was started in August, 1965 and completed in July, 1968. Construction of the bahawalpur bridge was started in May, 1966 and completed in August, 1968. The tender value of each bridge was Rs750000.

(A) /TRRL/

Fishwick, AL (Lee (Donovan H) and Partners) Highway Engineer Vol. 22 No. 1, Jan. 1975, pp 19-25, 1 Fig., 11 Phot.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 213308)

3A 125610
CONCRETE ROAD CONSTRUCTION IN BRITAIN TODAY

This paper is concerned with the construction of concrete roads in Britain today. After a brief introduction, the authors review the development of current design requirements, making reference to the doe specifications and technical memoranda and publications by TRRL. An account is given of the development of construction techniques with particular reference to the introduction of the rapid analysis machine, the formation and sealing of grooves. The next part of the paper is concerned with the economics of concrete roads with special reference to the things that have happened since 1969 to improve the outlook for concrete road construction, these include the TRRL analysis of the relative costs of flexible and concrete roads, specification changes and the acceptance of aggregates other than gravels. The authors discuss the surface of concrete roads in relation to the quality of ride and skid resistance, particular reference is made to the plastic grooving machine. After a brief discussion of roads in relation to the environment the authors conclude by discussing future developments including the use of the rapid analysis machine, the addition of carborundum to improve durability and skid resistance, the introduction of deep grooving and the possible development of better methods of case hardening the surface. This paper was prepared for presentation at the symposium on cement utilisation in road construction, ankara, turkey. /TRRL/

Harris, RS Mills, IR Humphreys (Howard) and Sons R&D Rept. Oct. 1974, 7 pp, 1 Fig., 11 Phot.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 213165)

3A 125619
STATE OF THE ART: PAVEMENTS

This bulletin is the first draft of a document which sets out to combine a number of state of art assessments (sota) relating to pavement practice in new zealand. Although the sota are less authoritative than codes of practice, it is believed that the document will significantly reduce the detail and explanation required within the codes themselves. The document is essentially qualitative in nature- quantification being considered appropriate to the codes of practice. Each chapter respectively deals with the different aspects of pavement practice namely: the evaluation of pavements; types of pavements; pavement materials; quality control and variability; pavement design; pavement construction; laboratory and field evaluation; earthwork and subgrade; subbases and bases; surfacings; aggregates; drainage; stabilization; maintenance and research. Each chapter commences by defining the subject, includes definitions of the technical terms used (which are summarized in the form of a glossary of terms) and gives a considered listing of facts, near facts and logical conjectures relating to its subject area. /TRRL/

Smith, AD National Roads Board, New Zealand R&D Rept. RRU Bulletin #2, 1974, 72 pp

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 213163)

3A 125653
TRENDS IN DESIGN AND CONSTRUCTION OF HIGHWAY STRUCTURES IN CANADA

This resume of the bridging activity in canada in recent times makes special reference to the latest trends in design methods, construction techniques and use of improved materials. The author points out that the selection of any structure is based upon economic considerations. The following types of bridges are discussed: the cast-in-place post-tensioned bridges, precast, prestressed beam bridges and steel girder bridges. Standard charts are available for detailing and drafting. Details are given of the use of elastomeric bearing pads and rotta bearings and the advantages of prestressed concrete over reinforced concrete are stressed. It is pointed out that durability of concrete decks is affected primarily by sealing, spalling and cracking of the concrete. The need for joint-sealing is discussed and an account of some notable achievements in long span crossings such as the port man bridge, deas island tunnel and the concordia bridge in montreal is given. /TRRL/

Busain, PC Indian Highways Vol. 2 No. 11, Nov. 1974, pp 5-14

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 213311)

3A 126135
FIFTY YEARS OF ALUMINUM CONSTRUCTION

The development of aluminium applications in construction equipment since 1925 is reviewed. Preferred alloys products, and methods of joining are examined as related to engines vehicle bodies, cranes, scaffolding, formwork, structures, architecture, tools, and equipment. During the 30-yr life of the Construction Division of ASCE, aluminium has grown from specialized application to become an accepted structural metal of general utility. The light weight and corrosion resistance, coupled with the versatility of the extraction process, has given it an important place that can only continue to expand in the next half-century. /ASCE/ Marsh, C (Concordia University, Canada) ASCE Journal of the Construction Division Proceeding Vol. 101 No. C03, ASCE #11591, Sept. 1975, pp 583-605, 6 Fig., 5 Tab., Photos., 15 Ref.

3A 126136
NORTHERN OFF-ROAD TRANSPORTATION IN THE 70'S

A general review of the present state-of-the-art of off-road transportation with emphasis on northern and Arctic operation on the American Continent. Defines off-road transportation, vehicle categories and applications, and looks at basic mobility parameters, e.g., ground pressure, resistances to motion, tractive effort, horse power/weight ratios, drawbar pull, track and wheel ground contact effects, and transmission. Particular problems associated with northern operations are examined, e.g., cats, heaters, metallurgical problems, maintenance, and abuse of vehicles. Basic and special design considerations are also presented. /ASCE/ Presented at the July 15-19, 1974, ASCE, EIC, RATA/Joint Transportation Engineering Mtg., Montreal Quebec, Canada (Preprint MTL-33).


3A 126401
RETEMPERING OF PROLONGER-MIXED CONCRETE WITH ADMIXTURES IN HOT WEATHER

The effect of water-reducing, and water-reducing and retarding admixtures on prolonged-mixed concrete at 30 C (86 F) was studied over a range of dosages. Loss of slump during mixing (for 1 or 2 hr), and the total mixing water required for regaining the initial slump of 10 cm (4 in.) after retempering, were measured. Results show that while loss of slump was higher (compared with the reference concrete) with the admixtures, the total mixing water after retempering was less. At the recommended dosage of admixtures, the differences in both parameters were very small and so were the differences in compressive strength. At higher dosages, however, a pronounced reduction in the total mixing water was observed, with a parallel significant increase in strength. /Author/
CONSTRUCTION EQUIPMENT AND METHODS

3A 127338
INCREMENAL LAUNCHING OF CONCRETE STRUCTURES
Development and current details of the incremental launching method of concrete structures-known as Taktscbiebeverfahren in Europe-are described. The method permits employment of a highly industrialized approach to construction of major concrete bridges and other heavy and long structures. The process requires a minimum of temporary erection and support equipment; however, it makes it imperative that a consistent high degree of quality control is applied to the entire work. The method has been found to be very economical. Bridge spans longer than 330 ft (100 m) can be fabricated, and girders up to 2000 ft (600 m) long can be built and launched in a continuous operation. /AUTHOR/

Based on a presentation at the symposium on Segmentated Bridge and Construction at the 1974 ACI Fall Convention. Atlanta, Ga.

Grant, A. American Concrete Institute, Journal of Vol. 72 No. 8, Aug. 1975, pp 395-402. 13 Fig.

3A 127339
A METHOD OF PREDICTING COMPACATION TIME FOR HOT-MIX BITUMINOUS CONCRETE
A heat-transfer model was used to develop an accurate and flexible procedure for predicting the available compaction time for hot-mix bituminous concrete placed during various climatic conditions, and the extrinsic and intrinsic factors which have the greatest influence on the cooling rate of hot-mix bituminous concrete were determined. The predictive method is presented as a climatic input chart and several accompanying compaction time curves. The compaction time curves were developed for numerous pavement systems, initial pavement surface temperatures, and initial bituminous mixture temperatures. The time for the bituminous concrete layer to reach an average temperature of 175 F was used as the available compaction time. The validity of the procedure is supported by excellent comparisons between the measured and predicted compaction times. The results of the study indicate that an increase in the bituminous mixture temperature, existing surface temperature, and layer thickness will increase the available compaction time. An increase in wind velocity causes a decrease in the available compaction time. A solar radiation increase will cause an increase in the available compaction time. Hot mix bituminous concrete lifts placed during cold weather should be greater than 1 in. thick. Air temperature alone is not a valid criterion for determining whether bituminous concrete paving can be accomplished during cold weather. The method developed provides a procedure whereby interaction of the climate, pavement system, bituminous mixture temperature, and equipment capabilities can be evaluated to produce a paving operation which is effective and efficient. The method developed to predict compaction times can be used to establish specifications for cold weather bituminous concrete construction.


Tegeler, PA (Illinois Department of Transportation); Dempsey, BJ
(Indiana University, Urbana) Association of Asphalt Paving Technologists Proc. Vol. 42 1973, pp 499-523. 16 Fig. 2 Tab., 10 Ref.

3A 127473
FUEL CONSERVATION
Controlling fuel economy requires attention to several areas-equipment selection, basic job planning, machine maintenance and operating practices. To-day's machines have engineering features that make possible economies that were unavailable with older equipment, e.g. the hydraulically angled bulldozer blade, the self-loadmg elevating scraper, and articulated motor grader. A bar chart is used to illustrate the general range of potential fuel savings possible with good operating practices: use of the right size backhoe buckets (too wide or too narrow can increase fuel consumption), and keeping scraper hounds smooth (this will increase scraper efficiency). Equipment maintenance for fuel consumption begins at the engine, overconsumption of fuel due to poor maintenance is a matter of degree, with potential approaching the limits as conditions worsen, i.e. plugged air cleaner, worn engine, timing correction (injection) plugged fuel filter, defective nozzle (injection), and burned valves. Combinations of these conditions may not be directly cumulative, due to their interrelationships. Tires make a difference to fuel consumption; rolling resistance must be minimal and correct inflation is important. The importance is stressed of the engine idle speed, frequent lubrication, and operation at the most efficient rpm. The higher the average load on the engine, the greater the fuel economy. Increasing load from 50 percent to 80 percent of rated engine horsepower on the JD 450-C crawler by shifting to a higher gear results in a fuel saving of 17 percent. Fuel saving suggestions are also made for backhoe and excavator operators.

Constructor Vol. 57 No. 9, Sept. 1975, pp 22-24. 3 Fig.

3A 127474
DOUBLE-TUBE TREMIE USES AMBIENT WATER TO PROTECT MIX
The tremie system described here used a slip valve and surrounding water to empty the tremie tube and keep it dry-between discharges. The double tremie system consists of an outer pipe with slits along its walls that permit water to flood the systems annular space between tubes, and an inner plastic tube of textured 2-mm-thick PVC, retarred with ionlon fiber to increase the tube's strength and life. The equipment is designed for placing concrete underwater over a wide area by repeated resetting of a small number of pipes without endangering the quality of the finished concrete. As the falling concrete fills the plastic tube, a dip valve in its bottom end opens to discharge mix. When concrete stops falling, water entering the outer pipe through the slits squeezes remaining concrete from the inner tube. The bottom valve immediately seals the tube after final mix is discharged. With the tube sloping flat and the valve closed, the tremie system can be repositioned for continued concreting, without fear of introducing water that might dilute or segregate the mix. Details are outlined of the successful placing of 33,000 yd. of concrete underwater for a dry-dock flooring using the double-tube method. Three double-tube tremies mounted on a 90-ft-long, 40-ft-wide raft assembled from plugged steel pipes handled the concrete. Nine men handled the tremie pipes; six others attended pumps and slicklines, and each 740-yd load was placed in a 10-hr shift.

Cryogenics Vol. 57 No. 9, Sept. 1975, pp 54-55. 4 Fig.

3A 127475
CONCRETE ADMIXTURES AND AGENTS
Versatile and efficient, modern-day products guarantee major time and cost-saving advantages as they customize and adapt concrete for virtually every type of application. Admixtures fall into one of six categories: air entraining, water reducing, retarding, accelerating, pozzolans, and workabil­ity agents. Air entrainers produce small air bubbles in the concrete to improve workability and placement with reduced water content. Darvair, a liquid that is typically added to a mix in rates from 3/4 to 3 fl oz per 100 lb of cement, is designed for use in mass concrete and in high cement factor, low slump paving mixtures. Master Builders MB-VR (water soluble) and Agent No. 2001 are other air entraining admixtures discussed here. Water reducing admixtures lower cement content requirements and improve workability. Plasticimn concrete densifier, Pozzolith polymer admixture ready to use solutions, and the Dares-Set Accelerator admixture which can be used when potential corrosion of embedded or stressed steel must be avoided. Workability agents ease the mixing, handling and placing of concrete; such agents include Pozzolith polymer type admixture, the Dares pumping aid, and retarders in paving mixtures. Master Builders MB-VR (water soluble) and Agent No. 2001 are other air entraining admixtures discussed here. Water reducing admixtures lower cement content requirements and improve workability. Plasticimn concrete densifier, Pozzolith polymer admixture ready to use solutions, and the Dares-Set Accelerator admixture which can be used when potential corrosion of embedded or stressed steel must be avoided. Workability agents ease the mixing, handling and placing of concrete; such agents include Pozzolith polymer type admixture, the Dares pumping aid, and retarders in paving mixtures. Master Builders MB-VR (water soluble) and Agent No. 2001 are other air entraining admixtures discussed here. Water reducing admixtures lower cement content requirements and improve workability. Plasticimn concrete densifier, Pozzolith polymer admixture ready to use solutions, and the Dares-Set Accelerator admixture which can be used when potential corrosion of embedded or stressed steel must be avoided.


Tegeler, PA (Illinois Department of Transportation); Dempsey, BJ
(Illinois University, Urbana) Association of Asphalt Paving Technologists Proc. Vol. 42 1973, pp 499-523. 16 Fig. 2 Tab., 10 Ref.

3A 127502
WRAPPING IT UP WITH NYLON FABRIC FORMS
Techniques with nylon fabric forms are described which are adaptable to erosion control, underwater concreting, encasing piles, lining tunnels, producing drains and other uses. These nylon forms are flexible containers

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that can be filled by pressure injection with fluid fine-aggregate concrete. They permit controlled drainage of water through the fabric, which reduces the water cement ratio. This causes rapid stiffening, produces high strength, and provides exceptional durability. The double-wall fabric comes in two designs: a quilted type capable of relieving hydrostatic pressure, and another type with a uniform cross-section for use where the primary objective is impermeability and a low coefficient of hydraulic friction.

Concrete Construction Vol. 20 No. 9, Sept. 1975, pp 389-390, 9 Fig.

3A 127527

PAVEMENT DESIGN AND THE DECISION-MAKING PROCESS

The history of pavement design is briefly reviewed, and development in and future prospects for utilizing systems engineering in the design-making process is discussed. Pavement design has evolved from the use of sections of different categories of soil, climate, and traffic conditions to that of empirical relationships between structural designs, materials, traffic, climate, and subgrade conditions based on test programs such as the AASHO Road Test. Recently, interest has been expressed in the concept of an objective function for pavement design. A Systems Analysis Model for Pavements (SAMP5) is one approach to considering initial construction, operation, and user costs in the decision making process. The SAMP5 program (an improvement of SAMP5) requires 12 classes of variables: program control and miscellaneous; environmental (2) and serviceability (3) traffic and reliability (2); constraint; traffic delay; maintenance, cross-section, cost model and shoulder; tack coat, prime coat, bituminous materials; wearing surface, overlay, pavement material, and shoulder layer material. The SAMP program operation normally considers between 1,000 and 2,000 different trial designs.

The output of the SAMP5 is provided in 3 parts: summary of input data, summary of the best design strategy for each material and larger combination; and the best design strategy in order of increasing total cost per square yard of traffic lane. Illustrations of the application of SAMP5 include a comparative study of the economics of staged construction and planned rehabilitation versus the "no-overlay" or single-layer construction approach, and a study of the effect of fluctuating material costs on optimum design. The operational SAMP program provides decision-makers with the capability of comprehensively selecting optimum strategies and updating decisions as conditions change.


Smith, HA

National Crushed Stone Association, National Sand and Gravel Association, National slag Association 1974, pp II 1-12, 1 Fig.

3A 127533

CHARACTERISTICS OF GRADED AGGREGATES AS RELATED TO THEIR BEHAVIOR UNDER VARYING LOADS AND ENVIRONMENTS

This presentation which focuses upon the characteristics of plant processed graded aggregates and the responses of such materials under static and repetitive loading as well as their responses to freezing conditions, discusses typical data which illustrate that graded aggregates can be used with confidence and reliability when such materials are incorporated into a well-designed pavement. The necessary and desirable characteristics can be assured through good specifications without performing elaborate and sophisticated testing; through such tests are required when and if a dispute over the suitability of such a material arises. A figure is used to illustrate the latest revision of ASTM D 2940 gradation specification; graded aggregates meeting the requirements as stated in this specification will possess the characteristics necessary to withstand static and repetitive loading under a variety of environmental conditions. Strain control triaxial testing, elastic response and plastic response under repetitive loading, and responses to freezing environment are discussed. It is pointed out that graded aggregates can be uniformly produced and supplied. Such aggregates do not fatigue after a large number of load applications; they become more rigid with use and resist permanent deformations; they are not adversely affected by high summer temperatures; they do not contribute to excessive resilient deformations that cause fatigue cracking of the surfacing (therefore fully compatible with bituminous surfacing); they are ideally suited to staged construction—they can be used in pavements with minimum surfacing thickness to help ease the energy shortage; determinantal frost heaving effects can be minimized by replacing unsuitable soils with graded aggregates; they can be used for cement or bituminous stabilized bases with less cementitious agent than other unprocessed mixtures; and potential improvements of stability, rigidity and durability are dependent on many factors e.g., compaction, mix size etc.


Kalcheff, IV (National Crushed Stone Association)


3A 127589

FULL-DEPTH ASPHALT AIRFIELD PAVEMENTS

A brief review is presented of the newly revised edition of The Asphalt Institute airfield pavement design manual. A new design procedure predicated upon multilayered elastic concepts is introduced. The method is based on the necessity for designing against two types of pavement distress: (1) Cracking in the asphalt layer due to fatigue; and (2) excessive deformation due to overstressing the subgrade. The design method is based on the theory that a full-depth asphalt pavement is a multilayered elastic system and that the application of load to the pavement produces two critical elastic strains: (1) Horizontal tensile strain at the bottom of the asphalt concrete layer; and (2) vertical compressive strain at the top of the subgrade layer. Design criteria based on maximum allowable values for the strains are used in developing the design procedure. Influence and effects of materials and environmental factors are examined. /ASCE/


3A 127781

BRIDGING THE NORTHUMBERLAND GAP

This article describes the North Seaton bridge which crosses the River Wansbeck Valley at a skew of approximately 25 degrees and links north and south Northumberland. This six-span prestressed concrete viaduct, 180M long and 124M wide, carries the newly constructed south east Northumberland spine road across the river. The in-situ, post-tensioned system consists of twin T-Beams. Each T-Beam has its own independent line of support columns, and each pair of columns is skewed to line up with the flow of the tide. Bank seats support the ends of the deck, which is hinged at the south end and has an expansion joint at the north end. Details are given of the deck formwork used, casting of the concrete and bbrv system of prestressing. The bridge deck is supported on five piers each comprising two reinforced concrete columns. The piers except no. 1 pier stand on A concrete columns. The piers except No. 1 pier stand on a 14 b section steel piers driven to a depth of 15 M in the underlying rock. All five foundations are set skew to the line of the bridge and are burred to reduce scour and obstruction of the river bed. Data are also presented on the construction of the abutments and costs. /TRRL/


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 214432)

3A 127782

IT'S QUICKER BY GEODRAIN

Details are given of a new system known as geodrain, developed and marketed by Tertafillo AB of Gothenburg, Sweden, for draining a clay soil to induce settlement before building work starts. The system consists of a rigid plastic geodrain and a paper sleeve of wet strength through which water can filter when the geodrain has been installed in the ground. The device measures 4mm by 100mm and is supplied in rolls of about 150M in length. The geodrain works on broadly the same principle as the sand drain. Comparisons have been carried out between both types of drain at the Swedish Geotechnical Institute. The ground consisted of loose post glacial clay with an underlay of glacial varved clay. Results showed that with geodrain the horizontal surface movement was restricted to a maximum of 5mm whereas with the sand drains the total horizontal movement was 379
around 100 mm. Shear strength of the soil in the immediate vicinity of the geodrain during installation was reduced by only 5% compared with 30% for a sand drain. Various types of machinery can be used to install geodrains in all cases lighter than that needed in the installation of sand drains. /TRRL/


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 214431)

3A 127897
TUNNELLING AND FALSEWORK HAZARDS

Extracts from some of the papers presented at the conference "Tunnelling and Falsework Hazards" held at the Institution of Civil Engineers in London in March 1975 are given. The papers include: Structural Safety and the Doc, Briddle, RJ; Tunnel Hazards-UK Experience, Muir Wood, AM, Unforeseen Loads on Falsework, Mott, JCS; Making Falsework Safer, Bragg, SL. /TRRL/

Bridle, RJ Buirle, RJ Mott, JCS Bragg, SL Surveyor - Public Authority Technology Vol. 145 No. 4319, Mar. 1975, 3 pp, 1 Fig.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 215057)


3A 127926
IMMERSED-TUBE TUNNELS

This article gives a general account of the use of immersed tube tunnels with particular reference to the Hong-Kong cross harbour tunnel designed by British engineers and the proposed Tees tunnel which is likely to be the first of its developed in the USA does not closely match the envelope this type of tunnel and the conditions under which it can be constructed. The two alternative types, steel shell and the European developed concrete box, are discussed. The former developed in the usa, does not closely match the envelope required by traffic and hence has to be located at a greater depth. However if ventilation is required the segmental spaces can be used for this purpose. Steel shell construction is also favoured by a combination of low material costs combined with high labour costs. The Hong Kong bridge is of the steel shell type, is 1536 metres long and has four lanes. The tube comprises two steel shells linked by diaphragms and keel concrete, later filled with tremie concrete. The units, weighing about 6,000 tons, varied in length from 99 to 113 metres. They were placed by an all purpose screed and lay barge using laser beam for alignment. The proposed Tees tunnel is of rectangular concrete box construction, 915 metres long and with four lanes. It will normally be self ventilating, but fans can be used under exceptional traffic conditions. The article outlines the proposed method of construction which involves manufacture of the units on a casting bed and their subsequent placement by means of a lowering dock. /TRRL/

Culverwell, DR (Freeman Fox and Partners) Consulting Engineer Vol. 39 No. 4, Apr. 1975, pp 47-53, 3 Fig., 4 Phot.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 214448)

3A 127929
FIELD SUPERVISORS' DUTIES AND RESPONSIBILITIES.

VOLUME I, CONTRACT ROADWORKS

This publication which is intended to help those responsible for the supervision of roadworks carried out by contract, covers general aspects, details of sampling, testing and site tests, and provides an inspection guide. The general aspects briefly reviewed here include public relations, documents and records, preliminary works, order of work, materials, emergencies, contract payments and cleaning up. Abbreviated instructions (must be supplemented by instructions from the engineer) are set forth for sampling materials encountered in roadworks. These materials include soils and pavement materials, tars and bituminous materials, precast concrete drainage structures, concrete constituents, concrete mix, paint, and the dispatch of samples. Aggregate tests and concrete tests are detailed and matters for inspection are listed. The latter include provision for traffic, protection of the public and property, safe construction practices, access to and security of abutting properties, public utilities, setting out, earthworks, drainage, pavements, surfacing, roadside furniture, and closing of works.

Svenska Vagforeningen May 1975, 24 pp, 1 Fig., 1 Tab., 2 App

3A 127943
BIG EARTHMOVERS AND REVISED JOB-PHASING SPEED HIGHWAY CONSTRUCTION

The repaying of job sequences to boost production (and cut construction times by 25 percent in a project utilizing massive earthmoving machines, indicates that even after a contract is awarded, re-evaluation of equipment and methods can improve job payoff. Planning called for building a culvert to reroute an existing canal prior to construction of two multi-plate tunnels under the old canal bed. On completion of this, construction would commence on a haul road construction and cutting and filling. Reconsideration determined that installing a diversion pipe across a curve in the canal would enable the culvert and multiplate tunnel to be built simultaneously. Although initial plans did not include the company's already-owned high-capacity machines, reanalysis indicated that a revised approach could slash job time from 37 to 28 months and a decision was made to use the jumbo equipment. Temporary on-grade traffic across a previously restricted roadway permitted work around telephone poles and the beginning of cuts and fills. The building of a 240x290x40-ft. high structural steel haul bridge, and a 120-day settlement during winter are described. Earthmoving was accomplished in 2 stages: first 5 million yd. was completed and the spreads then shut down to permit 12 and 24-ft-wide paving by slipformer; another 8 months of earthwork is scheduled to begin with bottom dumps and loaders and one spread of scrapers. Details are also outlined of the working of the bottom dumps, keeping the roads smooth, the working of the scrapers and wheel dozers, diversion of the canal, and the bridges.

Drossel, MR Construction Methods and Equipment Vol. 57 No. 10, Oct. 1975, pp 30-32, 5 Fig.

3A 127954
MECHANIZED CONSTRUCTION OF CONCRETE ROADS

Aimed at those concerned with construction and intended as a source of information for those involved with the design and detailing of new roads, this booklet provides a basic introduction to the subject, provides information on recent developments in plant and methods and presents a practical guide to good site practice. The methods and machinery described here are those best adapted to British conditions. Basic carriage way structure and pavement design requirements are discussed; pavement slab, carriageway joints, sub-base and separation membrane are covered. Details of paving with fixed-form plant are described which cover full-width or cutting slab paving, two-course or single-course paving, advance preparations for paving, concrete spreading, compaction, finishing, and adjustment of spreaders, compactors and finishers, surface texturing, curing, joint formation, joint sealing, and the paving of variable widths. The relative merits of slipform paving and fixed-form paving are discussed, and the details of slip-form paving are set forth. These include line and level control, the Guntert and Zimmerman slip-form paver, the PCP60 slip-form paver, the CMI Autograde slip-form paver, and paving with the slip-form plant. Special applications of slip-form paving are noted. Batching and mixing, plant location and transport of concrete are also covered.

Walker, BJ Beadle, D Cement and Concrete Association 46-013, June 1975, 75 pp, 94 Fig., 4 Tab., 2 App.

PURCHASE FROM: Cement and Concrete Association 32 Grosvenor Gardens, London SW1W 0AQ, England Repr. PC

3A 128279
OUSE BRIDGE, WHAT WENT WRONG AT PIER 157?

Brief details are given of the construction method used on the ouze bridge and the stage of the project when there was partial collapse of a military trestle leg at one of the structure's main river piers in July 1975. The remedial work undertaken is described and an outline is presented of the various stages and the methods used in the construction of the bridge which was begun in 1973. /TRRL/


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 215159)
CONSTRUCTION EQUIPMENT AND METHODS

3A 128468
PRECAST Prestressed SEGMENTAL ELEVATED URBAN MOTORWAY IN ITALY

The design and construction of an elevated urban motorway that was built in the city of Bolzano, Italy, using precast prestressed concrete segmental construction is described. The viaduct consists of 74 spans giving an overall length of 2580 m (1.6 miles). The superstructure is made up of one post-tensioned concrete multi-cell box-section spine beam with cantilever side slabs. The basic construction method of the superstructure is the span-by-span mode using percast segmental units erected on falsework and post-tensioned together. Each of the 34.5-m (113.2 ft) spans is composed of nine segments, 2.20 m (7.28 ft) wide by 1.6 m (5.25 ft) deep and weighing 110 tons. The precast elements are connected by a thin layer of epoxy resin adhesive. In the wintertime, the surface to be bonded was electrically heated. The average erection time cycle for the superstructure was one span per week. The viaduct was completed in April of 1974. /Author/

Gentilini, B Gentilini, L Prestressed Concrete Institute, Journal of Vol. 20 No. 5, Sept. 1975, pp 26-43, 23 Fig., 2 Tab.

3A 128498
INVESTIGATION ON SUGAR-ADmixed CONCRETE FOR PAVEMENTS

Certain investigations conducted at CRRI into the use of small quantities of sugar as a concrete admixture with particular reference to paving concrete have been reported. It is indicated that the optimum benefit is obtained by adding 0.05 percent sugar by wt. of cement into the mix, which would also be the most suitable amount compatible with constructional requirements. Besides the retarding action, addition of sugar increased both workability and strength of concrete resulting in appreciable economy in cement in the adjusted mix for a specified strength and workability. The field tests under hot and moderate weather conditions confirm the laboratory findings and show that the maximum benefit from use of sugar in concrete is derived in warm to hot weather. A full-scale experimental pavement length using sugar-admixed concrete has also been constructed in Haryana in collaboration with the P.W.D. of that State.


3A 128520
COMPUTER ANALYSIS OF SEGMENTALLY ERECTED PRECAST Prestressed BOX GIRDER BRIDGES

The economic advantages of precasting can be combined with the structural efficiency of prestressed concrete box girders for long span bridge structures when erected by segmental construction. The complete superstructure is precast in box segments of convenient size and assembled in cantilever form. These precast segments are erected in cantilever and post-tensioned together to form the complete superstructure. This report details the development of an analysis technique with an associated computer program to permit efficient analysis of constant depth segmental prestressed concrete box girders at all stages of erection. An existing box girder analysis program developed for analysis of completed structures was substantially altered to make it applicable to the multistage construction problem. The computer program has been written to simulate the complete construction sequence after a reasonable amount of user-generated data. The program provides a complete analysis for stresses and deflections at each stage of construction and will, at the user's option, compute revised tendon stresses for all tendons stressed earlier in the sequence and bonded by grouting. The use of the computer program is demonstrated by means of several practical examples, including an analysis of the first bridge of this type in the United States, erected at Corpus Christi, Texas. The general applicability of the program was verified in a related study by Kashima wherein measurements were made in a realistic model study of the Corpus Christi bridge and good correlation was obtained.

Work sponsored by the Texas Highway Department. Work done in cooperation with the Federal Highway Administration, Department of Transportation.


Res Study 3-5-69-121

3A 128562
RECYCLED MATERIALS REJUVENATE RURAL ROAD

In an effort to rejuvenate county roads at low cost, a rural road has been ripped up, its 2700 tons of asphalt materials crushed and reprocessed and then used to repave within the existing right-of-way. The $98,000 experimental work to repave the 1-mile segment consisted of 3 stages. In the first stage, the 22-ft wide surface was ripped, crushed in place, the asphaltic material was windrowed and then hauled 12 miles to the asphalt plant where they were stockpiled. A Cat 14 grader with rippers and a Cat DW 20 equipped with Hyster compactor wheels were used. The second stage consisted of subbase preparation using materials already in place in right-of-way. The 4-in. thick calcium chloride treated base was ripped and windrowed and pushed to each side. In this way, elevation was reduced about a foot as the width of the road was increased. Foresteps were changed from between 1-1/2: 1 and 1:1 to 3:1. When completed the new pavement will be 22 ft wide with 6-ft shoulders on each side. The base materials consisted of 25 percent clay and 75 percent gravel, and had once been treated with calcium chloride. The third stage included processing the recycled materials through a drum mixer at a conventional hot mix plant. It was found necessary to add virgin asphalt. The experimental mile was divided into 4 test sections: 1/2 mile had an additional 2-1/2 percent new asphalt; next quarter mile had 3-1/2 percent added; next eight mile had 4-1/2 percent; and the last eight had 4-1/2 percent with 30 percent of mixture 3/4 inch limestone. Further details and plans for the future are outlined.

Roads and Streets Vol. 118 No. 10, Oct. 1975, 2 pp, 3 Fig.

3A 128654
STRUCTURAL NOTES AND DETAILS

Information is provided and advice is given on the resolution of problems related to the use and application of various design techniques, the design and construction of connections, structural repair of buildings and structures, the simplification of specifications, the use of size instructional notes, and formal reports. The details and advice are grouped under the following headings: site investigations, foundations (general and complex items), composite construction-general and complex applications, structural details, structure notes relating to prestressed concrete, structural repairs and modifications, and contract organizations (programmes, data boards, executives). Two appendices are provided. One provides a glossary of technical terms, and the other, items which relate to the calculation of safety factors.


3A 128661
IOWA'S EXPERIENCE WITH FULL-DEPTH ASPHALT PAVEMENTS

Observations are presented of full-depth asphalt pavements constructed of hot mixtures on interstate, primary and country highways, in which the lower course is placed directly on the existing earth subgrade, or as earth subgrade mixed with small amounts of lime, portland cement, gravel, or crushed limestone. The wearing surfaces of these pavements are usually layers of hot-mix asphalt concrete, but chip seals are also fairly common on county highways. Full-depth pavements constructed on the foregoing types of subgrades or subbases, using mixtures produced in a drum are also discussed. Large full-width finishing machines, and storage and surge silos are commonly used. Self-propelled vibratory rollers are increasingly used. Specifications have permitted drum mixes using conventional hot mix temperatures for all asphalt-treated base materials. Automatic screed controls have been used. Thick lift construction has become an important aspect of construction. Comments are also made regarding stabilization needs, design thickness, the optimum asphalt-content and aggregates.

Stump, MJ (Iowa State Highway Commission) Paving Forum Sept. 1975, pp 8-11, 1 Fig.

3A 128695
USE OF WOVEN MATERIALS IN IMPROVED SUBGRADES
[Utilisation des textiles en couche de bases]

The design of improved subgrades laid on soil of different consistencies, which are sensitive to frost and water gives rise to numerous problems. Five experimental sections were built by the laboratory in Nancy in which woven and non-woven materials were used. The aims were : (1) to verify the
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anti-pollution role of structural additional materials laid under a granular improved subgrade and on top of a saturated clayey soil; (2) to measure the influence of those added materials on the traffic behaviour and deformability of the underlying layer; (3) to define laying techniques, although the experiments applied only to special site conditions (clayey supporting soil with a low consistency at the surface, light traffic, use of granular material) and did not demonstrate the methods of use for each type of textile; two main results were observed: (a) in the short term, possibility of laying a granular improved subgrade on top of a clayey soil of low consistency, which results in a slight increase in compaction efficiency; (b) in the longer term, non-pollution of the improved subgrade and marked consolidation of the soil. /TRRL/ [French]


ACKNOWLEDGMENT: Central and Regional Labs of Bridges & Highways, Fr, Transport and Road Research Laboratory (IRRD 101478)
PURCHASE FROM: Central and Regional Labs of Bridges & Highways, Fr 58 Boulevard Lefebvre, 75732 Paris Cedex 15, France Orig. PC

3A 129010
PAST AND FUTURE OF CONSTRUCTION EQUIPMENT-PART II
Basic earthmoving machine concepts were developed before 1950. In the early 1950's, three advancements initiated major refinements of construction machines: High-strength steel, nylon cord for tires, and high-speed lightweight high-output diesel engines. This expansion of technology led to larger capacity machines in the 1950's, expanded product lines in the 1960's, and machines with more productivity in the 1970's. Machine evolution, a day-to-day year-to-year process, ends when man has no further need to move the earth he lives on. The end is not in sight, for there is only the future. /ASCE/

Clump, EH (Caterpillar Tractor company) ASCE Journal of the Construction Division Proceeding Vol. 101 No. CO4, ASCE #11777, Dec. 1975, pp 689-698, 8 Fig., 1 Tab., 1 Ref.

3A 129018
A HALF-CENTURY OF COLD-REGIONS CONSTRUCTION
A review of construction practices in cold regions of the United States and Canada since 1925 reveals that, despite current emphasis on work in these areas, the industry has successfully completed a large number of projects under adverse cold conditions throughout this 50-yr period. Over 50 North American cold-regions projects are reviewed, including buildings, excavation, piling, roadway, bridge, dam, canal, and waterworks projects. Mention is made of cold weather construction practices in foreign countries, and a current project, the Trans-Alaska Pipeline, is noted. /ASCE/


3A 129047
DESIGN CONSIDERATIONS FOR A DIRECT-FIRED PROPANE HEATER TO PREHEAT THE BASE FOR COLD-WEATHER PAVING
A prototype direct-fired propane heater with variable gas rate and speed was designed for preheating the base to study cold-weather paving of thin mats. The results obtained were compared with those predicted by the computer program. The computer program was then used to simulate cold-weather paving. Statistical analysis of the data revealed that only three of the eight variables were significant. The effect of these three significant variables on the temperature for compaction was found to be linear. A new program was constructed to predict the time available for compaction. From the results of this study, a 12 by 12-ft (3.6 by 3.6-m) propane heater producing approximately 300,000 btu/hr-sq ft (9300 kW/sq m) and moving 2 min ahead of the paver at a speed of 20 to 80 ft/min (6.1 to 24 m/min) is recommended as a final design. Propane gas consumption for such a heater is estimated to be 1,980 lb/hr (890 kg/hr), which will result in a fuel cost of $136/hr.
Shah, ND Dickson, PF (Colorado School of Mines) Transportation Research Record No. 549, 1975, pp 55-62, 7 Fig., 2 Tab., 5 Ref.
PURCHASE FROM: TRB Publications Off Orig. PC

3A 129043
PERFORMANCE OF A LARGE CORRUGATED STEEL CULVERT
Because few published field data exist to help in the development and evaluation of design criteria for large buried structures, a construction project involving such a structure was instrumented in Thunder Bay, Ontario. The structure was a shallow-buried, elliptical, corrugated-steel pipe with a 16-ft (4.9-m) height and a 27-ft (8.2-m) span. A concrete relief slab was placed on the fill several feet (meters) over the crown to distribute the load. Pressures around the structure were measured by using embedded stress gauges. Horizontal and vertical extensometers measured strains in the backfill. Radial extensometers inside the structure provided the structural deformation pattern. Data was obtained during construction and during live load tests with heavy vehicles. The results provided information on the magnitudes and distribution of stresses and deformations, the influence of construction procedures, and the apparent moduli of the backfill. Even though the cover over the structure provided by the backfill and slab was only about 20 percent of the span, the deflections and stresses in the pipe from the heavy vehicle loads were much smaller than those produced by the dead weight of material placed over the crown. Many cycles of live loading were required before the culvert system
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began to respond elastically to the loading. The final soil pressure distribution around the structure and the observed deflections were greatly influenced by the construction procedures.

Selig, ET (State University of New York, Buffalo): Calabrese, SJ (Law Engineering Testing Company) Transportation Research Record No. 348, 1975, pp 62-76, 17 Fig., 1 Tab., 1 Ref.

PUBLICATION FROM: TRB Publications Off Orig. PC

3A 129564
SOIL MELTING-A PRACTICAL TRIAL
The article describes the subterrene system designed for tunnelling in loosely compacted formations in which a glass lining is formed to support a tunnel roof either as a temporary or a permanent measure. In tests the roof and sides of an experimental tunnel were formed by melting a series of 50mm diameter horizontal holes approximately 2M deep in a loose fill material using electrically heated consolidating subterrene penetrators. The holes were sufficiently close for the glass linings to fuse and so produce a double walled lining reinforced by webs. After tunnel roof and walls were formed, the fill material could be excavated by hand. A long-term development of this system includes equipment to melt a continuous kerf around the periphery of a tunnel being constructed in unconsolidated material so that the melt would be deposited in the form of a thick glass tunnel lining. /TRRL/

Williams, RE (Los Alamos Scientific Laboratory) Tunnels and Tunnelling Vol. 7 No. 1, Jan. 1975, pp 44-45, 1 Fig., 7 Phot.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD-214675)

3A 129565
PILING PROBE FOR BENTONITE BOREHOLES
This article gives a brief account of tests that are being conducted by CIRIA and BRE to find out whether the use of a bentonite slurry during the construction of concrete bored piles affects the friction between the pile and the strata. Three pairs of piles have been constructed using an auger for the first two and a bucket type drill with a bentonite suspension for the third. In the first, concrete was placed through a single hopper and in the second through a tremie pipe. Precautions were taken to ensure that friction measurements were restricted to the pile/london clay boundary and avoided friction at the base of the pile. Push rods indicate the distribution of strain over the length of the pile and vibrating wire gauges give a check on the strain and give more information on the distribution of skin friction. Brief details are given of the loading and recording methods used. Preliminary analysis of the results suggests that the bentonite is not detrimental to side friction and may even enhance it. /TRRL/


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD-215070)

3A 129661
SPREADING OF COATED CHIPPINGS ON BITUMINOUS SURFACINGS OF THE FRENCH SEMI-GRANULAR TYPE [Le coulage des revêtements hydrocarbures de type semi-granules]
The method of spreading hard coated chippings on the surface of a bituminous layer immediately after application of the latter is described. The technique used in France (which includes the rugochape process) is described in this article; it is a strict application of the technique described above, and it stresses the need of A satisfactorily-laid supporting bituminous layer, which can carry heavy traffic of 13 tonne-axle load vehicles. Based on the experience obtained from heavily trafficked roads over the last few years and the present knowledge on skidding, the characteristics, and behaviour of this type of surfacing are discussed. /TRRL/ [French]


ACKNOWLEDGMENT: Central and Regional Labs of Bridges & Highways, Fr (IRRD 101418), Transport and Road Research Laboratory

3A 129674
DRAWBRIDGE DESIGN BEATS LOCH LEVEN SNAGS
This article gives an account of the construction of the Dalla Chulish bridge on the shores of Loch Leven, Scotland. The method of construction used is likened to the operation of a drawbridge. After a general introduction in which the author refers to the lost time due to high rainfall and the advantages the bridge will bring, the article continues with an account of the choice of the design used. The author then gives an outline of the design, a through truss bridge with a main span of 183 M and side spans of 29 M and 82 M, which will cost 2 million. This is followed by an account of the construction of the abutments and the erection of the spans, which involved the use of special props that allowed an infinite range of height adjustment. Because the mobile crane available was inadequate to lift the steel sections out over the loch an alternative method, described in the article, was used. This involved the use of hinges at one end of each section, fixing the section parallel to the shore and pushing it through 90 degrees with the jib of the crane. This resembled the "drawbridge" method that was used to erect the structural steelwork in the main span, which is also described: this involved the use of a 30-tonne telescopic crane on bogies and the washing of the sections on another bogie. The article concludes with an outline of the way in which the bridge will be completed, and the measures to be taken to eliminate the sag in the mid-span area. /TRRL/


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 213493)

3A 129967
FLEXIBLE PAVEMENT DESIGN AND MANAGEMENT: SYSTEMS APPROACH IMPLEMENTATION
This report describes an operational computer program (SAMP6) that provides a basis for selecting flexible pavement design and management strategies with the lowest predicted total cost over a prescribed analysis period when considering such cost elements as initial construction, routine maintenance, periodic rehabilitation, interest on investment, salvage value, and roadway users cost. The program uses the AASHTO Interim Guides as its structural subsystem and the predicted decrease in serviceability with time and traffic as developed at the AASHO Road Test. The strategy selection capability is a quantitative procedure for considering long-term advantages and disadvantages of staged construction versus strong initial structural designs.


NCHRP 1-10 A

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 213493)

3A 129981
CONFERENCE ON RIGID PAVEMENT HELD ON THE 29TH NOVEMBER, 1972 REVIEW OF METHODS OF SURFACING CEMENT CONCRETE PAVEMENTS (Conférence du 29 Novembre 1972 sur les chaussées en beton. Bilan des techniques de revêtement de chaussées en beton de ciment)
The author recalls the experience gained during the laying of the concrete surfacing of the A6 motorway, between 1958 and 1968. The article is divided into 3 parts-(1) review of the main stages of rigid pavement surfacing techniques on motorway construction sites; (2) observations on the conditions of pavements in 1972; (3) observations on the strength, roughness, and skidding resistance of surfacings, and suggestions regarding the various fields of application of rigid pavements. /TRRL/ [French]


ACKNOWLEDGMENT: Central and Regional Labs of Bridges & Highways, Fr (IRRD 102008)

3A 129985
BRIDGE CONSTRUCTION BY EXTRUSION SLIDING
This article describes a method of concrete bridge construction known as extrusion sliding. Briefly, the method involves constructing segments of complete cross-sections, each approximately 30 M long, in a fixed location immediately behind one abutment. As each segment is completed, it is pushed out over the permanent piers A sufficient distance to allow the following completed segment to be attached, and the cycle repeated. The article describes this method as used in the construction of the broblital...
bridge across the river rhine. The segments in this case were 25 M long and weighed approximately 26 tonnes/m. The sliding was accomplished using polished stainless steel sheets and teflon coated pads, lubricated by soft soap on each pier and the far abutment. The sliding force was applied by horizontal jacks pushing a neoprene friction bearing, supporting the bridge structure, over an oil lubricated block. A relatively light, steel plate girder nose was fixed to the front of the first segment to reduce cantilever moments during sliding, and two temporary, movable, piers were erected at mid span for additional support. The article concludes by listing the advantages and disadvantages of the method and gives some potential applications. /TRRL/

Korn, H (Dames and Smith) *Concrete* Vol. 9 No. 5, May 1975, pp 16-21, 6 Fig., 1 Tab., 9 Phot., 3 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 216078)

3A 130550

AN INVESTIGATION OF PRECAST AND PRESTRESSED CONCRETE BULB TEE MULTI-BEAM BRIDGES

Multi-beam bridges, constructed from precast and prestressed concrete bulb tee sections, were evaluated through field observations and analyzed using the finite element method. Approximately 50 bridges were inspected in the states of Washington and Idaho, and data for over 100 bulb tee systems was obtained for evaluation. Personnel interviewed from agencies constructing these bridges were very accepting of the bulb tee bridge system. Their reasons for this acceptance included the ease of erection, low installation costs, and low maintenance costs. The field observations of existing bridges revealed some problems. Most of these problems have been eliminated in later designs by careful follow up work carried out by the producers and most agencies. Cost data on 81 bridges showed that the average cost per square foot of deck has been reduced by about 50 percent since 1965. Several finite element models were utilized to investigate the effect of the lateral load transfer devices. These analyses served to quantitatively illustrate the major role played by both the weld tie plate and the grout keyway in transferring the load laterally; furthermore the calculations revealed that a relatively minor amount of stiffness is contributed to the system by the diaphragms.

Report sponsored by the Federal Highway Administration, Idaho Division, Boise, Idaho.

Sack, RL

Idaho University, Moscow Final Rpt. FHWA-RD-75-84, June 1975, 61 pp

ACKNOWLEDGMENT: Federal Highway Administration (X-0006)

3A 130580

WIND LOADING ON FALSEWORK-PHASE I

Full scale installations of Modular Tubular Falsework were tested in a wind tunnel. The tests considered various tower spacings, wind velocities to 100 mph, oblique incidence of wind, and varying number of tower units in the wind stream. The angle of wind incidence and the number of towers in the wind stream were found to be major factors in determining the total wind load on a falsework bent. A design method, based on an empirically established wind velocity model and the test data, is presented. /FHWA/ 8

Nix, HD Bridges, CP Power, MG

California Department of Transportation, (CA-DOTDS-4179-1-75-4) Final Rpt. FHWA-RD-75-S0418, June 1975

Contract D-4-140

ACKNOWLEDGMENT: Federal Highway Administration (S-0418)

PURCHASE FROM: NTIS Repr. PC

3A 130627

HOW UNDERGROUND SPACE USE STARTED IN THE KANSAS CITY AREA

The recognition of the importance of subsurface openings, and their transformation through innovation in building systems and construction methods, into outstanding developments of two-tier space occupancy are described. The first underground storage facility for perishable goods was that developed in 1944 from a mine. Freezer space was developed for in-transit goods in 1946 and 1953. In 1959, a 44-acre site called "Downtown Industrial Park" was developed from a surface quarry. This development began on the surface over the first shaft-type mine in Kansas City. The shaft went down some 60 feet from the edge of a railroad to reach Bethany Falls. This site is now 106 acres site or built or under construction. The biggest problem encountered after overcoming the legal hurdles of splitting the fee and developing at two different levels of the same property, is that of the building codes. The importance of the connection between underground space development and civil defense is pointed out.

Published in the Proceedings of the Symposium on the Development and Utilization of Underground Space, March 5-7, 1975, Kansas City, Mo., sponsored by the Department of Geosciences, University of Missouri, Kansas City.

Dean, I. (Dean Equipment Company)

National Science Foundation Proceedings Mar. 1975, pp 25-28

3A 130771

EMISSIONS FROM FARM, CONSTRUCTION AND INDUSTRIAL ENGINES

Besides the automobile powerplant, other internal combustion engines, such as farm, construction and industrial types, contribute to national pollution. An estimate is given of how much exhaust emissions they actually contribute, and how their emissions compare to those from other sources. /GMRL/

*Automotive Engineering* Vol. 83 SAE #750788, Sept. 1975, 3 pp

3A 200206

HIGHWAY PAVING: WHICH WILL IT BE ASPHALT OR CONCRETE?

SOME OF THE VARIABLES INVOLVED IN THE NECESSARY DECISION-MAKING FOR ASPHALT OR CONCRETE HIGHWAY PAVEMENTS ARE DISCUSSED. IT IS POINTED OUT THAT EVEN WHEN COMPARATIVE FIGURES ARE AVAILABLE, THE CIRCUMSTANCES AND CONDITIONS UNDER WHICH A ROAD IS BUILT MAY BE SO SPECIALIZED THAT THE RESULTS CANNOT BE SAFELY GENERALIZED TO APPLY EVERYWHERE. COSTS VARY CONSTANTLY FROM AREA TO AREA & ARE DEPENDENT ON THE LOGISTICS OF SUPPLY, THE PRICE OF AGGREGATE, STEEL, LABOR & OTHER ELEMENTS IN THE POTENTIAL BID PRICE. THE TYPE & VOLUME OF TRAFFIC TO BE CARRIED WILL AFFECT THE THICKNESS OF THE PAVEMENT REQUIRED TO SUPPORT IT EFFICIENTLY AND ECONOMICALLY. COST PER MILE FIGURES ARE AFFECTED BY THE DEGREE OF CONTRACTOR INTEREST IN A JOB, THE EXTENT OF HIS EXPERIENCE, CLIMATE, THE TYPE, CONDITIONS, AVAILABILITY AND PROXIMITY OF MACHINERY AND EQUIPMENT AND ESTIMATED MAINTENANCE COSTS. IT IS CONCLUDED THAT THE INFLATIONARY SPIRAL, SHORTAGE OF MATERIALS, NEW DEVELOPMENTS IN MACHINERY, METHODS AND DESIGN CALL FOR AN OPEN MIND AND AN ALMOST DAILY REAPPRAISAL OF THE FACTORS WHICH INFLUENCE DECISION MAKING.

World Construction Apr. 1968

3A 200343

IN SERVICE TRAINING MANUAL FOR PROJECT ENGINEERS' AND C PROJECT SUPERVISORS' WORKSHOP

CONSTRUCTION EQUIPMENT AND METHODS

STEEL, T. E. LEWIS, M. M. PORTER BRIDGE CONSTRUCTION SLIDES GRAPHICAL LAYOUT M. M. PORTER EARTHWORK IBM CODING, J. BELLINGER

Indiana State Highway Commission 54 pp. Feb. 1969

3A 200420

STATISTICAL SPECIFICATIONS IN BITUMINOUS CONCRETE HIGHWAY CONSTRUCTION

THE MATERIALS FOR STATISTICALY ORIENTED ACCEPTANCE PLANS BY HIGHWAY DEPARTMENTS, AND FOR CONTROL PROCEDURES BY CONTRACTORS IS EVIDENT IN THE INCREASED DISCUSSION GIVEN THESE MATTERS IN HIGHWAY-ORIENTED MEETINGS FROM COAST TO COAST. ALTHOUGH SOME STATISTICAL SPECIFICATIONS ARE USED IN THE HIGHWAY INDUSTRY AT PRESENT, MANY MORE ARE NEEDED. THE DELAY IN ADOPTING THESE PROCEDURES HAS STEMMED FROM A RELUCTANCE ON THE PART OF HIGHWAY AGENCIES, BOTH FEDERAL AND STATE, TO PART WITH THEIR TRADITIONAL METHODS AND THE RELUCTANCE OF CONTRACTORS TO UNDERTAKE CONTROL OF THEIR OWN PROCESSES. THE STEPS BEING TAKEN BY MOST HIGHWAY AGENCIES IN IMPLEMENTING STATISTICAL SPECIFICATIONS AS WELL AS MOST OF THE IMPORTANT ITEMS IN ASPHALTIC CONCRETE SPECIFICATIONS ARE MENTIONED. /AUTHOR/

Hughes, CS Materials Research and Standards Oct. 1970

3A 200658

THE GREATEST ROAD CONSTRUCTION CONTRACT IN THE NORDIC COUNTRIES. FINLAND IS CONSTRUCTING WITH SWEDISH ASSISTANCE

THIS IS A REPORT ON THE MOTORWAY PROJECT BETWEEN HELSINKI AND LAHTI IN FINLAND; THE MOTORWAY COVERS A DISTANCE OF 100 KILOMETERS. MANY SWEDISH COMPANIES ARE ENGAGED IN THE DESIGN AND CONSTRUCTION OF THE PROJECT, AND TECHNICAL SOLUTIONS USED IN SWEDEN ARE NOW BEING INTRODUCED, E.G., A BRIDGE CONSTRUCTION METHOD AT KORS, JOKIVARSI. THE LOAD-BEARING STEM OF THE MOLD CONCRETE PLANT OF A 42 METER-LONG MOULD ELEMENT WHICH IS HYDRAULICALLY CONTROLLED. SINCE THE DISTANCE BETWEEN TWO PIERS IS 20 METERS, IT IS POSSIBLE TO LET THE MOULD ELEMENT ADVANCE 40 METERS AT A TIME. /TRRL/

Byggnadsindustrin, Stockholm /Sweden/ Vol. u2 N No. 6, 1972, pp 11-2, 2 Fig. 4 Phot

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/IRRD 205 163, 2CI1235924

3A 200687

ONTARIO TO TRAIN EQUIPMENT OPERATORS

THE ONTARIO ROAD BUILDERS ASSOCIATION /ORBA/ IN COOPERATION WITH THE PROVINCIAL DEPARTMENT OF EDUCATION IS INVESTING ABOUT $1 MILLION TO ESTABLISH A TRAINING SCHOOL FOR OPERATORS OF HEAVY EQUIPMENT. VARIOUS EQUIPMENT DEALERS WILL DONATE SOME EQUIPMENT AND A NUMBER OF OIL COMPANIES ARE DONATING FACILITIES TO SERVICE THE EQUIPMENT. THE PROVINCIAL INSTITUTE OF TRADES AND OCCUPATIONS WILL OPERATE THE SCHOOL, WHICH WILL BE LOCATED NEAR GORGETOWN, ABOUT 28 MILES NORTHWEST OF METROPOLITAN TORONTO ON LAND MADE AVAILABLE BY THE ORBA. THE COURSES ARE DESIGNED TO UPDATE AND RETRAIN PEOPLE REFERRED TO THE SCHOOL BY INDUSTRY AND ALSO PROVIDE RETRAINING FOR UNEMPLOYED PERSONS UNDER A FEDERAL-PROVINCIAL TECHNICAL AND VOCATIONAL TRAINING AGREEMENT. EACH TRAINEE WILL RECEIVE 10 WEEKS OF INSTRUCTION ON GRADERS, BULLDOZERS, FRONT-END LOADERS, SCRAPERS, HEAVY-DUTY TRUCKS, CRANES AND EXCAVATING EQUIPMENT.

McNevin, G , Heavy Construction News, ASST EDITOR Heavy Construction News /Canada/

3A 200734

EDUCATIONAL NEEDS FOR RIGID PAVEMENT CONSTRUCTION

THE CHANGING PICTURE IN PORTLAND CEMENT CONCRETE PAVEMENT CONSTRUCTION PRACTICES IS PRESENTED AND SOME SUGGESTIONS ARE OFFERED ON NEEDED PROGRAMS OF CONTINUING EDUCATION AND TRAINING. COMMUNICATIONS ARE DISCUSSED AS A TOOL FOR TEACHING A SKILL. THE PORTLAND CEMENT ASSOCIATION, NATIONAL READY MIX CONCRETE ASSOCIATION AND THE AMERICAN CONCRETE INSTITUTE ARE WORKING WITH THE DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE TO DEVELOP A 2-YEAR CURRICULUM AND MATERIALS FOR TRAINING WORKERS IN CONCRETE TECHNOLOGY AND VARIOUS JOB CLASSIFICATIONS. THE FIRST PHASE OF THE PROGRAM IS INTENDED TO: (1) PROVIDE COURSE CONTENT AND TEACHING GUIDES FOR AN AREA OF VOCATIONAL EDUCATION WHERE NO SUCH TRAINING EXISTS, (2) BROADEN EMPLOYMENT OPPORTUNITIES IN AN EXPANDING INDUSTRY FOR NON-ACADEMIC POST HIGH SCHOOL YOUTH, (3) PROVIDE A BASIS FOR IN-SERVICE JOB UPGRADING AND OTHER ADULT VOCATIONAL EDUCATION PROGRAMS, (4) REDUCE A CRITICAL SHORTAGE OF SKILLED MANPOWER IN THE GROWING CEMENT AND CONCRETE INDUSTRIES, (5) PROVIDE NEW AIDS FOR EMPLOYERS FOR PERSONS FROM SOCIALLY OR ECONOMICALLY DISADVANTAGED GROUPS, AND (6) INITIATE VOCATIONAL EDUCATION TRAINING PROGRAMS TO FILL THE MANPOWER NEEDS OF THE CEMENT AND CONCRETE INDUSTRIES. THE SECOND PHASE OF THE PROGRAM WILL BE A 2-YEAR PILOT PROGRAM TO PROVIDE THROUGH FIELD TESTS THE LEVEL OF TRAINING FOR WHICH THE BASIC CURRICULUM IS DESIGNED. AN ADAPTATION OF CURRICULUM MATERIALS DEVELOPED IN THE FIRST PHASE FOR OTHER LEVELS OF VOCATIONAL EDUCATION AND FOR TRAINING PROGRAMS FOR SPECIFIC OCCUPATIONS WILL BE ACCOMPLISHED IN THE THIRD PHASE. IT IS ADVISED THAT THERE ARE NEEDS FOR SEVERAL KINDS OF EFFORTS IN CONTINUING EDUCATION FOR BETTER BUILDING OF PORTLAND CEMENT CONCRETE PAVEMENTS. SUGGESTIONS ARE FOR BETTER QUALITY CONSTRUCTION AND GOOD GEOMETRIC DESIGN ARE NECESSARY TO ENSURE TRAFFIC SAFETY AND PAVEMENT SERVICEABILITY. /CGRA/

Hughes, CS Materials Research and Standards Oct. 1970

3A 201267

THE COST OF DOING VERSUS THE COST OF NOT DOING

A SERIES OF FOUR ARTICLES, EXPRESSING THE OPINIONS OF A MANAGER, AN ELECTED OFFICIAL, A ROADS SUPERINTENDENT AND A CONSULTING ENGINEER ON THE VALUES OF ROAD RECONSTRUCTION AGAINST THAT OF MAINTAINING OUTDATED SYSTEMS. THERE IS AGREEMENT THAT SAVINGS ARE TO BE REALIZED FROM RECONSTRUCTION, BUT FINANCIAL REQUIREMENTS MUST BE EVALUATED IN A GOOD TRANSPORTATION PLAN. QUALITY CONSTRUCTION AND GOOD GEOMETRIC DESIGN ARE NECESSARY TO ENSURE TRAFFIC SAFETY AND PAVEMENT SERVICEABILITY. /CGRA/


3A 201772

OPTIMUM LIFE OF EQUIPMENT FOR MAXIMUM PROFIT

A GROUP OF EQUATIONS IS DEVELOPED IN THIS PAPER TO STIMULATE THE COSTS OF OWNING, MAINTAINING, AND OPERATING CONSTRUCTION EQUIPMENT. BY MANIPULATING THE VARIABLES IN THESE EQUATIONS, THE DECISION-MAKER IS ABLE TO CONFIRM QUANTITATIVELY THE DECISIONS HE MUST MAKE WHICH INVOLVE THE ECONOMIC LIFE OF HIS EQUIPMENT. THE ECONOMIC LIFE OF A PIECE OF EQUIPMENT IS DEFINED AS THAT LIFE WHICH MAXIMIZES
CONSTRUCTION EQUIPMENT AND METHODS

THE RETURN TO THE OWNER DURING THE LIFE OF HIS ENTERPRISE IN MAKING DECISIONS ABOUT EQUIPMENT POLICY, MODERN ECONOMIC ENVIRONMENT DICTATES A CONSIDERATION OF AT LEAST THE FOLLOWING BASIC CONCEPTS: (1) TIME VALUE OF MONEY; (2) INFLUENCE OF INFLATION; (3) INCREASED COST OF BORROWING MONEY; (6) CONTINUING REPLACEMENTS IN THE FUTURE; AND (7) INCREASED COST OF FUTURE MACHINES. ALL OF THESE CONCEPTS ARE INCLUDED IN THE MODEL WHICH IS DESCRIBED. /AUTHOR/


ACKNOWLEDGMENT: Traffic Systems Reviews & Abstracts

3A 203622

MODULAR SYSTEMS FOR SHORE PROTECTION

MODULAR CONSTRUCTION AS IT IS USED IN PROTECTING THE SHORE BY CHECKING EROSION AND PROTECTING BEACHES FROM WAVE DAMAGE, IS DISCUSSED WITH RESPECT TO INTERLOCKING REVETMENTS, REVETMENT MATTEMS, PRECAST PERMEABLE GROIN, PERFORATED BREAKWATER, AND POLYPADS. INTERLOCKING REVETMENTS CONSIST OF PRECAST CONCRETE SECTIONS THAT INTERLOCK IN NUMEROUS ARRAYS. THE REVETMENT AN ANGLE OF APPROXIMATELY 45 DEGREES. REVETMENT MATTEMS ARE USUALLY OF NYLON, SECIONALIZED AND THEN FILLED WITH A FINE AGGREGATE CONCRETE OR MORTAR. THE PRECAST PERMEABLE GROIN--A 30 X 6 X 5' PERFORATED PRECAST CONCRETE BOX WITH 6" REINFORCED CONCRETE WALLS AND PERFORATIONS OVER THE SIDE WALLS--IS DESIGNED TO RETARD ONLY A SMALL PERCENTAGE OF THE LITTORAL DRIFT. A PERFORATED BREAKWATER STRUCTURE-SERVING AS A WHARP TOO-UTILIZED THE HOLES ON THE SEAWARD SIDE OF THE BREAKWATER TO DISSIPATE WAVE ENERGY. POLYPADS ARE NOTHING MORE THAN LARGE PRECAST CONCRETE STRUCTURES USUALLY INTERLOCKING IN A VARIETY OF SHAPES DESIGNED FOR THE PURPOSE OF PROTECTING THE SHORE AND USED WHEREVER THERE IS HEAVY WAVE ACTION OR IN BREAKWATERS.

Wilder, CR Koller, ER Civil Engineering Ace Oct. 1971

3A 203638

PREFABRICATED HIGHWAYS

TO FACILITATE MORE EFFICIENT AND ECONOMICAL WAYS OF BUILDING AND BUILDING ROADS AND BRIDGES IN URBAN AREAS THAT ARE SUBJECT TO BOTH CONSTRUCTION TIME RESTRICTIONS AND HIGH RATES OF CHANGE, SEVERAL NEW METHODS OF CONSTRUCTION ARE DESCRIBED. PRECAST CONCRETE COMPONENTS ARE POST-TENSIONED TOGETHER BY STANDARD OR SPECIAL TEFON COATED TENDONS A NUMBER OF HIGHWAY BRIDGES UTILIZING SUCH CONSTRUCTION TECHNIQUES HAVE ALREADY BEEN BUILT, BUT ONLY A FEW EXPERIMENTAL HIGHWAY PAVEMENTS HAVE BEEN TRIED TO DATE. A NEW TECHNIQUE DESCRIBED BY STITCHING PAVEMENT SLABS TOGETHER WITH CURVED TENDONS SHOULD EXPEDITE THE GREATER USE OF PREFABRICATED ROADS. ALSO MENTIONED ARE NEW METHODS OF USING PREFABRICATED FOOTING AND FOUNDATIONS, PARTICULARLY FOR BRIDGE CONSTRUCTION. /AUTHOR/


3A 203651

GEOTECHNICAL PROJECT AND QUALITY CONTROL OF HIGHWAY CONSTRUCTION IN AN ISLAND /IN PORTUGUESE/

THIS PROJECT CONCERNS THE BEHAVIOR OF PAVEMENTS CONSTRUCTED BY NON-STANDARD TECHNIQUES NECESSITATED BY DIFFICULTIES IN OBTAINING MATERIALS ON ITAPARICA ISLAND (BAHIA STATE). THE TWO METHODS EMPLOYED WERE THE USE OF FINE AGGREGATES AND CATIONIC EMULSIONS FOR COLD-MIX ASPHALT SURFACING AND THE APPLICATION OF TECHNIQUES TO AVOID THE INCONVENIENCES ASSOCIATED WITH THE USE OF ‘MASSAPE’ CLAYEY SOILS IN EARTHWORKS.

Tavares, NETO P Road Research Institute /Brazil/ 1971

ACKNOWLEDGMENT: Road Research Institute /Brazil/

3A 203969

FLEXIBLE CULVERTS UNDER HIGH FILLS-EQUILIBRIUM CONSIDERATIONS

THIS REPORT ON LOADS ON FLEXIBLE CULVERTS ON HIGH FILLS CONSIDERS ONLY EQUILIBRIUM STATES OF THE FLEXIBLE CULVERT AND IGNORES THE PROBLEM OF BUCKLING. IT IS ESSENTIALLY A REFINEMENT OF AN EARLIER ANALYSIS BY THE SAME AUTHORS OF RIGID PIPE. COMPARISONS WERE MADE WITH FIELD TEST RESULTS AND STATEMENTS ABOUT THE EFFECTS OF CONSTRUCTION METHODS, CULVERT RIGIDITY AND BASE MATERIAL WERE POSSIBLE. THE AUTHORS CONCLUDE THAT THE FINAL PRESSURE DISTRIBUTION COULD BE GRAVELY AFFECTED BY THE INITIAL CONFIGURATION AND ITS SUBSEQUENT MOTION. /BPR/

Brown, CB Green, DR Pawsey, SF California University, Berkeley, California Division Highways, California Department Public Works June 1967

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (6-467)1C6302055, PB 176 175, 1C23021042

3A 203985

BEHAVIOR OF THE REBUILT WOLF CREEK CULVERT


Willett, GA Schreer, AC Montana State University, Bureau of Public Roads /US/ 1968

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4615174 68)PB 179 884, PB 183 693, 1C23021404

3A 204378

STRUCTURAL ANALYSIS AND DESIGN OF PIPE CULVERTS

GENERALLY ACCEPTED METHODS FOR THE STRUCTURAL DESIGN OF PIPE CULVERTS REQUIRE DETERMINATION OF THE MAGNITUDE AND DISTRIBUTION OF LOADING AND SELECTION OF A READILY AVAILABLE RIGID (CONCRETE) OR FLEXIBLE (CORRUGATED METAL) CULVERT COMPATIBLE WITH THE LOADING. ALTHOUGH THE MARSTON-SPANGLER AND THE MORE RECENTLY DEVELOPED RING COMPRESSION THEORIES ARE CURRENTLY BEING USED EXTENSIVELY AS A BASIS FOR DESIGNING BURIED CONDUITS, A GREAT DEAL OF ENGINEERING JUDGMENT IS INVOLVED IN APPLYING THESE LOAD DETERMINATION PROCEDURES, PARTICULARLY IN
THE CASE OF RIGID CULVERTS, IN ADDITION, DURABILITY AND HANDLING PROBLEMS, WHICH ARE FREQUENTLY CRITICAL IN THE CASE OF FLEXIBLE CULVERTS, REQUIRE THE EXERCISE OF CONSIDERABLE ENGINEERING JUDGMENT. ONE OF THE MAJOR UNCERTAINTIES FACED BY THE PRESENT-DAY DESIGNER IS ASSOCIATED WITH THE APPROPRIATE USE OF DESIGN METHODS IN THE CASE OF FLEXIBLE CULVERTS, TOGETHER WITH THE DIFFICULTY OF SPECIFYING A GENERALLY ACCEPTABLE FAILURE CRITERION, MAKES THE SELECTION OF A SUITABLE SAFETY FACTOR EXTREMELY COMPLICATED. PERHAPS THE MOST IMPORTANT REASONS THAT DICTATE THE NEED FOR AN EVALUATION OF CURRENT DESIGN PRACTICES FOR RIGID AND FLEXIBLE CULVERTS ARE THE FOLLOWING: (1) THERE IS A SERIOUS CONCERN ABOUT THE ROLE OF POWER IN CURRENTLY USED THEORETICAL RELATIONSHIPS AND FIELD EXPERIENCE TO THE LARGER DIAMETER PIPES AND HIGHER FILLS INTO USE; (2) WITH CULVERT-SIZE HIGHWAY DRAINAGE STRUCTURES RESULTING IN AN EXPENDITURE OF ABOUT $500,000,000 ANNUALLY, THE POSSIBILITY OF OVERCONSERVATISM IN CULVERT DESIGN SHOULD BE EXPLORED, AND (3) CURRENT METHODS USED IN THE DESIGN OF PIPE CULVERTS FAIL TO REFLECT IN A RATIONAL WAY MANY OF THE FACTORS THAT INFLUENCE BEHAVIOR IN THE FIELD (FOR EXAMPLE, A BETTER UNDERSTANDING OF SOIL-PIPE INTERACTION IS NEEDED TO FURTHER DEVELOPMENT OF INTERMEDIATE-STIFFNESS PIPES MADE OF DIFFERENT MATERIALS, SUCH AS PLASTICS). EMPHASIS DURING THE STUDY WAS PLACED ON INVESTIGATION OF THE EFFECTIVENESS OF CURRENTLY USED DESIGN PROCEDURES, WITH MODIFICATIONS AND IMPROVEMENTS, ARE SATISFACTORY FOR CONTINUED JUDICIOUS USE, (2) IMPROVEMENTS TO METHODS FOR SELECTING SOME OF THE MORE IMPORTANT MATERIAL PROPERTIES USED IN EXISTING DESIGN METHODS; (3) DETERMINATION OF CONDITIONS FOR WHICH DIFFERENT APPROACHES SHOULD BE DEVELOPED; AND (4) RECOMMENDATIONS FOR LONG-RANGE RESEARCH NEEDS. FROM THE DESIGNERS' STANDPOINT, A MOST IMPORTANT FINDING IS THAT DURABILITY, HANDLING, AND CONSTRUCTION CONSIDERATIONS ARE MUCH MORE SIGNIFICANT THAN STRUCTURAL DESIGN PARAMETERS WHEN SELECTING A SUITABLE GENERALLY AVAILABLE PIPE CULVERT FOR CASES INVOLVING SMALL PIPES TO BE PLACED UNDER SHALLOW-TO-MODERATE FILLS. CURRENTLY USED EMPirical DESIGN PROCEDURES APPEAR ADEQUATE FOR THE MAJORITY OF THESE CASES MORE COMPLEX ANALYSIS AND DESIGN PROCEDURES SHOULD BE EMPLOYED WHEN LARGE-DIAMETER PIPES ARE TO BE USED, AND THERE IS A VITAL NEED FOR EXTENSIVE RESEARCH IN THE AREA OF EXTRA LARGE PIPES, PIPE ARCHES, AND OTHER THAN ROUND SHAPES. ALSO, THERE IS A NEED TO INVESTIGATE MORE FULLY THE EFFECT OF HEAVY CONSTRUCTION LOADS ON PIPES UNDER SHALLOW FILLS. /HRB/

Krizek, RJ Parmelee, RA Kay, JN Elnaggar, HA /Highway Research Board Travel Reports 1971

HRIS 23 218259, IP23218258

3A 205294

FROST CONSIDERATION IN HIGHWAY PAVEMENT DESIGN

WEST-CENTRAL UNITED STATES-AND DISCUSSION

THE WEST-CENTRAL UNITED STATES AREA INvolves regions of varies climates and topography, ranging from the forest and lake region of northern Minnesota through the vast plains and lowlands to the Ozarks in Missouri and Arkansas. It can generally be subdivided into three physiographic provinces-the Great Plains, central lowlands, and the Ozark plateau region. There were no significant frost problems in the souther portion of the West-Central states other than the deterioration of Portland cement concrete which is not discussed. Progressing northward, the best courses for sub-

CONSTRUCTION EQUIPMENT AND METHODS 3A

GRADE SOILS BECAME SUCCESSFULLY INVOLVED IN FROST ACTION RESULTING IN MORE NUMEROUS DEEP SEATED PROBLEMS. DESIGN AND CONSTRUCTION PRACTICES USED IN SEVERAL FROST AREAS CANNOT BE APPLIED IN LESS SEVERE AREAS WITHOUT ADJUSTING TO LOCAL CONDITIONS. GENERAL FROST DESIGN PRACTICES ARE EFFECTIVE IN MINIMIZING SOME OF THE PROBLEMS. A FEW ARE NOT FULLY SOLVED AND IMPROVEMENTS ARE POSSIBLE IN THE AREA OF BASE DESIGN FOR RIGID AND FLEXIBLE PAVEMENTS, CULVERT PLACEMENT, AND A NUMBER OF OTHERS. THE GREATEST ADVANCES HAVE BEEN MADE IN SOLVING SUBGRADE AND BASE PROBLEMS THROUGH IMPROVED DESIGN, GRADING AND BASE CONSTRUCTION PROCEDURES.

Fredrickson, FC McDonald, EB /Highway Research Record, Hwy Res Board 1963

3A 205329

FRICTION STUDIES IN BONDED CEMENT CONCRETE PAVEMENT SLABS

A SMOOTH BASE IS DESIRABLE FOR A PRESTRESSED CONCRETE PAVEMENT SO THAT LOSSES IN PRESTRESS DUE TO FRICTIONAL RESTRAINT AT THE INTERFACE BELOW CAN BE REDUCED TO MINIMUM. IN THE CASE OF NON-PRESTRESSED RIGID PAVEMENTS, OPINION IS VARIED REGARDING THE EFFICACY OF A SMOOTH BASE. IN INDIAN HIGHWAY PRACTICE, WHERE THE STAGE CONSTRUCTION METHOD IS COMMON, THE CONCRETE SLAB IS BONDED TO A WELL CONSOLIDATED WATER-BOUND MACADAM BASE BELOW. THIS BONDING INCREASES THE EFFECTIVE THICKNESS OF THE SLAB. FURTHERMORE, THE FORCE OF ADHESION AT THE INTERFACE IS EXTREMELY HIGH AND IN THE CASE OF RESTRAINED CONTRACTION OF THE SLAB, THE FAILURE TAKES PLACE WELL INSIDE THE BASE AND THE SLAB SIMPLY ACTS AS A BONDED SURCHARGE INITIATING THE DEFORMATIONS. IN OTHER WORDS, THE CLASSICAL DRAG THEORY DOES NOT SEEM TO BE VALID FOR BONDED SLABS. /Author/

Venkatathubramanian, V /Highway Research Record, Hwy Res Board 1966

3A 205429

A GUIDE TO THE STRUCTURAL DESIGN OF FLEXIBLE AND RIGID PAVEMENTS IN CANADA

THIS DOCUMENT SUGGESTS METHODS FOR THE STRUCTURAL DESIGN OF CONVENTIONAL FLEXIBLE AND RIGID PAVEMENTS FOR ROADS WITH RURAL CROSS-SECTIONS WHICH WILL, WITHIN 10 YEARS AFTER CONSTRUCTION, HAVE ANNUAL AVERAGE DAILY TRAFFIC VOLUMES PER LANE OF 1,000 OR MORE VEHICLES INCLUDING 10 PERCENT OR MORE TRUCKS AND BUSES. THE DESIGN PROCEDURES ARE BASED UPON THE RESULTS OF A 7-YEAR PROGRAM OF RESEARCH ON THE PERFORMANCE OF THOUSANDS OF SECTIONS OF PAVEMENTS OF VARIOUS DESIGNS IN THE PRIMARY HIGHWAYS IN ALL PROVINCES OF CANADA, SUPPLIMATED WITH DATA FROM OTHER SOURCES SUCH AS THE AASHO ROAD TEST. THE FLEXIBLE PAVEMENT DESIGN PROCEDURE IS BASED ON LIMITING VALUES OF PAVEMENT SURFACE BENKEIiAN BEAM REBOUND. THE RIGID PAVEMENT DESIGN RECOMMENDATIONS ARE BASED UPON DESIGNS WHICH ARE CURRENTLY BEING USED WITH SUCCESS IN CANADA. THE GUIDE CONTAINS STANDARD PROCEDURES FOR MEASURING BENKELMAN BEAM REBOUND, FOR ESTIMATING THE STRENGTH OF A SECTION OF FLEXIBLE PAVEMENT AND FOR DETERMINING THE PRESENT PERFORMANCE RATING. EXAMPLES OF DESIGN AND CONSTRUCTION PRACTICE ARE GIVEN IN THE GUIDE, EQUAL ATTENTION IS GIVEN TO CONSTRUCTION CONTROL. EVIDENCE INDICATES THAT THE UNIFORMITY OF CONSTRUCTION IS THE PRIMARY VARIABLE CONTROLLING PAVEMENT PERFORMANCE. /CGRA/

Canadian Good Roads Association

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3A 205464
Cement-Treated Subbase Practice in U.S. and Canada

In areas where granular materials meeting subbase specifications are scarce, cement-treated subbases often provide an economical solution. Besides preventing erosion caused by pumping, cement-treated subbase can use inexpensive substandard granular materials and can provide a stable, water-resistant working base for the contractor. Use of thinner concrete slab is important resulting in improved pavement performance. History and development of cement-treated subbases, now used in 31 states and provinces, is presented. Details are included on suggested criteria for granular materials and cement requirements, on design and performance of experimental projects, on structural properties, on construction methods used for fine-grading, and on performance of projects in service.


3A 205471
Layered System Design as Applied to Concrete Pavements

Concrete pavement preconditioned and prestressed layered system performances under wheel loads are predetermined not only by the strength properties incorporated in the layers by construction procedures, but more importantly by the confining influences of the rigid concrete layer on the other layers and by the shearing continuity incorporated between layers. The fundamental performance of concrete pavements in contact with concrete pavement systems are treated in detail in order to provide essential bases for understanding and judgements regarding the effectiveness of (1) the reinforcing action and load spreading capacity, (2) the stress reducing influence of the pavement system on the vertical stresses imposed in the supporting subgrade, and (3) the capacity of concrete pavement systems to resist tensile stresses and shear stresses in regions which are vulnerable to breakdown by bending and shear deformations. The principal problems of design and construction of concrete pavement systems are (1) to limit accumulated pavement settlements, (2) to ensure the pavement structure against cracking and breakdown, and (3) to increase the life of the pavement structure. Design of multi-layer concrete pavement systems to satisfy these requirements involves the determination of the number of layers, the determination of their tensile strengths, shear strengths and E-values, and the evaluation of thickness requirements for these layers. The problems of design and construction to meet these requirements are treated and illustrated. Recommendations are made for construction methods and procedure sequence to attain satisfactory performances and long life of concrete pavements.

Burmister, DM. *New Mexico University* 1963

3A 205497
Asphalt Pavement Engineering

Complete information is given on all types of asphalt pavements-including the latest design criteria and construction methods-so that the reader will be able to design an asphalt pavement for any loading or traffic situation. The most recent recommendations of the National Asphalt Pavement Association, the Asphalt Institute, and state highway departments are included to assist the reader in making design decisions. Special features include performance data as related to pavement structure thicknesses for a complete range of repetitive loadings, an economical and proven method of extending the useful life of asphaltic concrete pavements by an emulsion of oils and resins, and a discussion of the effect of the chemical composition of asphalt cements upon quality and durability. Performance and design by the asphaltene distribution parameter, the book describes the various types of asphalt pavements and gives specifications for them. It discusses the production gradation, and quality of mineral aggregates used in the various types of asphalt pavements and describes the necessary properties of an asphalt concrete mixture. It describes and illustrates in detail design procedures and construction methods for specific paving situations. Many useful tables and a series of design problems covering all types of asphalt pavements are included. /Author/

Wallace, HA. Martin, JR. *Mcgraw Hill Book Company* 351 pp, 1967

3A 205502
Laboratory Tests with a Heavy-Duty Rolling Load Machine

This paper describes a high-capacity rolling load testing machine and the results of tests performed with it over the last three years at West Virginia University. The testing machine is being used for the evaluation of basecourse materials in a simulated highway. Considerable economy in road and highway construction could be realized in West Virginia if some construction method were devised that would utilize the state's abundant and well-distributed supply of sandstone. The best evaluation would come from highways constructed of such materials, an evaluation expensive in both time and money. A properly designed rolling load testing machine, along with a carefully planned testing program, might reduce the cost in both aspects. Opinion as to the usefulness of rolling load machines or test tracks over the past several years has been divided. One machine has been abandoned while another very large machine has been constructed recently at Washington State University. Circular tracks are in use at the University of Illinois and at the American Oil Company in Whiting, Indiana. /Author/

Haynes, RR. Worrell, DT. *Highway Research Record, Hwy Res Board* 1967

3A 205536
Surfacing Courses-Norway

Thin wearing courses are discussed and divided into three groups: (1) very thin wearing courses acting as a kind of improved dust-layer, (2) permanent or semi-permanent wearing courses, and (3) temporary wearing courses on heavily trafficked roads. Many kinds of dust-preventing procedures were tried. One common method is to spread a bituminous binder with the aim of penetrating the surface and binding the dust. This method has often failed because the binder has not created a crust strong enough to stand the traffic. It is recommended that the binder contain amine and the gravel must have a suitable grading curve including a wanted amount of filler, resulting in a dense, durable crust or carpet. An experimental road was constructed to attempt to determine a construction method to secure the constant, projected quantity of binder.
AND MINERAL AGGREGATES ON EACH SQUARE FEET. THE PERMANENT WEARING COURSES COMPRISED SURFACE COURSES OF A THICKNESS FROM ABOUT 2.5 TO 4 CM. THE BASE MUST HAVE SUFFICIENT BEARING CAPACITY AND CONSIST OF EITHER GRAVEL OR CRUSHED ROCK, MECHANICALLY STABILIZED. TEMPORARY WEARING COURSES ARE THIN-AROUND 3.5 CM THICKNESS. THIS WAS PLACED ON A BASE WHOSE UPPER LAYER CONSISTED OF ASPHALT STABILIZED CRUSHED ROCK, EITHER PENETRATED OR CENTRAL MIXED, AND A THIN LAYER OF LEAN ASPHALT CONCRETE. STAGE CONSTRUCTION IS DISCUSSED BECAUSE OF THE NECESSITY CAUSED BY INCREASING TRAFFIC AND AXLE LOADS.

Brudal, H Perm Intl Assoc Road Congresses Proc 1967

3A 205543
RIGID PAVEMENTS-GREAT BRITAIN
IMPROVED TECHNIQUES FOR USING THE SLIP-FORM PAVING AND CONVENTIONAL PAVING TRAINS ARE DISCUSSED. THE PROTECTION OF THE SUB-GRADE FROM CONSTRUCTION LOADS AND FROM MOISTURE PENETRATION IS USUALLY PROVIDED BY A SUB-BASE OF EITHER A GRANULAR MATERIAL OR LEAN CONCRETE, BUT CEMENT STABILIZED MATERIALS ARE ALSO USED. THE NECESSARY THICKNESS OF THE SUB-BASE IS RELATED TO THE TYPE OF SUB-GRADE, THE SUB-BASE MATERIAL AND THE LOADS OF THE CONSTRUCTIONAL TRAFFIC. GREATER ACCURACY IS NOW ACHIEVED IN THE SHAPING OF THE SUB-BASE BY LAYING THE SUB-BASE MATERIAL WITH WIRE-GUIDED MACHINES AND THIS ACCURACY LEADS TO A REDUCTION IN THE WASTED CONCRETE NEEDED TO MAKE UP IRREGULARITIES IN THE SUB-BASE. THE EMPIRICAL METHOD OF PAVEMENT DESIGN CONTINUES TO BE USED. WITH LITTLE CHANGE IN THE REQUARED JOINT SPACINGS, JOINT ASSEMBLIES HAVE NOW BEEN DEVELOPED WHICH CAN RAPIDLY SET ACCURATELY AND RIGIDLY. EXPERIMENTAL WORK IS BEING CONDUCTED ON TEMPERATURE VARIATIONS IN CONCRETE SLABS. OBSERVATIONS ARE CONTINUED ON THE EXPERIMENTAL PRESTRESSED CONCRETE ROADS AT WINDSOR. ESTABLISHED METHODS OF MIX DESIGN USED ARE EMPIRICAL AND TRIAL MIXES ARE USUALLY MADE TO DETERMINE THE MOST SATISFACTORY MIX TO BE USED. THE SURFACE TEXTURE OF A CONCRETE ROAD IS APPLIED BY BRUSHING THE SURFACE IN A TRANSVERSE DIRECTION AND TESTS HAVE BEEN DEVELOPED WHICH MAKE IT POSSIBLE TO ASSESS THE SKIDDING RESISTANCE PROPERTIES OF THE APPLIED TEXTURE. A RE-ASSESSMENT OF DESIGN MADE OF CONSTRUCTION TECHNIQUES USED ON MINOR ROADS. AIR ENTRAINING AGENTS ARE USED TO PROVIDE RESISTANCE TO FROST AND DE-ICING SALT.

Sharp, DR Perm Intl Assoc Road Congresses Proc 1967

3A 205544
CONCRETE SLABS AND USE OF ADMIXTURES TO IMPROVE THE QUALITY OF CONCRETE-ITALY
THE THICKNESS OF CONCRETE SURFACINGS IS VARIABLE IN ITALY, VARYING FROM 15 TO 22 CM. REINFORCEMENT STUDIES ARE BEING CONDUCTED TO INCREASE THE RESISTANCE OF CONCRETE IN BENDING AND IN TENSION. LABORATORY TESTS ARE USED IN RESEARCHING THE EFFECT OF THE ADDITION OF THIN STEEL PIANO WIRES. EXPERIMENTAL PAVEMENT SECTIONS HAVE BEEN CONSTRUCTED WITH REINFORCEMENT CONSISTING OF METALLIC MESH. THE FUNCTION OF THE MESH IS TO PREVENT THE ENLARGEMENT OF CRACKS AND CRACKS WHICH OCCUR IN THE SLABS. TRANSVERSE JOINTS WERE CONSTRUCTED BY INSERTING A THIN PLANK OF TIMBER INTO THE CONCRETE. AFTER THE PASSAGE OF THE FINISHER THE UPPER LAYER OF THE CONCRETE IS CUT AND THE PLANK IS REMOVED. CONCRETE SLABS AFFECTED BY THERMAL ATMOSPHERIC VARIATIONS ARE SUBJECTED TO EXPANSIONS AND CONTRACTIONS. DISPLACEMENT OF THE ARRISES RESULTS FROM THOSE WHICH ARE NOT CONCORDANT. THE MATERIAL FOR FILLING THE JOINTS MUST BE WATERTIGHT TO PREVENT THE INFILTRATION OF WATER. MASTICS FROM TAR PITCH AND A CERTAIN QUANTITY OF ASPHAGTS FIBRE ARE USED ON AIRPORT RUNWAYS AND ARE RESISTANT TO THE ACTION OF FUELS. SYSTEMATIC STUDIES OF THE VARIATION OF TEMPERATURE WITHIN THE CONCRETE SLABS WERE CONDUCTED WITH THERMAL ELECTRIC PROBES. GRAPHS SHOW THESE VARIATIONS AND THE PROGRESSIVENESS OF THE INCREASE OF TEMPERATURE IN PROPORTION TO THE REDUCTION IN THICKNESS OF THE SLAB, AS WELL AS THE INFLUENCE OF THE SURFACE. THE ADDITION OF SYNOPAL TO BITUMINIZED HIGHWAYS IS RECOMMENDED FOR BETTER VISIBILITY. EXPERIMENTAL WORK IS CONDUCTED ON PRESTRESSED SLABS TO ELIMINATE TRANSVERSE JOINTS. THE USE OF ENTRAINMENT AGENTS TO INCREASE THE RESISTANCE OF CONCRETE TO THE ACTION OF FREEZING AND THAWING IS DISCUSSED. ADDITIVES WHICH ACT AS PLASTICIZERS THEREBY INCREASING MECHANICAL STRENGTH OR PREVENTING ITS REDUCTION AND SET RETARDERS ARE ANALYZED.


3A 205653
DEVELOPMENTS IN THE APPLICATION IN PRACTICE OF A FUNDAMENTAL PROCEDURE FOR THE DESIGN OF FLEXIBLE PAVEMENTS
THE EVALUATION OF EXISTING PAVEMENTS AND THE DESIGN OF AIRFIELD PAVEMENTS ARE BRIEFLY DISCUSSED FROM THE POINT OF VIEW OF A FUNDAMENTAL DESIGN APPROACH. THE DEVELOPMENT AND THE VALIDITY OF THE APPROACH ARE DISCUSSED IN THE LIGHT OF SUBSEQUENT LABORATORY AND FIELD INVESTIGATIONS. A NEW COMPUTER PROGRAM WHICH GIVES THE PRINCIPAL STRESSES OR STRAINS AT ANY POINT WITHIN A MULTI-LAYER ELASTIC SYSTEM PERMITS CONSIDERATION TO BE GIVEN TO THE INFLUENCE OF MULTI-WHEEL ASSEMBLIES AND TO THE SHEAR STRESSES IN THE VARIOUS STRUCTURAL LAYERS UNDER LOAD. TRENDS, DEDUCED USING ELASTIC THEORY, FOR SURFACE DEFORMATIONS AND THE STRESS DISTRIBUTION IN COMPOSITE CONSTRUCTIONS (INCORPORATING CEMENT BOUND BASE LAYERS) ARE BRIEFLY DISCUSSED. THE FUNDAMENTAL DESIGN APPROACH IS DEFINED AS A PROCEDURE IN WHICH THE THEORETICAL STRESS DISTRIBUTION IN ELASTIC LAYERED SYSTEMS AND THE IN-SITU DYNAMIC PROPERTIES OF THE CONSTRUCTION MATERIALS ARE APPLIED TO THE DESIGN OF PRACTICAL ROAD STRUCTURES. THE DESIGN OF A STRUCTURE IS GAINED BY SELECTING SUITABLE THICKNESSES OF ASPHALT AND UNBOUND GRANULAR MATERIALS SO THAT, UNDER THE DESIGN LOAD, THE CRITICAL STRESSES OR STRAINS DO NOT EXCEED PERMISSIBLE VALUES FOR THE DIFFERENT MATERIALS. THE IN-SITU DYNAMIC MODULI OF THE CONSTRUCTION MATERIALS, AND THE STRESSES OR STRAINS THAT CAN BE PERMITTED TO DEVELOP WITHIN THEM MUST BE KNOWN IN ORDER TO DO THIS. DISCUSSIONS ARE PRESENTED ON DESIGN CURVES FOR SPECIFIED LIFE OF MIXED TRAFFIC LOADINGS, APPLICABILITY OF ELASTIC THEORY TO ROAD BEHAVIOR AND GENERAL CONCEPTS ON DESIGN. THE DISCUSSIONS PRESENTED ON A VARIETY OF ASPECTS OF FLEXIBLE PAVEMENT DESIGN SERVE TO ILLUSTRATE THE COMPLEXITY OF THE PROBLEMS WHICH REMAIN TO BE OVERCOME. THE ELASTIC THEORY EMPLOYED DOES NOT ACCOUNT FOR THE NON-LINEAR BEHAVIOR OF THE MATERIALS USED, YET IT PERMITS RATIONAL GUIDELINES TO BE DEVELOPED. MODIFICATIONS ARE NEEDED CONCERNED WITH THE MAXIMUM SHEAR STRESSES DEVELOPED AT ANY POINT IN THE STRUCTURE. THE MINIMUM SHEAR STRENGTH THEORETICALLY REQUIRED AT ANY POINT IN THE UNBOUND GRANULAR LAYERS CAN NOW BE CALCULATED AND DESIGN CURVES SHOULD BE EXTENDED TO COVER THIS ASPECT.
CONSTRUCTION EQUIPMENT AND METHODS

3A 205573
A SIMPLE GUIDE FOR THE DESIGN OF FLEXIBLE PAVEMENTS USING CRUSHED STONE


Nichols, FP
National Crushed Stone Association
Mar. 1968

3A 205621
PRESTRESSED ROAD SECTION IN A PROVINCIAL HIGHWAY /IN DUTCH/


Cement, Amsterdam /Neth/ Sept. 1968

3A 205660
CONSTRUCTION OF AN EXPERIMENTAL PRESTRESSED CONCRETE ROAD IN BELGIUM /IN DUTCH/


Huijghe, G Wegen /Netherlands/ Vol. 44 No. 11, Nov. 1970, pp 292-98, 5 Fig. 1 Tab. 5 Phot. 3 Ref

3A 205685
PAVEMENT OVERLAYS USING POLYESTER RESIN AND ASPHALT LAMINATES

LAMINATED RESIN AND ASPHALT OVERLAYS ARE DURABLE COATINGS UNDER HEAVY VEHICLES AND WHERE SURFACE TEXTURES ARE REQUIRED. BOTH LARGE AND SMALL PARTICLES CAN BE HELD FIRMLY IN PLACE AGAINST TRAFFIC ABUSE. RUMBLE STRIP DURABILITY SHOWS IMPROVEMENT OVER THE USE OF ASPHALT ALONE. FOR THE MOST PART CONVENTIONAL EQUIPMENT AND PROCEDURES SUFICE FOR CONSTRUCTING THESE NEW SYSTEMS. ALTHOUGH A SPRAY RIG IS NEEDED, COMPONENTS ARE COMMERCIAL AVAILABLE. ALL OF THE EQUIPMENT USED IS PORTABLE, INDEPENDENT OF LARGE CENTRAL PLANTS, AND MAY BE APPLIED IN REMOTE AREAS. INSTALLATION COSTS, THEN, ARE MINIMUM. WHILE THE INITIAL COSTS OF RESINS IS HIGH COMPARED WITH THOSE OF CEMENT AND ASPHALT, THEY HAVE DESIRABLE PROPERTIES THAT NEITHER OF THESE OTHER MATERIALS POSSESS.

Schmidt, RJ Percival, DF Hein, TC Highway Research Board Bulletin 1961

3A 205694
FULL-SCALE ASPHALTIC CONSTRUCTION IN THE RESEARCH LABORATORY

THE BROAD GAP BETWEEN RESEARCH ON ASPHALTIC CONCRETE SPECIMENS PREPARED IN LABORATORY BENCH-TYPE EQUIPMENT AND TEST ROADS OR PUBLIC HIGHWAYS HAS BEEN NARROWED BY PROVIDING FULL-SCALE PAYING EQUIPMENT IN A RESEARCH FACILITY. THIS FACILITY PERMITS ASPHALTIC CONCRETE PAVEMENT CONSTRUCTION UNDER CONDITIONS OF CONTROL WHICH CANNOT BE REACHED IN FIELD OPERATIONS. THE USE OF THIS EQUIPMENT IS DESCRIBED. CONTROLS FOR ALL MAJOR CONSTRUCTION VARIABLES ARE DESCRIBED AND SPECIAL TECHNIQUES ARE DETAILED WHERE APPROPRIATE. METHODS INCLUDE: LARGE-SCALE AGGREGATE HANDLING, SCREENING AND GRADATION BLENDING TO LABORATORY TOLERANCES, REALISTIC DRYING AND MIXING, WITH CLOSE TEMPERATURE CONTROLS, ACCURATE MEASUREMENT AND RECORDING OF HOT-MIX TEMPERATURES THROUGHOUT THE MIXING, PLACING, AND ROLLING CYCLE, CONTROLLED STEEL- AND RUBBER-WHEELED COMPACTION, AND SAMPLING TECHNIQUES FOR EVALUATION TESTS. /AUTHOR/

Schmidt, RJ Highway Research Board Bulletin 1960

Acknowledgement: Road Research Laboratory /UK/

384
3A 205731
DESIGN OF PAVEMENTS USING DEFLECTION EQUATIONS FROM AASHO ROAD TEST RESULTS
THE STRUCTURAL PERFORMANCE OF SOME SATELLITE PAVEMENTS IN THE PIEDMONT REGION OF VIRGINIA AND THICKNESS EQUIVALENCY VALUES WERE EVALUATED OF MATERIALS USED ON THE BASIS OF AASHO ROAD TEST RESULTS. MODEL EQUATIONS SUGGESTED BY THE AASHO ROAD TEST COMMITTEE FOR DESIGNING PAVEMENTS INVOLVE VARIABLES WHICH COULD NOT BE APPLIED TO VIRGINIA SAND. (1) THE TOLERABLE DEFLECTION OF A Pavement Section, (2) Type of Materials Used, (3) Substrate Properties, (4) Environmental Conditions, (5) Type and Duration of Traffic, and (6) Age of Pavement. Twenty projects with varying Pavement structures were chosen for study to evaluate the Thickness Equivalency Values of the Different Materials in the Pavement's Systems, and to Correlate these Values with the Pavement Performance Along with the Variables of Soil Support, Traffic, and Age. Conclusions of the Investigation indicate that: (1) The Structural Performance of the Pavements can be Evaluated from Rebound Deflection or Curvature, or Longitudinal Cross-Sectional Area of the Deflected Basin, Obtained from the Benkelman Beam Data, (2) The Substrate Determined by the Virginia CBR Method Cannot be Correlated with Subgrade Soil Support Values Given by the AASHO Committee, (3) Assuming Thickness Equivalency Value of Asphaltic Concrete as Equal to 1.0, Thickness Equivalency Values Could be Considered for Design in Virginia with the Layers Placed in the Order Structural Performance of a Pavement is a Function of Its Rigidity, and (5) The Method Used in Virginia is Suitable for Design but could be Made More Flexible Using a Nomograph for Thickness Index Determination and a Design Based on Thickness Equivalency Values.

Vaswani, NK Highway Research Record, Hwy Res Board 1968

3A 205772
OPTIMAL DESIGN OF FLEXIBLE PAVEMENT SECTIONS
A SYSTEMS ANALYSIS WAS CONDUCTED TO DEVELOP A RATIONAL METHOD FOR THE OPTIMAL DESIGN OF FLEXIBLE PAVEMENT SECTIONS. THE OPTIMAL COMBINATION OF FLEXIBLE PAVEMENT COMPONENTS MUST MINIMIZE THE TOTAL IN-PLACE COST OF THE PAVEMENT SYSTEM. A DESIGN MODEL WAS CONSTRUCTED CONSISTING OF AN OBJECTIVE FUNCTION AND VARIOUS CONSTRAINT EQUATIONS. THE TOTAL PAVEMENT SYSTEM IS DESCRIBED BY THE VARIOUS DESIGN PARAMETERS WHICH REPRESENT TRAFFIC CONDITIONS, SOIL SUPPORT VALUES, PAVEMENT MATERIAL CHARACTERISTICS, ENVIRONMENTAL EFFECTS, AND PAVEMENT PERFORMANCE REQUIREMENTS. UNIT COSTS OF PAVEMENT COMPONENTS AND ALTERNATE CROSS-SECTION DESIGNS ARE CONSIDERED IN THE SELECTION OF THE OPTIMUM FLEXIBLE PAVEMENT SECTION. THE TOTAL COST OF THE PAVEMENT SYSTEM IS QUANTITATIVELY DESCRIBED BY THE OBJECTIVE FUNCTION, AND THE MINIMUM-COST SOLUTION IS OBTAINED FOR EACH COMBINATION OF ENVIRONMENTAL CONDITIONS. THE MATHEMATICAL DESIGN MODEL WAS SOLVED BY A MODIFIED LINEAR PROGRAMMING TECHNIQUE. THE DESIGN PROCEDURE SPECIFIES A MINIMUM PAVEMENT THICKNESS TO ACCOUNT FOR VARIOUS INFLUENCING ENVIRONMENTAL CONDITIONS. IN ADDITION TO THE TRAFFIC LOADING, SOIL SUPPORT, PAVEMENT PERFORMANCE REQUIREMENTS, AND ENVIRONMENTAL CONSTRAINTS, PRACTICAL LIMITATIONS ON LAYER THICKNESSES ARE SPECIFIED IN CONCURRENCE WITH PRESENT HIGHWAY CONSTRUCTION PRACTICES. THE UNIT COSTS OF THE PAVEMENT COMPONENTS ARE SPECIFIED TO PERMIT THE DESIGN OF AN ACCEPTABLE STRUCTURE FOR THE LEAST COST. THIS COST-EFFECTIVENESS APPROACH SEEMS TO PROVIDE BOTH AN OPTIMAL AND A PRACTICAL SOLUTION TO THE PROBLEM OF FLEXIBLE PAVEMENT DESIGN.

Hejal, SS Yoder, SR Oppenlander, JC Purdue & Ind State Hwy Comm Jbrp Sept. 1969

3A 205797
USE OF EXCESS FINE AGGREGATE IN CONCRETE PAVEMENTS
THE USE OF FINE GRADED AGGREGATES IN RELATIVELY LARGE PROPORTIONS FOR CONCRETE PAVEMENTS IS DISCUSSED, PRIMARILY AS TO THE MATERIALS, CONSTRUCTION METHODS, COSTS AND SERVICEABILITY OF THIS TYPE OF ROADWAY SURFACING. INFORMATION IS GIVEN ON SUCH SURFACINGS CONSTRUCTED IN FLORIDA, KANSAS, KENTUCKY AND IOWA. THIS INCLUDES GRADATIONS, COMPOSITION, AND CONSTRUCTION METHODS.

Conner, CN Cram, RW DISCUSSER Highway Research Board Proceedings 1928

3A 205854
EXPERIMENTAL VERIFICATION OF DISCRETE-ELEMENT SOLUTIONS FOR PAVEMENT SLABS
THE VALIDITY OF ANY ANALYTICAL METHOD CAN BEST BE PROVED BY COMPARING ITS SOLUTIONS WITH ACTUAL TEST RESULTS. TO OBTAIN SPECIFIC TEST RESULTS FOR USE IN VERIFICATION OF THE DISCRETE-ELEMENT METHODS, A STUDY OF SMALL-DIMENSION SLAB-ON-Foundation UNDER CONTROLLED CONDITIONS WAS CONDUCTED. AN INSTRUMENTED ALUMINUM SLAB 9 BY 9 BY 1/8 IN. WAS TESTED RESTING ON A SPECIALLY PREPARED SATURATED CLAY SUBGRADE UNDER 2 LOADING POSITIONS. PLATE-LOAD TESTS WERE PERFORMED TO DETERMINE LINEAR AND NON-LINEAR CHARACTERISTICS OF THE SOIL FOR REPRESENTING THE SUBGRADE ACCORDING TO THE WINKLER ASSUMPTION. THESE CHARACTERISTICS WERE ALSO DETERMINED FROM STRESS-STRAIN RELATIONS OF THE SOIL, OBTAINED FROM UNCONFINED COMPRESSION TESTS. A COMPARISON OF DISCRETE-ELEMENT SOLUTIONS AND EXPERIMENTAL RESULTS WAS MADE FOR DEFORMATIONS, PRINCIPAL STRESSES, AND STRESSES ALONG THE EDGE FOR DIFFERENT LOADS. THE TESTS CONFIRM THAT THE DISCRETE-ELEMENT SOLUTIONS CAN BE USED WITH CONFIDENCE TO OBTAIN SATISFACTORY SOLUTIONS FOR PAVEMENT SLABS.

Agarwal, SL Hudson, WR Highway Research Record, Hwy Res Board 1970

3A 205945
WARING STRESSES IN SLABS ON REISSNER FOUNDATION
Warping Stresses have been evaluated in circular and strip concrete slabs resting on the ground by idealizing the foundation medium by the Reissner Foundation. Linear temperature variation which increases with depth of slab and which results in partial support of the slabs has been considered. The results for deflection and moment coefficients have been presented for various values of non-dimensional length a, load coefficients q, and ratios of relative stiffness to shear stiffness. The results indicate that the shape of the slab has influence on maximum stresses and deflections up to a = 6. Further, the stresses in slabs on the Reissner Foundation are higher than the stresses in the same slabs when they are placed on the Winkler Foundation.

Aditya, AS Pranesh, MR Am Soc Civil Engr J Transportation Eng Aug. 1971

3A 206011
PRESTRESSED HIGHWAY PAVEMENT AT DULLES AIRPORT FOR TRANSP0 72
THE ADVANTAGES OF PRESTRESSED CONCRETE PAVEMENTS ARE DUE TO THE ELIMINATION OF PAVEMENT JOINTS AND
CONSTRUCTION EQUIPMENT AND METHODS

ATTENDANT PROBLEMS, AND TO COST SAVINGS DERIVED FROM REDUCED NEEDS FOR STEEL AND CONCRETE. A PROTOTYPE PAVEMENT, PLACED IN SIX LENGTHS THAT VARY FROM 400 TO 760 FEET, WILL PROVIDE USEFUL DESIGN AND CONSTRUCTION DATA FOR FUTURE FULL-SCALE HIGHWAY AND AIRPORT PAVEMENTS IN QUEEN ANNE'S QUAY.

STRESSING PROCEDURES FOR THE ACCESS ROAD AT DULLES AIRPORT ARE DESCRIBED. AN OUTLINE OF CONSTRUCTION PROCEDURES FOR A FULL-SCALE PROJECT IS GIVEN.

Pasko, TJ Prestressed Concrete Institute Journal Vol. 17 No. 2. Mar. 1972, pp 46-54, 9 Fig

3A 206026

EVALUATION OF SANDWICH LAYER SYSTEM OF FLEXIBLE PAVEMENTS IN QUEEN ANNE'S QUAY. THEORETICAL AND FIELD STUDIES HAVE BEEN CARRIED OUT TO DETERMINE HOW SANDWICHED LAYERS AFFECT THE DESIGN AND PERFORMANCE OF PAVEMENT SYSTEMS. IT HAS BEEN DETERMINED THAT A FLEXIBLE SANDWICHED LAYER CAN BE ECONOMICALLY USED IN A FOUR-LAYER SYSTEM BY PROVIDING AN OPTIMUM THICKNESS OF THE SANDWICHED MATERIAL. THE OPTIMUM THICKNESS AS DETERMINED IN THIS INVESTIGATION IS THE MINIMUM THICKNESS THAT WILL: (1) ACT AS A CUSHION TO PREVENT CRACKING IN THE SOIL CEMENT SUBBASE FROM REFLECTING TO THE SURFACE, AND (2) PERMIT COMPLIANCE WITH THE DENSITY SPECIFICATIONS. FOR CRUSHED STONE THIS THICKNESS IS 4". USE OF THIS THICKNESS SHOULD INCREASE PAVEMENT LIFE AND REDUCE CONSTRUCTION COSTS. IT HAS ALSO BEEN SHOWN THAT THE FOUR-LAYER SYSTEM PAVEMENTS CAN BE EVALUATED THROUGH ELASTIC LAYERED THEORY. A THREE-LAYER SANDWICH SYSTEM OF ECONOMICAL DESIGN, BASED ON TRAFFIC REQUIREMENTS, IS RECOMMENDED FOR LOW TRAFFIC VOLUMES. IN THIS CASE IT HAS BEEN DETERMINED THAT THE OPTIMUM THICKNESS IS THAT WHICH WILL (1) PREVENT REFLECTION CRACKING THROUGH THE UN-TREATED AGGREGATE FROM THE 6-INCH SOIL CEMENT MATERIAL, AND (2) SATISFY THE DENSITY SPECIFICATION. THESE REQUIREMENTS CAN BE MET WITH A 3" TO 4" LAYER OF CRUSHED STONE WITH A PRIME AND DOUBLE SEAL. THE EVALUATION OF THE FOUR-AND-THREE-LAYER SYSTEMS HAS SHOWN THAT THE STRAINS AND THE RESULTING PAVEMENT LIFE CAN BE PREDICTED FROM DYNAFLECT DEFLECTIONS. /AUTHOR/

Vaswani, NK Virginia Highway Research Council Apr. 1972

3A 206091

SYMPOSIUM-TECHNOLOGY OF THICK LIFT CONSTRUCTION WITH DISCUSSION

THIS SYMPOSIUM ON THICK LIFT CONSTRUCTION IS DIVIDED INTO FOUR SECTIONS. THE FIRST SECTION--STRUCTURAL DESIGN CONSIDERATIONS--ILLUSTRATES EXISTING AND POTENTIAL PAVEMENT DESIGN (THICKNESS SELECTION) PROCEDURES FOR THICK LIFT ASPHALT CONCRETE SECTIONS RESTING DIRECTLY ON PREPARED SUBGRADES. IN ADDITION, A METHOD USING RECENT RESEARCH DEVELOPMENTS INTENDED TO BROADEN THE DESIGN FRAMEWORK FOR SUCH PAVEMENTS AND BASED ON CONCEPTS EMBODIED IN THE SHELL PROCEDURE IS ALSO BRIEFLY ILLUSTRATED. THE SECOND SECTION--MIX DESIGN CONSIDERATIONS--POINTS OUT THAT CONVENTIONAL MIX DESIGN PROCEDURES ARE GENERALLY SUITABLE FOR DESIGNING ASPHALT PAVING MIXTURES FOR THICK LIFT CONSTRUCTION. IT ALSO IS POINTED OUT THAT INFORMATION IS AVAILABLE ON HOW VARIOUS MIX DESIGN VARIABLES AFFECT THE BASIC MATERIAL PROPERTIES OF ASPHALT PAVING MIXTURES SUCH AS ELASTIC, FATIGUE, AND FRACTURE STRENGTH PROPERTIES. SECTION THREE--LABORATORY CONSIDERATIONS--DEALS PRIMARILY WITH THOSE METHODS UTILIZED TO OBTAIN THE MATERIAL PARAMETERS USED IN THE DESIGN PROCEDURES DISCUSSED IN THE FIRST SECTION. SECTION FOUR--CONSTRUCTION METHODS--PRESENTS A CONTEMPORARY VIEW OF CONSTRUCTION METHODS AND PROCEDURES. A DISCUSSION IS INCLUDED WHICH DEALS WITH VARIOUS QUESTIONS ARISING FROM THIS SYMPOSIUM.


3A 206140

MODERN CONCRETE ROADS IN BENELUX


Flirt, JD Maes, J Grevelt, E Sipkema, JS Studiecentrum Wegenbouw /Neth/ Conf Paper 1972, pp 38-74, 6 Fig, 1 Tab

ACKNOWLEDGMENT: Transport & Road Res Lab /UK/IRR 207 242, 2C25236245

3A 206189

PAST PERFORMANCE OF COMPOSITE PAVEMENTS

EXISTING EXPERIMENTAL COMPOSITE PAVEMENTS ARE REVIEWED. PERFORMANCE IS STUDIED IN RELATION TO DESIGN, CONSTRUCTION, TRAFFIC AND OTHER FACTORS. THE DESIGN FEATURES AND PERFORMANCE OVER THE FIRST THREE YEARS OF SUCH A PAVEMENT IN MILTON, ONTARIO ARE DESCRIBED. THIS PAVEMENT IS TWO MILES LONG IN THE WEST BOUND LANES OF A MAJOR FOUR LANE CONTROLLED ACCESS HIGHWAY.

Smith, P Highway Research Record, Hwy Res Board 1963

3A 206196

RIGID PAVEMENT CONDITION SURVEYS

THE TYPE OF RIGID PAVEMENT CONDITION SURVEY CHOSEN WILL DEPEND ON THE TYPE AND EXTENT OF THE INFORMATION NEEDED BY THE SURVEY USER. INFORMATION OF THE PROPER TYPE MAY BE USEFUL IN PAVEMENT DESIGN, MAINTENANCE SCHEDULING, HIGHWAY ADMINISTRATION, PREDICTION OF MAINTENANCE COSTS, AND THE DEVELOPMENT OF NEW METHODS AND MATERIALS FOR PAVEMENT CONSTRUCTION. SURVEY TYPES INCLUDE RECONNAISSANCE, RATING PANELS, STATISTICAL COUNTS OF THE NUMBER OF TIMES SOME PAVEMENT CHARACTERISTICS ARE OBSERVED, SEMI-DETAILED SURVEYS, DETAILED STRIP MAPS, PICTORIAL OR PHOTOGRAPHIC, USE OF SURFACE ROUGHNESS MEASURING DEVICES, AND DETAILED INVESTIGATIONS. MOST REASONABLY COMPLETE SURVEYS OF PORTLAND CEMENT CONCRETE PAVEMENTS WOULD INCLUDE SOME MEASUREMENT OF SURFACE ROUGHNESS, SKID RESISTANCE, DURABILITY, ADEQUACY OF ANY SPECIAL DESIGN FEATURES AND AN INDICATION OF THE DESIGNS STRUCTURAL ADEQUACY UNDER CURRENT TRAFFIC CONDITIONS. GENERAL CONDITION SURVEYS MAY LOCATE CONDITIONS QUALIFYING FOR MORE DETAILED STUDY. THE CONDITION STUDY IS AN IMPORTANT TOOL FOR EVALUATING DESIGN, CONSTRUCTION TECHNIQUES AND MATERIALS.

Teske, WE Highway Research Record, Hwy Res Board 1963
The first two continuously-reinforced concrete pavements constructed by the Mississippi State Highway Department have been designated as experimental sections. These sections contain several design features which are relatively new in this type of construction. This paper describes the performance of the pavements. A brief description of the design features and the construction methods used for both pavement is presented. Longitudinal movements of the pavement have been measured periodically. Settlements have been made to obtain general information on the purpose of the study is to obtain data on existing pavements. This paper presents a summary of the findings of the Michigan Pavement Performance Study, a five-year program (1958-1963). To evaluate pavement performance from field surveys of existing pavements, in the five-year period, equipment and procedures for recording and analyzing pavement profiles have been developed and profiles of 10,000 miles of pavement have been accumulated. Although there have been several published reports of this work as it progressed, the final results have now been compiled and analyzed. The quantitative evaluation of pavement condition and performance and the physical inventory of existing roads provide factual information of direct value in design, construction, and maintenance of both rigid and flexible pavement and in the operation of the state trunk-line system as a transportation facility. The findings of the five-year study are reviewed. The adequacy of Michigan design standards is evaluated, and the effect on performance of certain construction practices is pointed out. The use of pavement profile data in more effective and timely maintenance and their value in the operation of the state highway system are discussed. /Author/

Spigolon, SJ Highway Research Record, Hwy Res Board 1964

3A 206214
EVALUATION OF PAVEMENT PERFORMANCE RELATED TO DESIGN, CONSTRUCTION, MAINTENANCE AND OPERATION
This paper presents a summary of the findings of the Michigan Pavement Performance Study, a five-year program (1958-1963). To evaluate pavement performance from field surveys of existing pavements, in the five-year period, equipment and procedures for recording and analyzing pavement profiles have been developed and profiles of 10,000 miles of pavement have been accumulated. Although there have been several published reports of this work as it progressed, the final results have now been compiled and analyzed. The quantitative evaluation of pavement condition and performance and the physical inventory of existing roads provide factual information of direct value in design, construction, and maintenance of both rigid and flexible pavement and in the operation of the state trunk-line system as a transportation facility. The findings of the five-year study are reviewed. The adequacy of Michigan design standards is evaluated, and the effect on performance of certain construction practices is pointed out. The use of pavement profile data in more effective and timely maintenance and their value in the operation of the state highway system are discussed. /Author/

Housel, WS Highway Research Record, Hwy Res Board 1964

3A 206265
APPLICATION OF AASHO ROAD TEST RESULTS TO DESIGN OF FLEXIBLE PAVEMENTS IN MINNESOTA
The purpose of the study is to obtain data on existing pavements that will lead to the adaptation of AASHO road test concepts and equations for use in Minnesota. In 1963 and 1964, 50 representative projects located throughout the state were selected for preliminary investigation. In 1966, the first long by one mile wide test section was selected in each project. For intensive study, the construction history of each project was studied and field inspections were made to obtain general information on the pavement design and condition, roadbed materials, drainage and topography. In the 1200-foot test sections, borings were made to check the uniformity of pavement structure thicknesses and roadbed materials. Initial PSI values were established either by estimation or by roughometer measurements obtained at the time of construction. Periodic roughometer measurements are being made to obtain PSI values for determining performance trends. Periodic plate bearing and Benkelman beam tests are being made to determine the strengths of the various pavement system components. Classification tests and CBR tests were run on all roadbed materials and on some base and subbase materials. Asphalt was extracted and recovered from the asphalt concrete and penetration, softening point and ductility tests were made on the recovered asphalt. Flexural beam, modified tension and resistance load tests were made on the asphalt concrete traffic volume classification and weight data were compiled and a procedure for determining traffic loadings in terms of equivalent daily 18-KIP single axle loads for each test section was developed.

Skok, EL Diethelm, PJ Minnesota University Feb. 1966

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4621262 65)

3A 206294
ASPHALT CONCRETE PAVEMENT AND PERMEABILITY
The permeability of asphaltic concrete pavements to water and air is of controlling importance in asphalt concrete pavements. A high permeability of an asphaltic pavement can seriously affect the durability of a roadway. The subject of this paper is a very general one and touches on the problem of permeability and construction practices. The permeability measurements in this investigation were made both on water and on air. Devices, both instruments were portable and the methods of measurement were rapid. Data accumulated in the field are also shown. The results of this study indicate /1/ the use of some type of flow rate device seems warranted as an indicator of inplace asphaltic concrete compaction during construction, /2/ on very dense pavements air flow rates seem to be more sensitive indicators of compaction than water flow rates, and /3/ based on trends shown, much care should be taken in the rolling and compaction of hot asphaltic concrete. /Author/


ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4671194 57)

3A 206313
DURABILITY OF BRIDGE DECK CONCRETE
Part I gives a detailed description of selected deteriorated bridge decks, and attempts to determine the cause of deterioration of each deck. Also given is a detailed description of construction practices at four new bridge decks, including slump, air content, water content, mixing time, etc., and the location of each load on the deck. The results indicate marked differences between the specified admixtures and those actually obtained. Part II is a description of statistical methods applied to quality control of concrete placed on two bridge decks, and a study of air-void system parameters and their relation to concrete durability. The control charts shown indicate that the concrete produced does not conform to state specifications, especially the slab, of particular interest in the study of air content is the statement that all
PARAMETERS EXCEPT AIR CONTENT SHOWED A SIGNIFICANT CORRELATION WITH DURABILITY AT THE 95 PERCENT SIGNIFICANCE LEVEL. PART III IS A REVIEW OF THE MAJOR FINDINGS AND INCLUDED ARE RECOMMENDATIONS, BASED LARGE, ON THE WORK THAT WAS DONE. THIS RESEARCH, THAT SHOULD LEAD TO IMPROVED PERFORMANCE OF BRIDGE DECK CONCRETE, VOLUME II CONTAINS A DESCRIPTION OF FIELD SURVEY PROCEDURES AND COMPLETE FIELD SURVEY RECORDS FOR 1966-67. REPORT NO. 5 IS A MANUAL OF PROCEDURES TO BE USED IN THE EVALUATION OF BRIDGE DECK CONCRETE.

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4641186 67)/C26021775, IC26021079, IC27020115, PB-177 004, PB-177 222

3A 206323
A STUDY OF CONSTRUCTION EQUIPMENT AND INITIAL PAVEMENT ROUGHNESS AS MEASURED WITH A PROFILOGRAPH

THE DEVELOPMENT OF A PROFILOGRAPH FOR MEASURING CONSTRUCTION ROUGHNESS IS DESCRIBED. PARTICULAR ATTENTION WAS GIVEN TO THE COST, RUGGEDNESS, SIMPLICITY OF OPERATION AND MAINTENANCE DURING ITS DESIGN IN ORDER THAT SIMILAR INSTRUMENTS COULD BE MADE AVAILABLE FOR USE BY THE VARIOUS DISTRICTS OF TEXAS. THE REASONS FOR ROUGHNESS IN ASPHALTIC CONCRETE PAVING ARE DISCUSSED. THE PRIMARY TEST SITE HAD THE ADVANTAGES OF THE FOLLOWING FEATURES: (1) THE SURFACE OF THE FLEXIBLE BASE HAD BEEN PLANNED WITH AN MCI AUTOGRADE USING ELECTRONICALLY CONTROLLED GRADE APPARATUS AND WAS VERY SMOOTH AND TRUE TO CROSS-SECTION, (2) TWO ASPHALTIC CONCRETE MATS WERE PLACED USING BITUMINOUS PAVERS WITH ELECTRONICALLY CONTROLLED SCREEDS. THE ROUGHNESS WAS DETERMINED WITH THE RAINHART PROFILOGRAPH AND CONSISTED OF OBTAINING A PROFILE OVER THE AREAS IN WHICH THE ROLLERS PARKED, THE PAVER PAUSED, AND VARIOUS PAVER SPEEDS WERE USED. THIS STUDY COULD FIND NO SIGNIFICANT ROUGHNESS IN THE AREA WHERE ROLLERS PAUSED. HOWEVER, SURFACE VARIATION WAS PRESENT NEAR THE AREA IN WHICH THE PAVER PAUSED FOR A CHANGE OF TRUCKS. INCREASED ROUGHNESS WAS EXPERIENCED AS THE PAVER SPEED INCREASED. /BPR/

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4830424 69)

3A 206380
FINAL REPORT: PERFORMANCE OF CONTINUOUSLY REINFORCED CONCRETE PAVEMENTS-HIGHSIDE SOUTHERN CONNECTICUT'S CRCP WAS BUILT AS AN EXPERIMENTAL PROJECT IN 1962. THE SIX-LANE DIVIDED HIGHWAY (184) WAS BUILT LANE-AT-A-TIME BY THE DOUBLE STRIKE-OFF METHOD. PLAIN WIRE FABRIC AND HIGH STRENGTH RE-BAR MATS WERE USED TO PROVIDE 0.6% REINFORCEMENT. DIFFICULTIES EXPERIENCED DURING PAYING ARE DESCRIBED. THE NATURALatrice TO THE RE-BAR MATS ARE PERFORMING WELL, BUT THE FABRIC AREAS HAVE 12 WIDE CRACKS WHERE THE STEEL HAS PARTED. THE CRACKS APPEAR TO HAVE PROGRESSIVELY OCCURRED DURING EXTENDED COLD PERIODS. THE CONVENTIONAL PAVEMENT HAS EXPANDED AND CLOSED THE TERMINAL JOINTS, AND SUBSEQUENTLY TWO-FOOT WIDE RELIEF JOINTS WERE CUT INTO THE PAVEMENT. INFORMATION IS PRESENTED ON WEATHER, CRACK OPENINGS, LOGICAL EXPLANATIONS ARE PRESENTED FOR EXPLAINING THE BEHAVIOR AND RECOMMENDATIONS ARE SUGGESTED. FOUR PREVIOUS UNCIRCULATED INFORMAL REPORTS HAVE BEEN MADE. THIS IS THE FIRST FOR WIDESPREAD DISSEMINATION. /BPR/

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4830364 69)

3A 206397
FACTORS AFFECTING THE DURABILITY OF CONCRETE BRIDGE DECKS, INTERIM REPORT NO 2 BRIDGE DECK CRACKING STUDIES ON FOUR CONSTRUCTION CONTRACTS HAVE BEEN EVALUATED. THE EFFECT OF CONSTRUCTION PRACTICES, AIR ENTRAINMENT, CURING, AND WEATHER SIZE CONDITIONS ON DECK CRACKING IS DISCUSSED. DECK TEMPERATURES DURING THE FIRST 14 DAYS ARE GIVEN FOR TWO SLABS. /AUTHOR/

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4641056 70)REPORT PENDING, IC26022025

3A 206595
PROCEEDING OF THE FOURTEENTH ANNUAL CONFERENCE OF CANADIAN TECHNICAL ASPHALT ASSOCIATION THE PROCEEDINGS CONTAINS SIXTEEN PAPERS, ALL OF WHICH ARE REPORTS ON RESEARCH PROJECTS ON THE PERFORMANCE AND BEHAVIOR OF ASPHALT PAVEMENT UNDER VARIOUS CONDITIONS WITH THE USE OF VARIOUS AGGREGATES AND DIFFERENT METHODS OF CONSTRUCTION. /RATAOC/

Cook, RD Peatfield, JN Kari, WJ Canadian Tech Asphalt Assoc Proc Nov. 1969
CONSTRUCTION EQUIPMENT AND METHODS

ACKNOWLEDGMENT: Roads & Transportation Assoc /Canada/

3A 206786
NEW DEVELOPMENTS IN BPR ROUGHNESS INDICATOR AND TESTS ON CALIFORNIA PAVEMENTS

THE ROUGHNESS INDICATOR WAS DEVELOPED BY THE BUREAU OF PUBLIC ROADS TO PROVIDE STANDARDIZED EQUIPMENT FOR MEASURING ROAD SURFACE ROUGHNESS. RESEARCH WITH THE UNIVERSITY OF CALIFORNIA HAS CONTINUED TO IMPROVE ITS ACCURACY AND CONSISTENCY AS A STANDARDIZED UNIT AND TO OBTAIN RECORDS OF ROAD ROUGHNESS THROUGHOUT THE STATE HIGHWAYS. CITY STREETS AND ON BRIDGES IN ALL PARTS OF CALIFORNIA. TESTS WERE CONDUCTED TO DETERMINE THE LIMITATIONS OF ACCURACY PROVIDED BY THE BPR DOUBLE BALL CLUTCH INTEGRATOR DESIGN AND ALSO THE ACCURACY OF AN INTEGRATOR CONSTRUCTED WITH A COMMERCIAL CLUTCH. MEASUREMENTS WERE MADE TO DETERMINE THE EFFECT OF VARYING AMOUNTS OF OUT-OF-ROUNDBEED THE SIZE OF THE TEST TIRE FROM 6.00 BY 16, WHICH IS NO LONGER AVAILABLE, TO A 6.70 BY 15 SIZE WHICH IS AVAILABLE. THE EFFECTS WERE MEASURED ON CALIFORNIA PAVEMENTS. IT WAS FOUND THAT THE ROAD ROUGHNESS INDEX IN INCHES PER MILE FOR CERTAIN PAVEMENTS WAS INCREASED BY APPROXIMATELY 50 PERCENT DUE TO AN OUT-OF-ROUNDBEED SIZE OF 0.05 INCHES WHICH CORRESPONDS TO THE AMOUNT OF OUT-OF-ROUNDBEED OBSERVED IN MEASUREMENTS OF PASSENGER CAR TIRES BY ATTENDANTS AT TIRE AND WHEEL ALIGNMENT SHOPS. TO PROTECT THE TEST TIRE AND ROUGHNESS EQUIPMENT FROM DAMAGE AND EXCESSIVE WEAR IN MOVING IT FROM ONE TEST SECTION TO THE NEXT TEST SECTION, A SPECIAL OUTRIGGER TRAILER WAS DEVELOPED TO CARRY THE TEST TRAILER IN A SUSPENDED POSITION BY THE USE OF A HOIST AND SPECIAL CLAMPING DEVICES. DETAILED SHOP DRAWINGS WERE MADE TO REPRESENT MANY IMPORTANT DETAILS. THE RESULTS OF ROUGHNESS MEASUREMENTS FOR ALL OF THE MAJOR TYPES OF PAVEMENT SURFACES USED ON STATE HIGHWAYS, CITY STREETS, AND ON VARIOUS TYPES OF BRIDGE FLOORS ARE REPORTED, ANALYZED AND CORRELATED WITH THE DESIGN FEATURES, AGE OF THE PAVEMENT AND CONSTRUCTION METHODS USED IN BUILDING THESE SURFACES. /AUTHOR/

Moyer, RA Ahlborn, G Highway Research Board Bulletin 1956

3A 206797
THE PAVEMENT SERVICEABILITY PERFORMANCE CONCEPT

A SYSTEM IS DESCRIBED WHEREIN THE SERVICEABILITY OF PAVEMENTS IS RATED SUBJECTIVELY BY A PANEL MADE UP OF MEN SELECTED TO REPRESENT MANY IMPORTANT GROUPS OF HIGHWAY USERS. THROUGH MULTIPLE REGRESSION ANALYSIS A MATHEMATICAL INDEX IS DERIVED AND VALIDATED THROUGH WHICH PAVEMENT RATINGS CAN BE SATISFACTORILY ESTIMATED FROM OBJECTIVE MEASUREMENTS TAKEN ON THE PAVEMENTS. THESE SERVICEABILITY INDICES (OR THE DIRECT RATINGS) ALWAYS REFER TO THE CONDITION, EXISTING AT THE TIME MEASUREMENTS (OR RATINGS) ARE MADE. PERFORMANCE OF A PAVEMENT MAY THEN BE DETERMINED BY SUMMARIZING THE SERVICEABILITY RECORD OVER A PERIOD OF TIME. THE SYSTEM, DEVELOPED AT THE AASHO ROAD TEST, HAS POTENTIAL FOR WIDER APPLICATION IN THE HIGHWAY FIELD, PARTICULARLY IN SUFFICIENCY RATINGS, EVALUATION OF DESIGN SYSTEMS, AND EVALUATION OF PERFORMANCE OF CONSTRUCTION TECHNIQUES THROUGH THE PROVISION OF AN OBJECTIVE MEANS FOR EVALUATION OF PERFORMANCE. /AUTHOR/

Carey, WN Irick, PE Highway Research Board Bulletin 1960

3A 206808
EVALUATING THE STABILITY OR ROAD STRUCTURES BY MEANS OF STATIC-ELASTIC THEORETICAL CALCULATIONS (IN GERMAN)

ROAD STRUCTURES, THE PROPERTIES OF WHICH DEPEND BOTH ON DYNAMIC TRAFFIC LOADING AND CLIMATIC CONDITIONS, CAN BE CHARACTERIZED ON THE BASIS OF THEIR MOMENTARY BEHAVIOR UNDER STATIC LOADING. STANDARDS WERE DERIVED FROM THE BEHAVIOR OF PROVEN STRUCTURES, WHICH, TOGETHER WITH STATIC-ELASTIC THEORETICAL CALCULATIONS, RENDER POSSIBLE AN ADVANCE COMPARATIVE EVALUATION OF THE STABILITY AND ECONOMICS OF ROAD STRUCTURES. AN ELECTRONIC COMPUTER PROGRAM WAS EVOLVED TO DETERMINE THE STRESSES AND DEFORMATIONS OCCURRING IN MULTI-LAYER ELASTIC STRUCTURES UNDER VERTICAL STATIC LOADING. USING THIS PROGRAM A CURRENT STANDARD CONSTRUCTION METHOD WAS EXAMINED FOR CONSTRUCTIONAL AND ECONOMIC JUSTIFICATION. IT WAS SHOWN TO BE SUFFICIENTLY STABLE. HOWEVER, VARIATIONS ON THE STANDARD METHOD, WHILE BEING EQUALLY STABLE, WERE SOMETIMES MORE ECONOMIC. /FG/RRL/

Gerlach, A Hannover Technical University /Germany/ 1968

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 206928
AN EXPERIMENTAL CONTINUOUSLY-REINFORCED CONCRETE PAVEMENT IN MICHIGAN

THE EXPERIMENTAL PROJECT INCLUDES TWO 24-FT ROADWAYS EACH CONTAINING TWO 12-FT LANES. TWO TYPES OF REINFORCING STEEL, DEFORMED BAR MAT AND WELDED WIRE MESH, EACH PROVIDING A STEEL RATIO OF APPROXIMATELY 0.6 PERCENT, WERE USED IN THE CONTINUOUSLY-REINFORCED, 8-INCH UNIFORM PAVEMENT SECTIONS. THE EASTBOUND ROADWAY IS COMPOSED OF A 2-MI SECTION OF CONTINUOUS WIRE MESH, 0.7 MI OF STANDARD 9-INCH UNIFORM PAVEMENT WITH RELIEF JOINTS SPACED AT 95-FT INTERVALS, AND A 2-MI SECTION OF CONTINUOUS BAR MAT. THE WESTBOUND ROADWAY CONTAINS APPROXIMATELY 4 MI OF CONTINUOUSLY-REINFORCED PAVEMENT, 2 MI EACH OF BAR MAT AND WIRE MESH. RELIEF SECTIONS OF 9-INCH UNIFORM PAVEMENT 493 FT LONG, CONSISTING OF ELEVEN 1-INCH EXPANSION JOINTS, WERE PLACED AT THE ENDS OF THE CONTINUOUSLY-REINFORCED SECTIONS. CONSTRUCTION METHODS AND EQUIPMENT ARE DESCRIBED, INCLUDING CONSTRUCTION JOINTS IN THE CONTINUOUSLY-REINFORCED SECTIONS. VARIOUS CHARACTERISTICS ASSOCIATED WITH THE CONSTRUCTION PHASE OF THE PROJECT ARE DISCUSSED INCLUDING SUBGRADE SOIL CLASSIFICATION, CONCRETE AND AIR TEMPERATURES, CONCRETE STRENGTH, AND A RECORD OF CONSTRUCTION PROGRESS. STUDY INVOLVED IN COMPARING THE PERFORMANCE OF EACH OF THE PROJECT SECTIONS INCLUDES THE STRESSES AND DEFORMATIONS OCCURRING IN MULTI-LAYER ELASTIC STRUCTURES UNDER VERTICAL STATIC LOADING. STANDARDS WERE DERIVED FROM THE BEHAVIOR OF PROVEN STRUCTURES, WHICH, TOGETHER WITH STATIC-ELASTIC THEORETICAL CALCULATIONS, RENDER POSSIBLE AN ADVANCE COMPARATIVE EVALUATION OF THE STABILITY AND ECONOMICS OF ROAD STRUCTURES. AN ELECTRONIC COMPUTER PROGRAM WAS EVOLVED TO DETERMINE THE STRESSES AND DEFORMATIONS OCCURRING IN MULTI-LAYER ELASTIC STRUCTURES UNDER VERTICAL STATIC LOADING. USING THIS PROGRAM A CURRENT STANDARD CONSTRUCTION METHOD WAS EXAMINED FOR CONSTRUCTIONAL AND ECONOMIC JUSTIFICATION. IT WAS SHOWN TO BE SUFFICIENTLY STABLE. HOWEVER, VARIATIONS ON THE STANDARD METHOD, WHILE BEING EQUALLY STABLE, WERE SOMETIMES MORE ECONOMIC. /FG/RRL/

Cudney, GR Highway Research Board Bulletin 1960

3A 206949
PERFORMANCE OF CONCRETE PAVEMENTS AS RELATED TO SUBBASE CONSTRUCTION METHODS

FIELD STUDIES OF THE PERFORMANCE OF CONCRETE PAVEMENTS BUILT ON SUBBASES OF VARIOUS DESIGNS AND MATERIALS SHOW THAT THE METHOD OF SUBBASE CONSTRUCTION...
CONSTRUCTION EQUIPMENT AND METHODS

IS AN IMPORTANT FACTOR. UNIFORMITY OF GRADATION WAS FOUND TO BE THE ONE SUBBASE QUALITY HAVING THE MOST INFLUENCE ON PAVEMENT PERFORMANCE. SUBBASE MATERIALS HAVING A SMALL MAXIMUM SIZE WERE FOUND GENERALLY TO BE PREFERABLE TO COARSER MATERIALS BECAUSE SEGREGATION IS LESS LIKELY TO OCCUR DURING PLACEMENT. INFORMATION WAS OBTAINED DURING THE CONSTRUCTION OF 28 PROJECTS IN MANY PARTS OF THE COUNTRY REPRESENTING TYPICAL SUBBASE CONSTRUCTION METHODS. THE EFFECTS ON SUBBASE DENSITY AND GRADATION OF VARIOUS CONSTRUCTION OPERATIONS ARE DISCUSSED. THESE INCLUDE: THE EFFECT OF SUBGRADE COMPACTION, SUBBASE MIXING, PLACEMENT AND COMPACTION, AND FINE-GRADING. HEAVY CONSTRUCTION TRAFFIC ON THE COMPLETED SUBBASE NULLIFIES THE EFFORTS EXPENDED TO OBTAIN UNIFORMITY AND RESULTS IN SUBSTANDARD PAVEMENT PERFORMANCE. /AUTHOR/

Fordyce, P. Goesaman, J.D. Highway Research Board Bulletin 1959

JOINT CONSTRUCTION IN CONCRETE PA VEMENT RESEARCH AND DESIGN ENGINEERS HAVE DEVELOPED A VAST STOREHOUSE OF INFORMATION ON PERFORMANCE OF VARIOUS TYPES OF JOINTS IN PORTLAND CEMENT CONCRETE PAVEMENTS. THE PERFORMANCE OF SUCH JOINTS DEPENDS TO A LARGE DEGREE ON THE TYPE AND QUALITY OF THEIR CONSTRUCTION. CARELESS CONSTRUCTION PRACTICES OR INCORRECT METHODS OF CONSTRUCTION RESULTING FROM A LACK OF KNOWLEDGE OF THE JOINT FUNCTION RESULTS IN PAVEMENTS WITH BELOW STANDARD RIDING CHARACTERISTICS AND MAINTENANCE PROBLEMS. CORRECT CONSTRUCTION PROCEDURES FOR VARIOUS JOINT TYPES ARE OUTLINED AND ILLUSTRATED. INSTALLATION OF DOWELS, TIEBARS AND EXPANSION JOINT FILLERS IS EXPLAINED. /AUTHOR/


TYPES AND CAUSES OF FAILURE IN HIGHWAY PAVEMENTS SIXTY-TWO DIFFERENT TYPES OF PAVEMENT DISTRESS ARE DISCUSSED AND PICTURES ARE INCLUDED WITH THE HOPE OF OBTAINING SOME AGREEMENT IN TERMINOLOGY IN REFERENCE TO FAILURES IN HIGHWAY PAVEMENTS. IT IS CONCLUDED THAT NO MATTER HOW WELL THE PRELIMINARY WORK HAS BEEN ACCOMPLISHED SUCH AS MATERIALS EVALUATION, DESIGN, PLANNING AND SPECIFICATION WRITING THE PROBLEM OF TURNING OUT A GOOD JOB RESTS WITH THE CONSTRUCTION ENGINEER. /AUTHOR/

Hveem, F.N. Highway Research Board Bulletin 1958

WARNING SIGNS OF PAVEMENT DISTRESS MUCH CONCERN HAS BEEN EVIDENCED REGARDING THE ABILITY OF EXISTING PAVEMENTS TO SAFELY AND SATISFACTORILY ACCOMMODATE PRESENT DAY AND PROPOSED AIRCRAFT LOADINGS. IN ANY INVESTIGATION OF PAVEMENT PERFORMANCE, IT IS NOT ONLY NECESSARY TO DETERMINE THE PRESENT CONDITION OF THE PAVEMENT—BY SUCH MEANS AS CONDITION OR PERFORMANCE SURVEYS—BUT IT IS ALSO NECESSARY TO CONSIDER THE RESULTS OF SUCH SURVEYS IN LIGHT OF THE BASIC DESIGN PRINCIPLES AND CONSTRUCTION PRACTICES WHICH OBTAINED WHEN THE PAVEMENT WAS BUILT. IN ESSENCE, THE EVALUATION IS A REVERSAL OF THE DESIGN PROCEDURE. REPORTED HEREIN IS A GENERAL METHOD OF AIRPORT PAVEMENT EVALUATION PROCEDURE CONSISTENT WITH THE CURRENT DESIGN PRINCIPLES SET FORTH IN CIVIL AERONAUTICS ADMINISTRATION PUBLICATION, AIRPORT PAVING, DATED OCTOBER, 1956. /AUTHOR/


EVALUATION OF RIGID PAVEMENT PERFORMANCE FOR OVER FIFTEEN YEARS THE U.S. ARMY CORPS OF ENGINEERS HAS BEEN CONDUCTING AN EXTENSIVE INVESTIGATION IN CONJUNCTION WITH THE DESIGN, CONSTRUCTION AND EVALUATION OF CONCRETE AIRFIELD PAVEMENTS. THIS PROGRAM HAS GIVEN CONSIDERATION TO PAVING MATERIALS, CONSTRUCTION METHODS, ANALYTICAL METHODS OF DESIGN, TRAFFIC ON SPECIFICALLY CONSTRUCTED TEST PAVEMENTS, AND THE CONDITION OF EXISTING CONCRETE AIRFIELD PAVEMENTS. THE PURPOSE OF THIS INVESTIGATIVE WORK ON RIGID PAVEMENT IS TO ESTABLISH A REALISTIC METHOD OF DESIGN AND EVALUATION AND TO INSURE THAT THE PAVEMENTS CONSTRUCTED ARE IN ACCORD WITH THE REQUIREMENTS OF THE DESIGN. THIS PAPER SUMMARIZES BRIEFLY THE METHOD FOR THE DESIGN AND EVALUATION OF RIGID PAVEMENTS BASED ON THE CORPS OF ENGINEERS STUDIES. ALTHOUGH THE EVALUATION OF RIGID PAVEMENT PERFORMANCE INVOLVES MANY FACTORS, THE APPROACH TAKEN IN THIS PAPER IS THAT THE LOAD CARRYING CAPACITY OF THE PAVEMENT WITH REGARD TO BOTH THE MAGNITUDE AND THE FREQUENCY OF LOADING, MUST BE OF PRIME CONSIDERATION BEFORE FACTORS OTHER THAN LOAD CAN BE VIEWED IN THEIR PROPER PERSPECTIVE. /AUTHOR/

Mellinger, F.M. Highway Research Board Bulletin 1958


CONSTRUCTION EQUIPMENT AND METHODS

3A 207032
PAVEMENT CONDITION SURVEYS: SUGGESTED CRITERIA
PAVEMENT CONDITION SURVEYS ARE NECESSARY TO EVALUATE THE EFFECT UPON PAVEMENT LIFE AND SERVICE CAUSED BY VARIOUS FACTORS SUCH AS SUBGRADE SOIL OF THE VARIOUS CLASSIFICATIONS, SUBGRADE DENSIFICATION, SUBGRADE TREATMENTS, SUBGRADE DRAINAGE, SUBBASE MATERIALS AND METHODS OF PLACING, PAVEMENT MATERIALS, PAVEMENT DESIGN, PAVEMENT CONSTRUCTION METHODS, TRAFFIC, MAINTENANCE MATERIALS AND METHODS, AND CLIMATIC CONDITIONS. PAVEMENT CONDITION IS LOGICALLY MEASURED FOR PORTLAND CEMENT CONCRETE PAVEMENTS BY THE CONDITION OF JOINTS AND CRACKS, CONDITION OF THE SURFACE, AND THE AMOUNT OF CRACKING AND BREAKAGE. IN ADDITION, IT IS LOGICALLY MEASURED FOR PAVEMENTS OF THE FLEXIBLE TYPE BY THE AMOUNT OF CRACKING, TYPE OF CRACKING, RAVELING, RUTTING, SHOVING, SETTLING, BLEEDING, AND THE AREA AND DEPTH OF PATCHES. SKID RESISTANCE AND DEGREE OF BUMPINESS ARE PAVEMENT CONDITION FACTORS FOR BOTH RIGID AND FLEXIBLE PAVEMENTS. VARIOUS TYPES OF CONDITION SURVEYS ARE OUTLINED AND SUGGESTIONS MADE FOR MAKING THEM. APPENDICES PRESENT DEFINITIONS OF CONSTRUCTION COMPONENTS, AND DEFECTS, OR MANIFESTATIONS WITH ILLUSTRATIONS. SUGGESTED FORMS TO FACILITATE RECORDING AND STUDYING THE DATA OBTAINED FROM PAVEMENT CONDITION SURVEYS ARE PRESENTED IN AN APPENDIX.

Highway Research Board Special Reports 1957

3A 207036
THE AASHO ROAD TEST: REPORT 6-SPECIAL STUDIES
STUDIES ARE REPORTED WHICH WERE CONDUCTED DURING THE MAIN AASHO ROAD TEST WHICH WERE NOT DIRECTLY ASSOCIATED WITH THE PRINCIPAL EFFECTS OF THE PAVEMENT OR BRIDGE RESEARCH BRANCHES AND THOSE STUDIES CONDUCTED PRIMARILY FOR THE DEPARTMENT OF THE ARMY DURING THE SPECIAL STUDY PROGRAM FOLLOWING THE MAIN TEST. THE EXPERIMENT DESIGN AND THE INSTRUMENTATION AVAILABLE DID NOT HAVE THE REFINEMENTS INVOLVED IN JOINT SPACING AND CONSTRUCTION METHODS.

Highway Research Board Special Reports 1962

3A 207061
ANALYSIS OF CONCRETE SLABS ON GROUND SUBJECTED TO WARPING AND MOVING LOADS
A THEORY HAS BEEN DEVELOPED WHEREBY STRESSES AND DEFORMATIONS COULD BE CALCULATED FOR A SERIES OF RECTANGULAR SLABS LYING ON A VISCEROELASTIC FOUNDATION AND SUBJECTED TO A MOVING LOAD. THE STRESSES AND DEFORMATIONS ARE CAUSED BY THE WEIGHT OF THE SLAB, THE MOVING CONCENTRATED LOAD, AND THE LINEAR TEMPERATURE (OR MOISTURE) VARIATIONS THAT CAUSE SUFFICIENT WARPING SO THAT THE SLAB IS ONLY PARTIALLY SUPPORTED BY ITS FOUNDATION. THE SUPPORT CONDITIONS WERE SIMULATED BY A KELVIN VISCO-ELASTIC MODEL, AND ZONES (WHICH DEPENDED ON THE VALUE OF SUB-GRADE REACTION) WERE SET UP SO THAT THE SOLUTIONS TO THE GOVERNING DIFFERENTIAL EQUATIONS COULD BE REDUCED TO A SET OF SIMULTANEOUS ALGEBRAIC EQUATIONS. THE EQUATIONS WERE SOLVED WITH THE HELP OF AN IBM 7090 DIGITAL COMPUTER USING A PORTABLE SOURCE PROGRAM. IT WAS FOUND THAT WHEN PARTIAL SUPPORT CAUSED BY WARPING EXISTS, THE TENSILE STRESS IN THE SLAB CAN INCREASE WITH INCREASING VELOCITY OF LOAD. HOWEVER, THE MAXIMUM DEFLECTION (DOWNWARD) NEED NOT OCCUR WHEN THE VELOCITY OF THE LOAD IS EQUAL TO ZERO. THE REDUCTION IN SUBGRADE SUPPORT OVER A NARROW REGION (O FT. OR LESS) LEADS TO DEFORMATIONS AND STRESSES THAT ARE HIGHER THAN THOSE CALCULATED USING THE INITIAL VALUE OF SUBGRADE REACTION. THIS IS PARTICULARLY EVIDENT WHEN THE LOAD IS OVER THE REGION OF REDUCED SUBGRADE REACTION. /AUTHOR/

Lewis, KH Harr, ME Highway Research Record, Hwy Res Board 1969

3A 207158
AN EXPERIMENTAL ROAD OF CEMENT BOUND MACADAM
AN EXPERIMENTAL ROAD OF CEMENT BOUND MACADAM WAS CONSTRUCTED TO OBTAIN INFORMATION ON MATERIALS, REQUIREMENTS, CONSTRUCTION METHODS AND DATA ON WHICH DESIGNS AND ESTIMATES COULD BE BASED. THE TEST ROAD IN SUBURBS WAS CONSTRUCTED WITH THREE SIZES OF LIMESTONE, THREE SIZES OF GRAVEL AND ONE SIZE OF SLAG COARSE AGGREGATE. THESE COARSE AGGREGATES WERE PENETRATED WITH GROUT OF DIFFERENT PROPORTIONS BY WEIGHT OF SAND OF VARIOUS COARSENESS WITH VARYING AMOUNTS OF WATER. THE REQUIREMENTS FOR UNIFORM AND FULL PENETRATION OF COARSE AGGREGATES BY THE GROUT WAS STUDIED. COMPACTION METHODS WERE DESCRIBED. CONCLUSIONS AND RECOMMENDATIONS WERE GIVEN PERTAINING TO SUBGRADE, COARSE AGGREGATE, GROUT, COMPACTION, CONSTRUCTION METHODS, STRENGTHS, AND QUALITY OF MATERIALS.

Fleming, EM Anderson, AA Litkiser, RR DISCUSSER Shelton, WA DISCUSSER Highway Research Board Proceedings 1934

3A 207404
INVESTIGATIONAL CONCRETE PAVEMENT IN MICHIGAN
THE MICHIGAN TEST ROAD WAS CONSTRUCTED IN 1940 FOR THE PURPOSE OF ESTABLISHING CERTAIN PRINCIPLES IN CONCRETE PAVEMENT DESIGN. IN PARTICULAR THOSE INVOLVED IN JOINT SPACING AND CONSTRUCTION METHODS. THE TEST PROJECT IS 17.8 MILES LONG AND COMPOSED OF TWO SEPARATE TEST SECTIONS, THE DESIGN PROJECT AND THE DURABILITY PROJECT. THE PROGRAM CONSISTS OF THE FOLLOWING OBSERVATIONS: (1) SEASONAL AND DAILY MEASUREMENTS OF: JOINT WIDTHS, SLAB MOVEMENT, STRAIN, TEMPERATURE AND MOISTURE OF THE CONCRETE AND SLAB; (2) PERIODIC MEASUREMENTS OF VERTICAL DISPLACEMENT OF THE SLABS; (3) PERIODIC CONDITION SURVEYS OF PAVEMENT; (4) CONTINUOUS RECORD OF TEMPERATURE AND PRECIPITATION; AND (5) CONTINUOUS TRAFFIC RECORD. /AUTHOR/

Coons, HC Highway Research Board Research Reports 1945

3A 207463
LOW TRAFFIC CONCRETE PAVEMENT PERFORMANCE AND MAINTENANCE IN IOWA
REPORTS ON PERFORMANCE AND MAINTENANCE OF 2800 MILES OF CONCRETE PAVEMENT ON THE SECONDARY ROAD SYSTEM IN IOWA ARE PRESENTED. THESE ARE RELATED TO DESIGN, SPECIFICATIONS, CONSTRUCTION EQUIPMENT AND

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Methods. Included are construction and maintainance costs and results of pavement smoothness measurements. /Author/

Kauson, MJ American Concrete Paving Association No. 13, 1972, 19 pp, 5 Figs, 2 Phot, Refs

3A 207484 TRACKWORK STUDY-VOLUME I-TRACKWORK PRACTICES OF NORTH AMERICAN RAPID TRANSIT SYSTEMS-FINAL REPORT A SUMMARY IS PRESENTED OF THE TRACKWORK PRACTICES OF SEVEN NORTH AMERICAN RAIL TRANSIT OPERATIONS: BOSTON, CHICAGO, CLEVELAND, NEW YORK, PHILADELPHIA, SAN FRANCISCO AND TORONTO. RESPONSES TO QUESTIONNAIRES SENT TO THE PROPERTIES COVERED CONSTRUCTION STANDARDS FOR RAIL, RAIL WELDS, TRACK GAUGE, RAIL FASTENINGS, SUPPORT SPACING, RAIL ANCHORAGE, TIES, ROADBED AND BALLAST SECTIONS. SPECIFIC TRACK PRACTICES AND CRITERIA FOR THE PROPERTIES ALSO REPORTED THEIR TRACK MAINTENANCE CRITERIA FOR RAIL WEAR, TIE LIFE, AND BALLAST CLEANING, AS WELL AS TEST INSTALLATIONS AND RECOMMENDATIONS FOR IMPROVING TRACKWORK. /Author/

Dunn, RH Washington Metro Area Transit Authority Nov. 1967, 149 pp

ACKNOWLEDGMENT: NTIS/NTIS PB 204 212, 3C26226248


Stallmeyer, JE Munse, WH Selby, KA Highway Research Record, Hwy Res Board 1965

3A 207713 TESTS EVALUATING PUNCHING SHEAR RESISTANCE OF PREFABRICATED COMPOSITE BRIDGE UNITS MADE WITH INVERTED STEEL T-BEAMS DESIGN INFORMATION IS DEVELOPED FOR A SPECIAL TYPE OF PREFABRICATED COMPOSITE SUPERSTRUCTURE UNIT FOR BRIDGE SPANS IN THE 30-TO 70-FT RANGE. THESE STEEL AND CONCRETE UNITS CONSIST OF SPAN-LENGTH, 7-IN. THICK REINFORCED CONCRETE SLABS 6 TO 10 FT WIDE. THE WEBS OF A PAIR OF INVERTED T-SHAPED STEEL BEAMS ARE EMBEDDED IN EACH SLAB. HORIZONTAL STEEL STUDS WELDED AT INTERVALS TO THE BEAM WEBS ACT AS SHEAR CONNECTORS. TO EVALUATE THE RESISTANCE OF TWO PARTICULAR PREFABRICATED UNITS TO PUNCHING SHEAR AND TO DEVELOP GENERAL DESIGN INFORMATION FOR DETERMINING SAFE STUD SPACINGS, TESTS WERE CONDUCTED ON TWO 10-FT WIDE BY 5 1/2-FT LONG SPECIMENS REPRESENTING A SECTION OF A TYPICAL BRIDGE. THE STUDS WERE SPACED AT 4-IN. INTERVALS IN ONE SPECIMEN AND AT 10-IN. INTERVALS IN THE OTHER. BOTH SPECIMENS WERE LOADED AND LOADED SO THAT THEY WOULD BE SUBJECTED TO PUNCHING SHEAR. BOTH SPECIMENS FAILED IN A SIMILAR MANNER AT LOADS THAT WERE ABOUT FIVE TIMES GREATER THAN THE MAXIMUM WHEEL LOAD /INCLUDING 30 PERCENT FOR IMPACT/ SPECIFIED BY AASHO FOR H20 OR H20-5/16 TYPE TRUCKS. THE MODE OF FAILURE APPEARED TO BE A COMBINATION OF TENSION AND BOND FAILURE IN THE CONCRETE, RATHER THAN A PUNCHING-TYPE FAILURE. A METHOD OF DETERMINING THE SAFE SPACING OF STUDS FOR RESISTING COMBINED PUNCHING AND HORIZONTAL SHEAR WAS DEVELOPED AND WAS BASED ON THE CONSERVATIVE ASSUMPTION THAT THE STUDS CARRY ALL THE PUNCHING SHEAR. IT WAS ALSO ASSUMED THAT THE INTENSITY OF THE PUNCHING SHEAR WAS PROPORTIONAL TO THE DISTRIBUTION OF THE LAB NEAR THE WEB. AND THAT A CONSERVATIVE APPROXIMATION OF THIS RELATIONSHIP IS THAT THE SHEAR INTENSITY VARIES PARABOLICALLY FROM ZERO TO MAXIMUM SHEARING STRESS TO ZERO-OVER AN 8-FT LENGTH. THIS PROCEDURE PERMITS THE MAXIMUM VERTICAL SHEAR PER STUDY TO BE CALCULATED AND THEREBY MAKES IT POSSIBLE TO USE CONVENTIONAL PROCEDURES IN DESIGNING THESE PREFABRICATED SUPERSTRUCTURE UNITS. /Author/

McDermott, JF Highway Research Record, Hwy Res Board 1965

3A 207714 SUBSTRUCTURE INFLUENCE ON DYNAMIC STRESS RESPONSE OF SUPERSTRUCTURES IN COMPOSITE BRIDGES-AN EXPERIMENTAL STUDY THE VIRGINIA COUNCIL OF HIGHWAY INVESTIGATION AND RESEARCH HAS CONDUCTED A STUDY OF THE DYNAMIC STRESS RESPONSE AND VIBRATION CHARACTERISTICS OF TWO HIGHWAY BRIDGES WITH SIMPLY SUPPORTED COMPOSITIONS. A TEST VEHICLE, SIMULATING AN H20 -5/16-44 STANDARD LOADING, MADE RUNS ON THE BRIDGES. BOTH BRIDGES HAD IDENTICAL 66-FT 5-IN. SPANS. BUT ONE HAD HIGHER AND LESS STIFF PIERs THAN THE OTHER. COMPARISON OF THE DATA INDICATES THAT THE STIFFNESS OF THE SUBSTRUCTURE HAS AN INFLUENCE ON THE RESPONSE OF THE SUPERSTRUCTURE TO DYNAMIC LOADING. /Author/

Kinnier, KH Mckee, WT Highway Research Record, Hwy Res Board 1965
CONSTRUCTION EQUIPMENT AND METHODS

3A 207716
SIMPLIFIED DESIGN CHECK OF THERMAL STRESSES IN COMPOSITE HIGHWAY BRIDGES

A simple formula intended for use as a design check of thermal stresses in simply supported composite highway bridges is described. It is based on a series of field tests of various bridges ranging in span from 47 ft 3 in. to 71 ft 5 in. The formula relates the thermal stress at the bottom of the girder to the temperature difference between the top and bottom of the slab and the depth of the bridge. /Author/

Zuk, W Highway Research Record, Hwy Res Board 1965

3A 207717
FABRICATION OF ORTHOTROPIC DECK SECTIONS FOR PORT MANN BRIDGE

Though in use in many parts of Europe for some years, orthotropic bridge decking is comparatively new on this continent. High labor cost as compared to European wage scales has inhibited its use in North America. Production line methods and equipment have been able to achieve efficiency and economy in this field, bringing orthotropic deck construction into competition in long-span bridge design and construction. /Author/

Smylie, RG Highway Research Record, Hwy Res Board 1966

3A 207728
MINIMUM REQUIRED SHEAR CONNECTORS BETWEEN SLABS AND STEEL STRINGERS IN COMPOSITE CONSTRUCTION BRIDGES

The study was undertaken in order to determine if satisfactory composite action of a concrete slab on steel beams could be obtained with a lesser number of shear connectors than required by AASHO specifications. Two alternative approaches were used: the elimination of shear connectors at the ends of the beam outside the central portion of the span where the moment capacity of the steel stringer alone was exceeded, and conversely, the provision of shear connectors only near the ends of the span to retard end slipage sufficiently to furnish composite action throughout the span. Three test beams incorporating each of the above two concepts were loaded statically at 2 points near midspan along with 3 control beams designed in accordance with AASHO specifications. The loading was increased from zero to three increments within the elastic range in turn and thence to ultimate. The results are presented in terms of observed deflection, strain and slip at the various load levels. It was concluded that the performance of the beams with shear connectors at the span ends only compared favorably with that of the control beams. It was pointed out, however, that the test program was limited to static tests and that fatigue loading effects on similar specimens should be investigated. /BPR/

Uyanik, ME Bramer, CR Robinson, JC North Carolina State University June 1964

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4610002 65)

3A 207748
ULTIMATE SHEAR STRENGTH OF PRESTRESSED CONCRETE BEAMS WITH WEB REINFORCEMENT

The report begins with a good summarization of the background, scope and objectives of the total study and of the previous work at Lehigh University and elsewhere on the shear strength of prestressed concrete. The Shear strength calculated from the ACI code, possibly due to cracking developed at transfer due to lack of end blocks, the slab span consisting of ten beams placed side-by-side with a 3-5/8 inch reinforced deck added without shear connectors, beams which evidenced good transverse load distribution, the system studied was concluded to have merit as a structural method with proper end anchorage. Further study of the prestressed tile unit behavior under repeated loading is needed before consideration for bridge members.

Zia, P Byrd, EM North Carolina State University June 1964

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4610002 65)

3A 207729
AN EXPERIMENTAL INVESTIGATION OF THE BEHAVIOR OF COMPOSITE PRESTRESSED TILE BEAMS AND SLAB

A series of experimental studies were conducted to observe the structural behavior of prestressed, prestressed concrete beams statically loaded individually and as components of a slab span with a concrete topping cast in situ. The prestressed beams were composed of hollow structural clay tile units mortared end to end with a pretensioned strand running lengthwise through the voids. The voids then served as a form for the addition of concrete to create an integral beam. All test beams were without concrete topping and five were designed without end blocks for individual tests. These developed cracking and separation with the transfer of prestress. Ten beams were incorporated in the composite slab and were cast with end blocks as were two other specimens intended for a study of prestress losses. Individual beam tests consisted of pure flexure and flexure shear loadings resulting in failures that were sudden and brittle. Theoretical moment capacity was developed but all beams tested in flexure-shear failed to develop the theoretical shear capacity calculated from the ACI code, possibly due to cracking developed at transfer. The beam span consisting of ten beams placed side-by-side with a 3-5/8 inch reinforced deck added without shear connectors, beams which evidenced good transverse load distribution. The system studied was concluded to have merit as a structural method with proper end anchorage.

Hanson, JM Halsbos, CL Lehigh University Apr. 1965

ACKNOWLEDGMENT:
CONSTRUCTION EQUIPMENT AND METHODS

A STUDY OF DETERIORATION IN CONCRETE BRIDGE DECKS

This study includes:

1. A detailed survey of deterioration of 610 bridge decks throughout Missouri.
2. Observation of construction procedures and testing of fresh concrete on bridge decks.
3. Analyses of cores taken from sound and deteriorated areas of bridge decks. The major findings from this study were:
   1. Fracture plane and surface mortar deterioration are the most serious type of bridge deck deterioration in Missouri.
   2. Fracture plane is associated with a built-in plane of weakness occurring in the plane of the top mat of reinforcing steel. Use of de-icing salts.
   3. Surface cracking, and depth of reinforcing steel, are not related to top slab mortar deterioration. There is an associated amount of mixing water, an insufficient amount of entrained air, the use of de-icing salt, and the severity of the frost action.

Acknowledgment: Bureau of Public Roads /US/ (4640002 65)

HORIZONTAL SHEAR CONNECTION IN COMPOSITE CONCRETE BEAMS UNDER REPEATED LOADING

Results of an investigation into fatigue strength of the joint in concrete composite members are presented. Twenty-three precast beams tested in fatigue. Twenty-two of the precast beams were I-beams or inverted T-beams with a relatively narrow joint and a rectangular slab placed on them. The twenty-third beam was a box-beam with a relatively wide joint but with the same type of slab on its top. The three principal variables were the amount of joint reinforcement, the roughness of the joint, and the amount of slab to effective depth. Particular attention was given to the relationship between diagonal tension cracking and cracking in the horizontal joint. Attention was also focused on the relationship between the development of cracking and slip at the joint, and the loss of composite action. Several of the test beams failed in flexure or in diagonal tension but most failed in the joint, some during the fatigue testing, and some during the subsequent static test to failure. Information was gained about the influence of the diagonal tension cracking on the joint failure and about the mechanism of joint failure. A criterion of joint failure has been defined so that the flexural capacity of the composite beam is essentially equal to that of a corresponding monolithic beam. This implies no extensive loss of composite action. An allowable joint shear stress for concrete composite beams under fatigue loading has been developed on the basis of the test results. Equations as functions of the three principal variables are recommended.

Acknowledgment: Bureau of Public Roads /US/ (4615192 66)

PERFORMANCE OF COMPOSITE LIGHTWEIGHT CONCRETE DECKS ON STEEL STRINGERS

Results are presented of a field and analytical study into the causes of cracking of lightweight concrete bridge slabs in Louisiana. The field study involved the determination of the present condition of 389 simply supported lightweight concrete bridge slabs built compositely with steel stringers. This included a crack size and distribution study and a determination of reinforcement embedment depth. Available construction records were reviewed, climatic conditions to which the structures had been subjected were studies along with the traffic history of each bridge. The analytical studies attempted to relate design criteria, dynamic behavior of the structure and concrete shrinkage to the present condition of the bridge. Some of the conclusions presented were:

1. There appears to be no reasonable relationship between slab deterioration and most of the variables involved in design and construction.
2. If the concrete cover was less than 3/4 inches, the cracks tended to coincide with reinforcement orientation. If the cover was larger, no relationship between cracks and reinforcement orientation could be found.
3. The strain at the reinforcement embedment depth as analytically determined are as great as the approximate tensile strength of the concrete.
4. The dynamic behavior analysis pointed to the assumption that for some span length and loading combinations, crack propagation is caused mainly by oscillations due to moving vehicles.

Acknowledgment: Bureau of Public Roads /US/ (4641126 67) 1C27020252, PB 176 067, 1C27021019

STUDY OF A PRECAST-PRESTRESSED MODEL BRIDGE SLAB

A half-scale concrete composite model bridge slab was studied to evaluate the structural performance of a 36-foot long, two-lane, highway bridge span. The proposed composite member is composed of a prestressed concrete channel, an interior void filled with a top slab, and bottom prestressed concrete channels. Theoretical analysis of the load distribution behavior of an orthotropic plate based on the Guyon-Massonnet distribution theory is presented. Application of the theory to this particular bridge system together with a sample calculation is presented in an appendix. A 18-foot long, 12 ft. 6 in. wide model bridge span consisting of five prestressed channels and a cast-in-place top slab was con-
CONSTRUCTION EQUIPMENT AND METHODS

3A 207904

STATIC BEHAVIOR OF CONTINUOUS-COMPOSITE-BOLTED BEAMS

A further investigation is described of the use of high strength bolts for a more rigid connection between a concrete slab and a steel beam. This investigation covers the behavior of the negative moment region of continuous-composite members loaded to failure. Each member tested consisted of a simply-supported span continuing into a cantilever. Load-deflection curves, strain profiles, and slip distribution curves were used in investigating the composite behavior of the members. Predicted loads were compared with the actual loads obtained. Six tension-pushout specimens were also investigated. Load-slip curves were determined and compared with those obtained from the composite members. Following are some of the conclusions made from this investigation: (1) because of the nature of the load-slip per bolt data for the composite members, a conclusion for the validity of using tension pushouts to predict connector behavior in a member can not be justified, (2) for those members with connectors over the negative moment regions, there was practically no slip at their working loads, (3) simple ultimate strength theory can be used to satisfactorily predict the ultimate capacity in the negative moment region of members with connectors over the negative moment regions, and (4) the elimination of connectors over the negative moment region of the composite member reduced the working the first yielding loads of that member by approximately 15%. 

4/19/89

Dallam, LN Gaudini, P
Missouri University, Columbia, Missouri State Highway Commission, Bureau of Public Roads /US/ 1969

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4613892 69)HRIS 27021380, HRIS 27021936, 3C27021653, PB 183 620

3A 207936

STUDY OF A PROPOSED PRECAST-PRESTRESSED COMPOSITE BRIDGE SYSTEM

The research efforts on Missouri Cooperative Research Project No. 67-1, “Study of Precast-Prestressed Composite Slabs” are summarized. A particular type of precast-prestressed composite box bridge system is proposed for use in highway bridge construction on primary and secondary roadways. The basic concept and design procedure, as well as an evaluation of the structural performance and an economic evaluation of the proposed system, are summarized. In addition to these summaries design recommendations for the proposed systems are made. 

Salmons, JR
Missouri University, Columbia, Missouri State Highway Commission, Bureau of Public Roads /US/ 1968

ACKNOWLEDGMENT: Bureau of Public Roads /US/ REPORT PENDING, HRIS 27021380, HRIS 27021446, 1C27022013, HRIS 27021653

3A 207938

COMPOSITE BRIDGE STRINGERS-FINAL REPORT

A summary is given of the results of an extensive research program established to determine the behavior and efficiency of shear connectors in the design of composite bridge members. Five previous detailed reports plus a bibliography have been issued and are listed. Items of particular interest to designers are the results of studies of stud shear connectors in lightweight concrete and the effect of haunches on composite design. Descriptions of the pushout tests, load-slip curves and stud shear connector capacity curves are included. Comparison of test results with 1967 design practice indicates that design is more conservative than necessary. 

Baldwin, JW
Missouri University, Columbia, Missouri State Highway Commission, Bureau of Public Roads /US/ 1969

ACKNOWLEDGMENT: Bureau of Public Roads /US/ REPORT PENDING, I27020250

3A 208629

A REPORT ON BRIDGE GIRDER WEBS SUBJECTED TO HORIZONTAL LOADS

In construction of plate girders, when no ground supported falsework is used, metal brackets bolted to the web of the exterior girders are used to support construction loads. The objective of this study was to investigate the web stresses and deformations which occur as a result of using temporary construction brackets. Four bracket types were studied experimentally under ideal conditions; a mathematical solution was established for a simplified bracket to predict the structural behavior of the web under lateral loads; and finally, web stresses and deflections due to temporary bracket loads were determined for an actual bridge under construction. Such stresses were 50 percent greater than comparable reinforced concrete beams. However, cracks appeared early in the tests. 

Zuk, W

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4613432 69)PB-184 953, I27021757

3A 207911

DOUBLE PLATED STEEL BRIDGE DECKS

Four special composite test panels were fabricated and tested. The test panel consisted of two thin parallel steel plates held together by a group of thin studs welded to the plates. The space between the plates was filled with an expanding cement-lightweight concrete. Two test panels were tested in flexure, and two in direct compression. The object of this pilot study was to see how such sandwich panels behaved under load. Results showed that the ultimate capacity of the panels was 50 percent greater than comparable reinforced concrete beams. However, cracks appeared early in the tests.


ACKNOWLEDGMENT, Bureau of Public Roads /US/ (4613892 69)HRIS 27021380, HRIS 27021936, 3C27021653, PB 183 620
3A CONSTRUCTION EQUIPMENT AND METHODS

WERE COMPARED WITH LABORATORY TESTS TO AID IN ACCURATELY DETERMINING THE BEHAVIOR OF A GIRDER WEB WHEN SUBJECTED TO HORIZONTAL LOADING. /AUTHOR/

Shoukry, Z
South Dakota Department Highways, South Dakota State Univ, Brookings, Federal Highway Administration /US/ Study No 646 (66)

ACKNOWLEDGMENT: Federal Highway Administration ( 4061-142) REPORT PENDING. 2C27022792

3A 208050 SELF-STRESSED SANDWICH BRIDGE DECKS PRESENTED IS AN ENTIRELY NEW TYPE OF BRIDGE DECK, CONSISTING OF AN UNREINFORCED LIGHTWEIGHT CONCRETE SLAB MADE OF EXPANDING CEMENT SANDWICHED BETWEEN TWO THIN PLATES OF STEEL. THE EXPANDING CORE SERVES TO PRESTRESS THE PANEL. LABORATORY TESTS WERE CONDUCTED ON THE CONCRETE TO DETERMINE PREDICTABLE RELATIONSHIPS FOR EXPANSION. LABORATORY TESTS WERE ALSO CONDUCTED ON TEN SMALL SCALE PANELS, SOME LOADED WITH A CONCENTRATED LOAD AND OTHERS LOADED WITH A UNIFORMLY DISTRIBUTED LOAD. INSTRUMENTATION WAS INSTALLED TO MEASURE STRAINS AND DEFLECTIONS. MATHEMATICAL THEORIES WERE ALSO DEVELOPED TO PREDICT BOTH THE PRESTRESSING AND EXTERNAL LOAD BEHAVIOR OF THE PANELS. A SATISFACTORY CORRELATION WAS FOUND BETWEEN THE TEST RESULTS AND THE THEORY. A COMPARATIVE STUDY OF THE PROPOSED SANDWICH PANELS AND STANDARD REINFORCED CONCRETE SLABS INDICATED THAT THE PROPOSED SANDWICH PANELS ARE SUBSTANTIALLY STRONGER AND STIFFER THAN CONCRETE SLABS USING THE SAME QUANTITY OF CONCRETE AND STEEL. /AUTHOR/

Zuk, W Sinha, R
Virginia Highway Research Council Nov. 1971

ACKNOWLEDGMENT: Federal Highway Administration NTIS PB 207841, 2C27022929

3A 208058 PART III: CONDITION OF 249 FOUR-YEAR-OLD BRIDGE DECKS 249 BRIDGE DECKS IN PENNSYLVANIA, WHICH ARE OVER 30 FEET IN LENGTH AND WERE BUILT IN 1966 WERE EXAMINED FOR SIGNS OF DETERIORATION. EVIDENCE OF FRACTURE PLANES, SPALLS, CRACKS, SURFACE MORTAR DETERIORATION, AND MINOR EVIDENCE OF DETERIORATION WERE EVALUATED. THIS DETERIORATION WAS FURTHER CLASSIFIED WITH ALL POSSIBLE FACTORS WHICH WERE BELIEVED TO INFLUENCE SUCH DETERIORATION, SUCH AS: STRUCTURAL STIFFNESS, DEPTH OF STEEL, SUPERSTRUCTURE TYPE, CONSTRUCTION PRACTICES, FLEXURAL STRENGTH OF THE CONCRETE, RETARDER USE, NUMBER OF SALT APPLICATIONS PER YEAR, FORM TYPE, SPAN LENGTH, MAXIMUM PLACEMENT TEMPERATURE, ANTISKID MATERIAL, AVERAGE DAILY TRAFFIC, DECING CHEMICAL TYPE, FINISHING MACHINE, AND AGGREGATE SOURCES. THREE PRIMARY CONCLUSIONS AND FINAL RECOMMENDATIONS WERE ADVANCED: (1) BOTH EXCELLENT AND POOR QUALITY BRIDGE DECKS CAN BE CONSTRUCTED USING PRESENT PRACTICES AND SPECIFICATIONS. IT APPEARS THAT SPECIFIC PRACTICES AND SPECIFIC MATERIALS CAUSE DETERIORATION. (2) DIFFERENT CONTRACTORS PRODUCE BRIDGE DECKS OF WIDELY DIFFERENT QUALITIES. THIS SUGGESTS THAT SOME CONSTRUCTION PRACTICES ARE BETTER THAN OTHERS IN REDUCING OR ELIMINATING THE THREE PRINCIPAL FORMS OF DETERIORATION. THE PRINCIPLE EXAMPLE OF THIS IS THE RECURRENT RELATIONSHIP WE OBSERVED BETWEEN FRACTURE PLANES AND SPALLS AND SHALLOW REINFORCING STEEL. CONTRACTORS WHO USE STRIP FORMING DECKS HAVE FAR FEWER CRACKS THAN CONVENTIONALLY FORMED DECKS. THEY EXHIBIT SOMewhat MORE MORTAR DETERIORATION (PRIMARILY EVIDENCED BY WEAR). /PSU/

Cady, PD Carrier, RE Bakr, TA Theisen, JC Pennsylvania State University, Pennsylvania Department Transp Dec. 1971, 153 pp

ACKNOWLEDGMENT: Federal Highway Administration REPORT PENDING. 2C27022797


ACKNOWLEDGMENT: Federal Highway Administration FHWA S0098, REPORT PENDING, 2C27023258

3A 208125 LOAD DISTRIBUTION IN A COMPOSITE STEEL BOX GIRDER BRIDGE FIELD TESTS WERE PERFORMED TO ASSESS THE BEHAVIOR OF A STEEL BOX GIRDER BRIDGE HAVING A COMPOSITE, CONCRETE ROADWAY DECK SLAB. THE STRUCTURE WAS INSTRUMENTED AT ONE MIDSPAN CROSS-SECTION AND A SECTION NEAR THE SUPPORT OF SPAN 20, ONE OF THE SIMPLE APPROACH SPANS, TO PERMIT STUDIES OF BENDING AND SHEAR STRAIN DISTRIBUTIONS. LIVE LOAD WAS APPLIED WITH A SIMULATED AASHO DESIGN TRUCK AND A DOUBLE GOOSE-NECK, LOWBED HAULER BALLASTED TO A GROSS LOAD OF 220,000 POUNDS. THEORETICAL ANALYSES WERE PERFORMED WITH A FINITE ELEMENT PROGRAM CALLED FINPA. LIVE LOAD MEMBRANE STRESSES WERE ACCURATELY PREDICTED BY THE PROGRAM, BUT FIBER STRAINS, ESPECIALLY IN THE TRANSVERSE DIRECTION, WERE GREATLY INFLUENCED BY PLATE WARPAGE AND INITIAL LOCAL, DEAD LOAD DEFLECTIONS. AS SUCH, LOCAL LOAD STRAINS WERE LARGER THAN THEORETICAL AND MAY HAVE BEEN INFLUENCED IN SOME DEGREE BY FALSEWORK. LOCAL AND LIVE LOAD DEFLECTIONS WERE APPROXIMATED BY THE THEORETICAL ANALYSIS, BUT THE PROGRAM OVER-ESTIMATED THE TORSIONAL STIFFNESS OF THE SUPERSTRUCTURE. LIVE LOAD STRAINS WERE NEGLIGIBLY CHANGED BY THE ADDITION OF CONCRETE BARRIER RAILINGS. LIVE LOAD SHEAR STRESSES NEAR THE SUPPORT WERE CORRECTLY PREDICTED BY THE PROGRAM ON THE UNLOADED SIDE, BUT THE MEASURED STRESSES DIFFERED IN MAGNITUDE AND VERTICAL DISTRIBUTION ALONG THE WEB
FROM THOSE PREDICTED BY THE PROGRAM ON THE LOADED SIDE; HOWEVER, THE STRUCTURE HAD BEEN MATHEMATICALLY MODELLED FOR ACCURATE PREDICTION ON MID-SPAN STRAINS RATHER THAN SHEAR STRESSES. /FHWA/

Davis, R.E. Castleton, GA California Department Transportation, California Department Public Works, Calif Business & Transportation Agency Res Rpt, June 1973

ACKNOWLEDGMENT: Federal Highway Administration FHWA S0205, NTIS PB 229 948/AS. 1C27023618

3A 208166 BRITISH IDEAS INFLUENCE WORLD BRIDGE BUILDING NEW CONCEPTS IN BRIDGE DESIGN DEVELOPED BY BRITISH ENGINEERS HAVE RESULTED IN LONGER, MORE ECONOMIC SPANS. THE EXTENSIVE USE OF WELDED STEEL BOX GIRDERS IN SPANS AND IN TOWERS AS WELL AS AN AERODYNAMIC DESIGN HAS DECREASED THE WEIGHT OF THE BRIDGES WHILE INCREASING STABILITY. THE USE OF STEEL BOX GIRDERS IN HPBRIDGES IS THE MOST AERODYNAMIC DESIGN HAS DECREASED THE WEIGHT OF THE BRIDGES WHILE INCREASING STABILITY. THE USE OF STEEL BOX GIRDERS IN HPB A RELATIVELY NEW CONCEPT IN THE CABLE CANTILEVER BRIDGE ARE COMPOSITE STRUCTURES OF STEEL AND CONCRETE WHICH WERE FOUND TO BE THE MOST PRACTICAL BUILDING MATERIALS. /CGRA/

Ripley, JG Engineering and Contract Record /Can/ June 1965


Inglis, F Heavy Construction News /Canada/ Dec. 1966

ACKNOWLEDGMENT: Canadian Good Roads Association

3A 208179 ALBERTA CUTS ERECTION TIME IN HALF BY PRECASTING PIER, DECK UNITS FOR BRIDGE THIS REPORT OUTLINES THE USE OF PRECAST, PRESTRESSED COMPONENTS FOR PIER AND DECK CONSTRUCTION, FOR A 288-FT. LONG STRUCTURE /OVERPASS/ ON HIGHWAY 16 NEAR EDMONTON. ON-SITE CONSTRUCTION TIME WAS REDUCED TO ABOUT HALF OF CONVENTIONAL METHODS. COST WAS COMPARABLE WITH CONSTRUCTION OF STANDARD OVERPASS BRIDGES OF THE SAME SPAN RANGE. /CGRA/

Hayter, R Heavy Construction News /Canada/ Jan. 1967

ACKNOWLEDGMENT: Canadian Good Roads Association

3A 208188 SEVEN GIANT TUNNEL SECTIONS ARE FLOATED OUT OF DRYDOCK THE LOUIS-HIPPOLYTE LAFONTAINE TUNNEL IS THE LARGEST PRESTRESSED PRECAST CONCRETE STRUCTURE IN THE WORLD. THE TUNNEL ITSELF IS 4,560 FT LONG AND IT FORMS PART OF A 3.5 MI. BRIDGE-TUNNEL COMBINATION THAT CROSSES THE ST. LAWRENCE RIVER AT THE EAST END OF MONTREAL. THE ENTIRE PROJECT WILL COST $50 MILLION, OF WHICH THE TUNNEL ALONE ABSORBS $42 MIL-

LION. THE TUNNEL WILL CARRY 6 LANES OF TRAFFIC AND IS ONE OF THE LAST REMAINING LINKS IN THE TRANS-CANADA HIGHWAY. THE ARTICLE DEALS WITH THE CONSTRUCTION AND PLACING OF THE SEVEN 360-FT LONG TUNNEL ELEMENTS EACH WEIGHING 32,000 TONS. /CGRA/

Caplan, B Engineering and Contract Record /Can/ July 1965

ACKNOWLEDGMENT: Canadian Good Roads Association


Branchaud, A Engineering Journal /Canada/ Apr. 1967

ACKNOWLEDGMENT: Canadian Good Roads Association

3A 208201 COMPOSITE STEEL-CONCRETE MULTI-BOX GIRDER BRIDGES A DISCUSSION OF BACKGROUND STUDIES OUT OF WHICH EVOLVED THE "CRITERIA FOR DESIGN OF STEEL-CONCRETE COMPOSITE BOX GIRDER HIGHWAY BRIDGES" IS GIVEN. AS WELL AS THE RESULTS OF DESIGN STUDIES ON SEVERAL BRIDGES USING THE CRITERIA. THE TYPE OF BRIDGE UNDER CONSIDERATION IS OF MODERATE LENGTH (UP TO 350 FEET) AND CONSISTS OF RECTANGULAR OR TRAPEZOIDAL SECTION STEEL GIRDERS MADE COMPOSITE WITH A REINFORCED CONCRETE DECK SLAB. /CGRA/

Fountain, RS Canadian Inst Steel Constrr, Toronto Feb. 1968

ACKNOWLEDGMENT: Canadian Good Roads Association

3A 208214 PIER SHAPE-UP FOR NEW CROSSING OF N.B.S. SAINT JOHN RIVER A BRIEF DESCRIPTION IS PRESENTED OF THE DESIGN AND METHODS BEING USED IN THE CONSTRUCTION OF THE BURTON BRIDGE WHICH WILL CROSS THE ST. JOHN RIVER 15 MILES BELOW THE CITY OF FREDERICTON, NEW BRUNSWICK. THE BRIDGE WAS FIRST DESIGNED FEATURING A CABLE-TAYED ORTHOTROPIC DECKED SUPERSTRUCTURE, BUT LATER THE DESIGN WAS CHANGED IN ORDER TO COPE WITH UNDESIRABLE WIND-BEHAVIOR CHARACTERISTICS. /CGRA/

Heavy Construction News /Canada/ Aug. 1969

ACKNOWLEDGMENT: Canadian Good Roads Association

3A 208258 ULTIMATE STRENGTH DESIGN FOR HIGHWAY BRIDGES AN ULTIMATE STRENGTH DESIGN METHOD FOR HIGHWAY BRIDGES IS PRESENTED. HIGHWAY BRIDGES HAVE VARIABLE LIVE LOAD CAPACITY, AND THE SMALLER BRIDGES CONTROL HIGHWAY SYSTEM CAPACITY. IT IS DEMONSTRATED THAT THE PRESENT MINIMUM CAPACITY IS 2.0 LIVE LOADS. A LOWER BOUND LOADING OF 1.5 DEAD LOADS PLUS 2.0 LIVE LOADS IS ADVOCATED FOR ALL COMMON BRIDGES. THIS LOADING IS APPLIED TO CONCRETE DECKS, REINFORCED CONCRETE GIRDERS, PRESTRESSED GIRDERS, COMPOSITE STEEL GIRDERS, TRUSSES, AND SUBSTRUCTURES. THESE HAVE INTERMEDIATE GRADE REINFORCING STEEL AND A36
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STRUCTURAL STEEL. CONCRETE GIRDER BRIDGES CAN BE COMPLETELY DESIGNED USING EXISTING SPECIFICATIONS. DEVELOPMENT WORK REMAINS TO BE DONE ON STEEL GIRDER BRIDGES AND TRUSSES. THE PROPOSED DESIGN METHOD OFFERS CONSISTENT SERVICE RATINGS AND MATERIAL ECONOMICS IN ALL COMMON BRIDGE TYPES. THE SAVINGS ARE ESTIMATED TO BE 4 PER CENT OF THE NATIONAL BRIDGE BUDGET. /AUTHOR/


ACKNOWLEDGMENT: Highway Res Abstracts Hwy Res Board

3A 208353
RECENT DEVELOPMENTS IN HIGHWAY BRIDGE DESIGN AND CONSTRUCTION
RECENT ADVANCES IN THE METHODS OF DESIGN AND CONSTRUCTION OF CONCRETE AND STEEL HIGHWAY BRIDGES IN GREAT BRITAIN AND ABROAD ARE PRESENTED. BASIC REQUIREMENTS OF GOOD DESIGN AND PROGRESS IN COMPUTER PROCEDURES ARE DISCUSSED. RESEARCH WORK CARRIED OUT BY THE ROYAL RESEARCH SOCIETY, BRITISH WELDING RESEARCH ASSOCIATION AND CEMENT AND CONCRETE ASSOCIATION AT VARIOUS UNIVERSITIES ON COMPOSITE CONSTRUCTION, CRACK CONTROL OF CONCRETE, BEHAVIOR OF BEARINGS AND EXPANSION JOINTS, STRENGTH OF FABRICATIONS, FATTY EFFECTS, PROTECTIVE TREATMENT OF STEEL AND DE-ICING OF BRIDGE DECKS IS VERY BRIEFLY DESCRIBED. /AUTHOR/

Kerensky, OA Inst Hwy Engineers Journal, London /UK/ July 1966

ACKNOWLEDGMENT: Highway Res Abstracts Hwy Res Board

3A 208306
PREFABRICATED COMPOSITE HIGHWAY BRIDGE UNITS WITH INVERTED STEEL T-BEAMS
A PREFABRICATED BRIDGE UNIT CONSISTING OF A CONCRETE DECK CONNECTED TO TWO STEEL INVERTED T-BEAMS BY STUDS WAS DEVELOPED TO MEET THE CURRENT NEED OF HIGHWAY ENGINEERS FOR A LOW-COST PREFABRICATED SHORT-SPAN BRIDGE UNIT THAT CAN BE RAPIDLY ERECTED. A MAIN FEATURE OF THIS PREFABRICATED COMPOSITE BRIDGES IS THAT, UNLIKE CONVENTIONAL COMPOSITE BEAM BRIDGES, THE STEEL T-BEAMS IN THESE UNITS HAVE NO TOP FLANGES. ANOTHER ADVANTAGE IS THAT MOST OF THE CONCRETE SHRINKAGE OCCURS BEFORE ERECTION, AND PRE-ERECTION SHRINKAGE CRACKS PARALLEL TO THE LONGITUDINAL AXES OF EACH UNIT WOULD BE UNLIKELY. THIS PRE-ERECTION SHRINKAGE CRACKS PARALLEL TO THE LONGITUDINAL AXES OF THE BRIDGE IN FINISHED STRUCTURE. DESIGNS ARE PRESENTED FOR UNITS WITH INVERTED STEEL T-BEAMS HAVING SEVERAL DIFFERENT UNITS WIDTHS AND DIFFERENT SPANS. IT APPEARS THAT UNITS WOULD BE BOTH STRUCTURALLY ADEQUATE AND ECONOMICAL.

Mcdermott, JF Highway Research Record, Hwy Res Board 1967

3A 208320
CORROSION-RESISTANT STEEL IN HIGHWAY BRIDGES
COST STUDIES INDICATE THAT CORROSION-RESISTANT HIGH STRENGTH LOW ALLOY STEELS HAVE DEFINITE ECONOMIC POSSIBILITIES FOR USE IN SHORT AND MEDIUM LENGTH HIGHWAY BRIDGES. THE STEEL COPPER-TITANIUM HIGH STRENGTH LOW ALLOY STEEL SHOULD BE USED DUE TO ITS BETTER RESISTANCE TO ATMOSPHERIC CORROSION. ANALYTICAL COST COMPARISONS ARE MADE OF THE SUPERSTRUCTURES OF TYPICAL SHORT SPAN CONCRETE SLAB AND ROLLED WIDE FLANGE STEEL STRINGER HIGHWAY BRIDGES FABRICATED FROM NICKEL-COPPER HIGH STRENGTH LOW ALLOY STEEL WITH THOSE FABRICATED FROM ASTM A7 AND A377 STEELS. COST COMPARISONS ARE MADE FOR WELDED I-SECTION STRINGERS WITH CONCRETE DECK FOR SHORT AND MEDIUM LENGTH HIGHWAY BRIDGES. THESE STRUCTURES ARE DESIGNED IN ACCORDANCE WITH STANDARD PRACTICE AND SPECIFICATIONS. COST COMPARISONS ARE MADE OF THE USE OF HIGH STRENGTH STEELS IN FORMS FOR HIGHWAY BRIDGES INDEPENDENT OF STANDARD DESIGN SPECIFICATIONS. A PRECAST HIGH STRENGTH CONCRETE DECK IS DESIGNED TO ACT INTERGRALLY WITH A ONE OR THREE CELL STEEL BOX GIRDER. A DESIGN PROCEDURE IS PRESENTED FOR THE COMPOSITE BOX SUPERSTRUCTURE. /ASCE/

Am Soc Civil Engr J Highway Div Apr. 1967

3A 208406
AN INVESTIGATION OF THE EFFECTIVE CONCRETE SLAB WIDTH FOR COMPOSITE CONSTRUCTION

Hagood, TA Guthrie, L Hoadley, PG American Institute Steel Construction Jan. 1968
CONSTRUCTION EQUIPMENT AND METHODS

3A 208434

CONTINUOUS INTEGRAL DECK CONSTRUCTION: A RATIONAL APPROACH TO PLACING STRUCTURAL DECK ON THREE-SPAN CONTINUOUS BRIDGE UNITS

ESTABLISHMENT OF STRUCTURAL CONCRETE SLABS ON THREE-SPAN CONTINUOUS STRUCTURES IS USUALLY ACCOMPLISHED BY SEGMENTAL PLACEMENT. THIS RESULT IS DIFFICULT TO OBTAIN PROPERLY CONSTRUCTED, SMOOTH RIDING SURFACES. WHEN COMPOSITE DESIGN AND CONSTRUCTION WAS ADOPTED, THE SEGMENTAL PRACTICE INTRODUCED OTHER UNDESIRABLE EFFECTS, AND THE BEAMS WERE RECEIVED TO PLACE THE STRUCTURAL SLAB WITH INTEGRAL WEARING COURSE ON THE THREE-SPAN CONTINUOUS UNITS ON THE BRUCKNER EXPRESSWAY IN THE BRONX, NEW YORK. THIS IS A DIVIDED STRUCTURE WITH AN OVER-ALL WIDTH OF 94 FEET. EACH STRUCTURE HAS A MINIMUM TRAVELWAY OF 37 1/2 FEET. THERE IS A 11-FOOT MALL BETWEEN THE TRAVELWAYS AND EACH THREE-SPAN CONTINUOUS UNIT IS APPROXIMATELY 210 FEET LONG. A FIELD RESEARCH PROGRAM WAS ESTABLISHED SO THAT DATA COULD BE OBTAINED RELATIVE TO DEFLECTION OF THE STRINGERS (THEORETICAL VS. ACTUAL), LOCATION OF THE REINFORCING STEEL TOGETHER WITH THE REQUIRED COVER, AND CONTROLLED ADDITION OF THE RETARDING ADMIXTURE, AS WELL AS A COMPLETE PHYSICAL REPORT OF THE CONSTRUCTION. THE RESULTS OBTAINED HAVE BEEN SIGNIFICANT IN THAT THIS STRUCTURE, WHICH IS 1 MILE LONG, HAS EXHIBITED MINIMAL CRACKING IN BUT A FEW OF THE MANY THREE-SPAN CONTINUOUS UNITS. THE RIDING QUALITY OF THIS STRUCTURES IS EXCEPTIONAL SINCE THE AVERAGE FINAL FIELD PROFILE VARIES FROM THE THEORETICAL PROFILE BY ONLY 0.020 FEET.

Britton, HB
Highway Research Board Bulletin 1962

3A 208466

CREEP IN PRESTRESSED LIGHTWEIGHT CONCRETE: A PROCEDURE, USING THE RATE-OF-CREEP METHOD, IS DEVELOPED FOR PREDICTING CREEP STRAINS, CAMBER, AND PRESTRESS LOSS IN PRETENSIONED, PRESTRESSED CONCRETE HIGHWAY BRIDGE BEAMS. THE PROCEDURE USES SHRINKAGE DATA AND CREEP PER PSI DATA, BOTH EXPRESSED AS FUNCTIONS OF TIME, DEVELOPED FROM SMALL-SCALE SPECIMENS. NON-LOADED PRETENSIONED, PRESTRESSED LIGHTWEIGHT CONCRETE BEAMS 5 X 8 IN. IN SECTION, 8 FT. LONG, WERE USED TO TEST THE PROCEDURE. CREEP AND PRESTRESS LOSSES TAKEN FROM THE BEAMS WERE COMPARED WITH VALUE PREDICTED BY USING THE PROCEDURE DEVELOPED IN THE PAPER. THE METHOD WAS EXTENDED TO ACCOMMODATE PRECAST PRESTRESSED BEAMS WITH CAST-IN-PLACE REINFORCED CONCRETE SLABS, AND LABORATORY BEAMS WERE TESTED TO VERIFY THE PROCEDURE. A FULL SIZE HIGHWAY BEAM AND SLAB WERE INSTRUMENTED FOR FIELD INSTALLATION TO CHECK OUT TECHNIQUES PROPOSED FOR USE IN A FULL SIZE HIGHWAY BRIDGE INSTALLATION. A FULL SIZE HIGHWAY BRIDGE USING PRECAST PRESTRESSED BEAMS AND CAST-IN-PLACE SLABS WAS INSTRUMENTED FOR PURPOSES OF TESTING THE PREDICTION METHOD. DATA COLLECTED FOR THE BEAMS HAS BEEN COLLECTED FOR APPROXIMATELY ONE YEAR. THE SLAB WAS BEING READIED FOR PLACING AT THE TIME OF WRITING. CREEP, SHRINKAGE, CAMBER, AND PRESTRESS LOSSES WERE TAKEN BY MEASUREMENTS OF STRAIN AND ELEVATIONS FROM THE BRIDGE BEAMS. PREDICTED CREEP, CAMBER, AND PRESTRESS LOSS BASED ON DATA FROM SMALL SPECIMENS ARE COMPARED WITH DATA FROM LARGE-SCALE SPECIMENS WITH THE 101N MECHANICAL STRAIN GAGE AND AN ENGINEERS LEVEL. REASONABLE AGREEMENT IS REACHED BETWEEN PREDICTIONS AND MEASUREMENTS. PRESTRESS LOSSES IN LIGHTWEIGHT FULL SIZE BRIDGE BEAMS ARE APPROXIMATELY 1% AND FOR NORMAL WEIGHT, APPROXIMATELY 14% AT 300 DAY AGE. /AUTHOR/

Furr, HL, Sinno, R
Texas Transportation Institute, Texas State Department of Highways & Public Transp Oct. 1967

3A 208498

LATERAL DISTRIBUTION OF LOAD IN MULTIBEAM BRIDGES: A SUMMARY IS PRESENTED OF RESEARCH CONDUCTED ON THE LATERAL DISTRIBUTION OF LOAD IN MULTIBEAM BRIDGES. THIS TYPE OF BRIDGE IS CONSTRUCTED FROM PRECAST RECTANGULAR BEAMS MADE OF EITHER REINFORCED OR PRESTRESSED CONCRETE. THESE BEAMS ARE PLACED SIDE BY SIDE ON THE ABUTMENTS AND THE INTERACTION BETWEEN THE BEAMS IS DEVELOPED BY CONTINUOUS LONGITUDINAL SHEAR KEYS AND LATERAL BOLTS THAT MAY OR MAY NOT BE PRESTRESSED. THE INVESTIGATION INCLUDED A FIELD TEST, A THEORETICAL STUDY, AND A SERIES OF TESTS ON A LARGE-SCALE MODEL BRIDGE. THE THEORY OF ORTHOTROPIC PLATES WAS USED TO ANALYZE THE MULTIBEAM BRIDGE. THE BENDING STIFFNESS IN THE LONGITUDINAL DIRECTION WAS CONSIDERED DIFFERENT FROM THE BENDING STIFFNESS IN THE LATERAL DIRECTION. THE STIFFNESS IN THE LATERAL DIRECTION IS DEPENDENT ON THE EFFICIENCY OF THE SHEAR KEYS AND LATERAL BOLTS. MEASURED DEFLECTION FROM TESTS WERE COMPARED WITH THE THEORETICAL CALCULATIONS. THE THEORY IS SHOWN TO YIELD A SOLUTION FOR THE DEFLECTION DISTRIBUTION WHICH AGREES VERY CLOSELY WITH THE EXPERIMENTAL RESULTS.

Hulsbos, CL
Highway Research Board Bulletin 1962

3A 208589

SELF-ANCHORED PRESTRESSED CONCRETE SUSPENSION BRIDGES WITH PARABOLIC CABLES: THE CONCEPT OF THE PRESTRESSED CONCRETE SUSPENSION BRIDGE WITH PARABOLIC CABLES AND VERTICAL SUSPENDERS IS EXPLORED. A SPECIMEN OF 100 M SPAN IS DESCRIBED. IT PROVED TO BE VERY ECONOMICAL. METHODS OF CONSTRUCTION OF THE SUPERSTRUCTURE OF SUCH BRIDGES AND METHODS OF PRESTRESSING THEM ARE REVIEWED. A DESIGN FOR A BRIDGE OF 350 M SPAN IS OUTLINED. IT WAS SUBMITTED IN A COMPETITION AND ALSO TURNED OUT TO BE VERY ECONOMICAL. THE ECONOMY OF PRESTRESSED CONCRETE SUSPENSION BRIDGE WITH TRIANGULAR SYSTEM OF SUSPENDERS IS PRESENTED.

Vandepitte, D
Suspension Bridges Symposium /Portugal/ Nov. 1966

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 208672

CONCRETE SLABS WITH PARTIALLY EMBEDDED STEEL-BEAM SUPPORTS: AN INVESTIGATION INTO A SYSTEM OF CONSTRUCTION WHICH PREVIOUSLY COULD NOT BE USED BY THE STRUCTURAL DESIGNER BECAUSE OF LACK OF KNOWLEDGE OF ITS BEHAVIOR IS DESCRIBED. TESTS WERE MADE WHICH SIMULATED REINFORCED CONCRETE SLABS SUPPORTED ON UNENCASED STEEL BEAMS AT VARIOUS LEVELS OF EMBEDMENT FROM 0 TO 80% OF THE EFFECTIVE SLAB DEPTH. THE RESULTS ARE PRESENTED IN THE FORM OF SIMPLE EQUATIONS AND CAN BE APPLIED WITH CONFIDENCE TO SLABS NOT EXCEEDING 150 MM DEPTH AND 3 M SPAN. /RRL(A)/

Docaster, AA Horsley, PD
Inst Civil Engineers Proc, London /UK/ Feb. 1970

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 208699

PERFORMANCE EVALUATION OF A PARTIALLY PRESTRESSED RIGID FRAME CONCRETE BRIDGE: THE CASCADE ORCHARDS BRIDGE IS A CONTINUOUS PARTIALLY PRESTRESSED RIGID FRAME CONCRETE BRIDGE. IT IS CONSTRUCTED FROM CAST-IN-PLACE CONCRETE BOX GIRDS...

Grant, A Clark, JH
Intl Symp Conc Bridge Des Proc /Can/ 1969

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 208701
CONTINUOUS PRECAST PRESTRESSED CONCRETE BRIDGE STRINGERS
A METHOD OF STANDARDIZING THE DESIGN OF PRECAST BRIDGE STRINGERS IS PRESENTED ALONG WITH THEORETICAL DESIGN AND CONSTRUCTION PROCEDURES FOR DEVELOPING CONTINUITY IN MULTISPAN PRECAST PRESTRESSED CONCRETE BRIDGES. EMPHASIS HAS BEEN PLACED ON THE IMPORTANCE OF STANDARDIZING THE DESIGN OF PRECAST CONCRETE UNITS TO REDUCE FABRICATION COST AND INCREASE PRODUCT QUALITY. CURRENT PRACTICE OF THE ILLINOIS DIVISION OF HIGHWAYS FOR DEVELOPING CONTINUITY IN MULTISPAN BRIDGES IS DESCRIBED. THE DESIGN INCORPORATES MILD STEEL REINFORCEMENT IN THE BRIDGE DECK, STEEL DWEL BARS AND A CONCRETE DIAPHRAGM BETWEEN STRINGERS. ADDITIONAL METHODS THAT HAVE BEEN STUDIED INCLUDE POST-TENSIONING AND MECHANICAL STEEL CONNECTING PLATES. /RRL/A

Jacobsen, FK
Intl Symp Conc Bridge Des Proc /Can/ 1969

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 208765
AN EXPERIMENT STUDY OF THE USE OF HIGH-STRENGTH FRICTION GRIP BOLTS AS SHEAR CONNECTORS IN COMPOSITE BEAMS
EXPERIMENTS WERE CONDUCTED ON THE USE OF THIS HIGH STRENGTH FRICTION-GRIP BOLT TO PROVIDE THE SHEAR CONNECTION BETWEEN THE CONCRETE SLAB AND STEEL BEAM IN COMPOSITE CONSTRUCTION. STATIC PUSH-OUT TESTS WERE MADE TO DETERMINE THE STRENGTH OF SUCH CONNECTORS. TESTS WERE ALSO MADE ON BEAMS, SOME WITH PRECAST AND OTHERS WITH CAST-IN-SITU SLABS USING THEM. THE RESULTS SHOW THAT THE HIGH-STRENGTH FRICTION-GRIP BOLT CAN BE USED AS AN EFFICIENT CONNECTOR IN COMPOSITE CONSTRUCTION. /RRL/A

Marshall, WT Nelson, HM Banerjee, HK Structural Engineer /UK/ Apr. 1971

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 208835
VIBRATION AND DEFORMATION OF ROLLED-BEAM AND PLATE-GIRDER BRIDGES
OBSERVATIONS ARE REPORTED ON THE VIBRATION AND DEFORMATION CHARACTERISTICS OF AN EIGHT-SPAN PLATE GIRDER BRIDGE CONSISTING OF FIVE SIMPLE SPANS AND TWO CONTINUOUS SPANS OF CONTINUOUS BEAM DESIGN, AND A CONTINUATION OF THE VIBRATION AND DEFLECTION STUDIES ON THE FENNVILLE BRIDGE, WHICH WAS PREVIOUSLY REPORTED. THE LATTER BRIDGE CONSISTS OF SIX SIMPLE SPANS OF ROLLED BEAM CONSTRUCTION WITH CONCRETE DECKING. ONE OF THESE SPANS WAS BUILT WITH COMPLETE CONSTRUCTION. THREE TYPES OF LOADING WERE USED—NORMAL COMMERCIAL TRUCK TRAFFIC WITH A MINIMUM OF CONTROL, CONTROLLED TESTING WITH TWO-AXLE TRUCKS, AND CONTROLLED TESTING WITH A SPECIAL THREE-AXLE TRUCK WITH AXLE SPACING IDENTICAL TO THAT FOR H20-S16 BRIDGE LOADING. OBSERVATIONS ARE REPORTED ON THE FREQUENCY OF VIBRATION, THE AMPLITUDE AND DURATION OF VIBRATION, AND THE DEFLECTION FOR THESE SPANS UNDER SIMILAR LOADING CONDITIONS. THE LATERAL DISTRIBUTION OF THE VIBRATION AND DEFLECTION AMONG THE LONGITUDINAL BEAMS IS SHOWN FOR SEVERAL ROLLED BEAM SPANS. A METHOD IS PRESENTED FOR CALCULATING THE NATURAL FREQUENCY OF A HIGHWAY SPAN WHICH CHECKS THE OBSERVATIONS WITHIN APPROXIMATELY THREE PERCENT. THE OCCURRENCE OF APPRECIABLE VIBRATION IS CORRELATED WITH THE TYPE, GROSS WEIGHT, AXLE SPACING, AND SPEED OF THE VEHICLE CAUSING VIBRATION. OTHER FACTORS INFLUENCING VIBRATION ARE DISCUSSED. THE EFFECT OF VEHICLE SEQUENCE ON VIBRATIONS AND THE EFFECT OF INDUCED IMPACT. THE DIFFERENCES IN BEHAVIOR OF THE VARIOUS SPANS ARE CORRELATED WITH PRESENT DESIGN CRITERIA. THAT IS, DESIGN LIVE LOAD PLUS IMPACT DEFORMATION AND DEPTH TO SPAN LENGTH RATIOS. /AUTHOR/

Foster, GM Oehler, LT Highway Research Board Bulletin 1956

3A 208903
RECENT DEVELOPMENTS IN PRECASTING OF HIGHWAY BRIDGES AND STRUCTURES
THE IMPORTANCE OF PRECASTING IS EMPHASIZED IN BRIDGE CONSTRUCTION. TWO DIFFERENT SYSTEMS OF PRECASTING ARE DESCRIBED: (1) COMBINING PRECAST STRINGERS WITH CAST-IN-SITU FLOOR SLABS RESULTING IN INTEGRAL STRUCTURES, (2) THE FIELD ASSEMBLY OF PRECAST BEAMS OR STRINGERS AND FLOOR SLAB PANELS SEPARATELY WHICH ARE WELDED TOGETHER WITH CONCRETE TO FORM AN INTEGRAL STRUCTURE. EXAMPLES ARE GIVEN OF THESE TWO SYSTEMS. THE USE OF PRECAST MEMBERS IN CULVERTS AND TUNNEL LINING IS ALSO DISCUSSED. RECOMMENDATIONS REGARDING PRECASTING ARE DISCUSSED AND A DISCUSSION IS INCLUDED ON THE ADVANTAGES OF PRECASTING HIGHWAY BRIDGES AND STRUCTURES IS INCLUDED. EXPERIENCE IN PRECASTING BRIDGES HAS SHOWN THAT THE METHOD RESULTS IN SAVING OF TIME, LABOR, AND MONEY.

Memian, RB Highway Research Board Bulletin Aug. 1951

3A 208939
CORROSION AND CORROSION PROTECTION OF TENDONS IN PRESTRESSED CONCRETE BRIDGES
THE RESULTS OF AN EXTENSIVE STATE-OF-THE-ART SURVEY ARE REPORTED. ALTHOUGH THE CORROSION OF PRESTRESSING STEEL IS NOT A COMMON PROBLEM, IT HAS OCCASIONALLY CAUSED SERIOUS AND DANGEROUS FAILURES. CORROSION OF TENDONS IS CAUSED MOSTLY BY IMPROPER CONSTRUCTION TECHNIQUES INCLUDING HANDLING, STORAGE AND SHIPMENT, AND TO A DEGREE, BY IMPROPER DESIGN, HIGH QUALITY, DENSE, AND IMPERVIOUS CONCRETE OR GROUT CAN FURNISH PERMANENT CORROSION PROTECTION IN MOST ENVIRONMENTS TO WHICH A HIGHWAY BRIDGE IS EXPOSED, PROVIDED THAT CERTAIN REQUIREMENTS ARE SATISFIED. RECOMMENDED CORROSION PREVENTING MEASURES OF A CIVIL ENGINEERING CHARACTER ARE DISCUSSED IN DETAIL. /AUTHOR/

Sizlrd, R Am Concrete Inst Journal & Proceedings Jan. 1969

3A 208960
SHEAR TRANSFER IN REINFORCED CONCRETE

Sizlrd, R Am Concrete Inst Journal & Proceedings Jan. 1969
CONSTRUCTION EQUIPMENT AND METHODS

FOR THE CALCULATION OF SHEAR TRANSFER STRENGTH IN INITIALLY UNCRACKED CONCRETE, BASED ON THE ZIA ENVELOPE TO MOHR CIRCLES REPRESENTING FAILURE CONDITIONS FOR CONCRETE. /AUTHOR/

Tennessee Department of Highways May 1969

3A 209017
FLOATING CAISSON FOUNDATIONS

DESIGNS ARE PRESENTED OF TWO FOUNDATIONS FOUNDED UPON A NEW FLOATING CAISSON TYPE FOUNDATION. THE STRUCTURE CONSISTS OF TWO TANKS, ONE AT EACH END OF THE CITY AREA ARE PIER 57 AND THE NYACK-TARRYTOWN BRIDGE. ABOUT 85 PERCENT OF THE LOAD OF THE PIER AND 65 PERCENT OF THE LOAD OF THE BRIDGE ARE CARRIED BY BUOYANCY. GEOLOGIC PROFILES AND FLOATING CAISSON FOUNDATIONS STRUCTURES ARE PRESENTED. DETAILS OF THE ACTUAL CONSTRUCTION PROCESS ARE REVIEWED. THE FINISHED PIER CONSISTS OF A FLOATING PIER ELIMINATED THE NEED FOR LONG EXPENSIVE PILES FOR THE FINGER PORTION. THIS METHOD PRODUCED AN EFFICIENT, HIGH-CAPACITY, MODERN PIER CONSTRUCTED ON POOR FOUNDATION MATERIALS FOR ABOUT THE SAME AMOUNT OF MONEY AS WOULD BE REQUIRED FOR A SIMILAR PIER ON REASONABLY GOOD FOUNDATION MATERIALS. THE DESIGN HAS BEEN MADE OF ABOUT 36,000 GALLONS. THE WAS FOUND ECONOMICAL TO PUT ATTACHMENTS NEAR THE FOOT OF STEEL PILES IN ORDER TO INCREASE THEIR BEARING CAPACITY. THE DESIGN OF ATTACHMENTS FOR SUCH PROJECTS IS DESCRIBED. A VERY LARGE SAVING IN COST WAS PROVIDED BY DESIGNING THE PILES TO DEVELOP THEIR BEARING CAPACITY IN THE STRATIFIED SILT AND SAND LAYER OVERLYING THE DEEP CLAY DEPOSIT.

Low, J Highway Research Board Special Reports 1960

3A 209021
PHASE I REPORT ON AN EVALUATION OF BRIDGE VIBRATION AS RELATED TO BRIDGE DECK PERFORMANCE. A SERIES OF FIELD TESTS OF A CONDONED ON 11 TYPICAL HIGHWAY BRIDGES IN TENNESSEE TO DETERMINE THE INFLUENCE OF BRIDGE VIBRATION ON BRIDGE DECK PERFORMANCE. THE THEORETICAL FREQUENCIES AND STATIC DEFORMATIONS DUE TO THE CONTROL LOAD WERE COMPUTED FOR EACH BRIDGE. A WILD THEODOLITE WAS USED TO VISUALLY OBSERVE THE AMOUNT OF DEFORMATION CAUSED BY THE VIBRATION. THE CONTROL LOAD WAS A SCALES TRUCK WITH A GROSS LOAD OF ABOUT 36,000 POUNDS. THE TRUCK WAS DRIVEN OVER THE BRIDGE AT A CRAWL SPEED, 20 MPH AND 40 MPH. A COMPUTER PROGRAM WAS DEVELOPED FOR THE STATIC DEFORMATION CALCULATIONS AND THE COMPUTATION OF THE NATURAL FREQUENCIES OF VIBRATION AND ASSOCIATED MODAL SHAPES FOR ANY BRIDGE. THE PROGRAM USES A FINITE DIFFERENCE TECHNIQUE TO FORMULATE THE CHARACTERISTIC EQUATIONS. ONE BRIDGE WAS INSTRUMENTED WITH FOIL STRAIN GAGES AT FIVE Locations TO CHECK THE GAGING TECHNIQUE AND DETERMINE THE STRAINS CREATED IN THE BRIDGE DUE TO NORMAL TRAFFIC TRANSVERSE CRACKING WAS MORE EVIDENT ON THE BRIDGES SUBJECTED TO HIGHER VOLUMES OF TRAFFIC. THE CONTINUOUS SPAN STEEL BRIDGES DISPLAYED THE MOST CRACKING THAT WOULD BE ASSOCIATED WITH TRAFFIC INDUCED VIBRATIONS VARIABLES WHICH DETERMINE THE INFLUENCE OF BRIDGE VIBRATION ON BRIDGE DECK PERFORMANCE ARE CONSTRUCTION METHODS, SELECTION AND HANDLING OF MATERIALS AND MIX DESIGN. BRIDGES WITH HIGHER FREQUENCIES GENERALLY HAD THE LEAST AMOUNT OF CRACKING, THE HIGHER FUNDAMENTAL FREQUENCIES ARE ASSOCIATED WITH CONCRETE AND PRESTRESSED BRIDGES.

Goodpasture, DW Goodwin, WA Am Concrete Inst Journal & Proceedings Feb. 1969

3A 209038
HIGH STRENGTH BOLT SHEAR CONNECTORS-PUSHOUT TESTS


Dallam, LN Am Concrete Inst Journal & Proceedings Sept. 1968

3A 209109
TURKISH PROGRESS: THE JOINING OF EAST AND WEST


World Construction Nov. 1969

3A 209171
A METHOD OF LAYING LOW VOLTAGE HEATING ELEMENTS IN A BRIDGE SURFACING

IN THE CONSTRUCTION OF LOW-VOLTAGE ROAD HEATING INSTALLATIONS WITH STEEL MESH HEATING ELEMENTS, ENGINEERING PROBLEMS ARISE BECAUSE OF THE DIFFICULTY IN SECURING THESE ELEMENTS TO THE ROAD. SECURANCE IS NECESSARY IN ORDER TO PREVENT DISTORTION BY ROAD LAYING MACHINERY AND BY THE THERMAL EXPANSION DUE TO THE APPLICATION OF HOT ASPHALT. THIS PROBLEM IS ACCENTUATED ON BRIDGES BECAUSE OF THE PRESENCE OF A WATERPROOF MEMBRANE ON THE BRIDGE DECK WHICH SHOULD NOT BE PUNCTURED IN SEVERAL PLACES. STEEL MESH HEATING ELEMENTS, IN A BRIDGE SURFACING USING STEEL STRIP HEATING ELEMENTS LAYED BENEATH A MASTIC WATERPROOFING MEMBRANE IS DESCRIBED. /AUTHOR/
3A 209240
CONCRETE MASONRY STRUCTURES--DESIGN AND CONSTRUCTION

RECOMMENDATIONS ARE PROVIDED FOR THE DESIGN AND CONSTRUCTION OF REINFORCED AND NONREINFORCED CONCRETE MASONRY STRUCTURES. USING UNITS MANUFACTURED TO ASTM SPECIFICATIONS. THE MANUFACTURING PROCESS ITSELF IS NOT DISCUSSED, AND MORTARLESS MASONRY AND CONSTRUCTION USING RESIN-TYPE ADHESIVES BETWEEN THE UNITS ARE NOT COVERED. DESIGN RECOMMENDATIONS BASED ON THE WORKING STRESS METHOD GIVE ALLOWABLE STRESSES FOR BOTH REINFORCED AND NONREINFORCED MASONRY. CONSTRUCTION RECOMMENDATIONS INCLUDE CHAPTERS ON MATERIALS AND THE SPECIFICATIONS; MORTAR AND GROUT, PREFERRED CONSTRUCTION PRACTICES; DETERMINATION OF MASONRY STRENGTH; INSPECTION, CONNECTIONS TO EMBEDDED AND ADJOINING CONSTRUCTION; AND REINFORCING BAR DETAILS. DESIGN CHAPTERS DEAL SEPARATELY WITH REINFORCED WALLS AND COLUMNS AND NONREINFORCED WALLS AND COLUMNS, SHEAR, BOND, AND ANCHORAGE PROVISIONS ARE GIVEN FOR REINFORCED MASONRY. RECOMMENDATIONS FOR CONTROL OF WALL MOVEMENTS ARE MADE, AND CONSTRUCTION OF MASONRY VENEERS, SCREEN WALLS, AND FENCES IS DESCRIBED. NEARLY 200 TERMS RELATING TO MASONRY DESIGN AND CONSTRUCTION APPEAR IN THE APPENDIX. /AUTHOR/

3A 209258
CONCRETE BEAMS WITH PRESTRESSED REINFORCEMENT

TESTS ON SIX RECTANGULAR BEAMS REINFORCED WITH VARIOUS AMOUNTS OF DEFORMED STEEL BARS AND PRECAST PRESTRESSED CONCRETE PRISMS ARE REPORTED. METHODS ARE SUGGESTED FOR COMPUTING THE MOMENT CAUSING CRACKING OF THE IN SITU CONCRETE AND THAT CAUSING CRACKING OF THE PRESTRESSED REINFORCEMENT. AFTER CRACKING OF PRESTRESSED REINFORCEMENT, AND UP TO COMMENCEMENT OF YIELD OF NONPRESTRESSED TENSION REINFORCEMENT, FLEXURAL ANALYSIS COULD BE DONE USING SAME ASSUMPTIONS OF CLASSIC WORKING STRESS DESIGN BY ASSOCIATING TO THE COMBINED AREA OF STRAND AND DEFORMED BARS A PSEUDOMODULUS AT LEAST TWICE THAT OF ORDINARY STEEL. DURING THAT STAGE IT WAS FOUND THAT FOR SIMILAR BEAMS WITH EQUAL TOTAL AREAS OF TENSION REINFORCEMENT, THE RATIO BETWEEN THEIR MAXIMUM CRACK WIDTHS WAS PRACTICALLY EQUAL TO THE INVERSE OF THEIR RESPECTIVE PSEUDO MODULI. STRAIN HARDENING EFFECTS SHOULD BE TAKEN INTO CONSIDERATION IN ESTIMATING ULTIMATE MOMENT CAPACITY OF BEAMS REINFORCED WITH SUCH COMPOSITE REINFORCEMENT. /ASCE/


3A 209354
CONCRETE BOX-GIRDER BRIDGES AS SANDWICH PLATES

A RELATIVELY SIMPLE, ACCURATE METHOD FOR THE COMPLETE DETERMINATION OF INTERNAL MOMENTS, SHEARS, AND BENDING MOMENTS FOR BOX GIRDER BRIDGES WITH STATICALLY APPLIED EXTERNAL LOADS HAS BEEN DEVELOPED AND IS DESCRIBED. THE METHOD OF ANALYSIS USED IS BASED ON THE CONCEPT OF REPLACING THE ACTUAL STRUCTURE BY AN EQUIVALENT UNIFORM PLATE WHICH MODELS THE BEHAVIOR OF THE ACTUAL STRUCTURE. THE OBJECTIVES OF THE STUDY, WHICH ARE ANALYZED IN DETAIL, ARE A DISCUSSION OF THE BASIS AND APPLICABILITY OF THE ANALYSIS OF BOX GIRDER BRIDGES BY SANDWICH PLATE THEORY. PRESENTATION AND SOLUTION OF THE GOVERNING EQUATIONS FOR THE BOUNDARY CONDITIONS AND LOADINGS CONSIDERED; THE DEVELOPMENT OF PROCEDURES FOR COMPUTING GOVERNING STIFFNESS PARAMETERS; AND PRESENTATION OF RESULTS DERIVED FOR A SAMPLE STRUCTURE AND COMPARISON OF PREDICTED BEAM BENDING MOMENTS WITH CORRESPONDING QUANTITIES MEASURED IN A FULL SCALE FIELD TEST BRIDGE. /AUTHOR/

3A 209434
WELDED BRIDGES

WELDED BRIDGES CONSTRUCTED IN THE UNITED STATES, CANADA, AND IN FOREIGN COUNTRIES ARE REVIEWED, PARTICULARLY VARIOUS PRACTICES IN SPECIFYING STEEL MATERIALS, DETAILS OF DESIGN, AND METHOD OF CONSTRUCTION. THE RESULTS OF GERMAN FATIGUE TESTS ON WELDED BEAMS, FATIGUE PRACTICES IN GIRDERS AND STRINGERS OF RIVETED BRIDGES, AND THE REPAIRS THAT WERE MADE BY WELDING ARE PRESENTED.

Groves, L Welding Journal American Welding Soc

ACKNOWLEDGMENT: Highway Research Board Proceedings

3A 209453
COMPOSITE CONSTRUCTION FOR I-BEAM BRIDGES

A COMPOSITE BRIDGE IS DESCRIBED CONSISTING OF LONGITUDINAL STEEL I BEAMS SUPPORTING A REINFORCED-CONCRETE SLAB CONNECTED TO THE BEAMS IN SUCH A MANNER THAT THE BRIDGE ACTS SIMILARLY TO A MONOLITHIC STRUCTURE. THREE SUBJECTS ARE TREATED: (1) THE BEHAVIOR OF COMPOSITE STEEL AND CONCRETE T BEAMS, (2) THE FUNCTION AND ACTION OF THE SHEAR CONNECTION BETWEEN THE CONCRETE SLAB AND THE STEEL I BEAMS, AND (3) COMPARISON BETWEEN COMPOSITE AND NONCOMPOSITE CONSTRUCTION. IT IS SHOWN THAT THE COMPOSITE STRUCTURE IS TOUGHER THAN ITS NONCOMPOSITE COUNTERPART BUT THAT THIS GREATER TOUGHNESS WILL BE REALIZED FULLY ONLY IF THE SHEAR CONNECTION BETWEEN THE STEEL BEAMS AND THE CONCRETE SLAB AT ALL STAGES OF LOADING UP TO THE ULTIMATE CAPACITY OF THE STRUCTURE. CRITERIA FOR THE DESIGN OF SUCH COMPOSITE T BEAMS AND THEIR SHEAR CONNECTIONS ARE ALSO DISCUSSED. /AUTHOR/

Viest, IM Siess, CP Highway Research Board Proceedings 1953

3A 209468
PROBLEMS IN FABRICATION AND ERECTION OF HIGH-STRENGTH STEELS

THE TYPES OF BRIDGE STRUCTURES ON WHICH HIGH-STRENGTH STEELS HAVE BEEN USED AND AN OUTLINE OF THE TYPES OF STEELS SUITABLE FOR HIGH-STRENGTH PURPOSES IS DISCUSSED. THE MAIN DIFFERENCES IN FABRICATION BETWEEN THESE STEELS AND ORDINARY CARBON STEEL ARE COVERED AND ALSO THE DIFFERENCES IN ERECTION. PROCESSES TO BE OBSERVED IN DESIGN TO ASSURE THAT PROPER DETAILING OF HIGH-STRENGTH STEEL MEMBERS IS ACCOMPLISHED ARE MENTIONED. /AUTHOR/

Ball, EF Highway Research Board Proceedings 1957

3A 209504
INDUSTRIALIZED BRIDGE BUILDING

SEVERAL TYPES OF PREFABRICATED BRIDGE SYSTEMS ARE DESCRIBED. THE UNIT MODULE CONSTRUCTION CONSISTS OF CLIPPING ON PRECAST DECK PANELS COMPLETE WITH FULL ROADWAY WIDTH AND CURBS. ANOTHER TYPE OF BRIDGE USING PRECAST, PRESTRESSED COMPONENTS, INCLUDING PINS, IS CALLED LINEAR COMPONENT CONSTRUCTION. THE
CONSTRUCTION EQUIPMENT AND METHODS

DECK MEMBERS ARE EITHER T OR INVERTED U SHAPE, SPANNING BETWEEN SUPPORTS. FOR SHORT SPAN BRIDGES UP TO 50 FEET, EXTRUDED PRESTRESSED CONCRETE SECTIONS CAN BE INCORPORATED INTO THE STRUCTURE. FOR MEDIUM AND LONG SPAN BRIDGES, PREFABRICATED CONCRETE MODULES USUALLY AS FULL WIDTH HOLLOW BOX SECTIONS ARE USED AS SPANNING ELEMENTS. A MOBILE, DEMONSTRABLE, REUSABLE FRICTION TRUSS OF STEEL IS USED FOR PLACING PRECAST CONCRETE UNITS. THE SLIP CASTING AND TECHNIQUE MEANS THAT THE BRIDGE CAN BE ASSEMBLED ADDICTION TO THE STRUCTURAL SYSTEMS, SLID ONTO ITS PINS. ALTHOUGH THIS SYSTEM HAS BEEN USED ONLY FOR STEEL STRUCTURES, IT CAN BE ADAPTED FOR PRESTRESSED CONCRETE SPANS AS WELL. /AUTHOR/

Zuk, W Constructor Apr. 1971

3A 209540
ORTHOGRAPHIC SANDWICH PLATES
A DYNAMIC RELAXATION SOLUTION IS PRESENTED FOR THE SMALL DEFLECTION BEHAVIOR OF RECTANGULAR ORTHOTROPIC AND ISOTROPIC SANDWICH PLATES OF UNIFORM OR VARYING CROSS SECTION AND SUBJECTED TO ANY SYSTEM OF NORMAL LOADING. THE NECESSARY THEORY FOR THE TREATMENT OF ANY ADDITIONAL IN-PLANE LOADING IS ALSO INCLUDED. ANY COMBINATION OF SIMPLY SUPPORTED, FIXED OR FREE EDGES MAY BE SPECIFIED AND ADVANTAGE MAY BE TAKEN OF SYMMETRY ABOUT EITHER OR BOTH CENTER LINES WHEN IT EXISTS. THE ACCURACY OF THE METHOD HAS BEEN VERIFIED BY COMPARISON WITH EXISTING SOLUTIONS. THE DYNAMIC RELAXATION COMPUTER PROGRAM IS USED TO OBTAIN THE SOLUTIONS FOR A NUMBER OF NORMAL LOAD CASES FOR BOTH ISOTROPIC AND ISOTROPIC PLATES. FOR WHICH SOLUTIONS BY OTHER METHODS ARE ALREADY AVAILABLE. THE PRESENT SOLUTIONS HAVE BEEN SHOWN TO BE IN EXCELLENT AGREEMENT WITH THE EXISTING ONES. THE APPLICATION OF THE SANDWICH PLATE ANALOGY TO THE SOLUTION OF CERTAIN OTHER PLATES OR PLATE-LIKE STRUCTURES UNDERGOING APPRECIABLE VER- HICAL SHEARING DEFORMATIONS, VIZ., HOMOGENEOUS THICK PLATES AND MULTICELL AND VOIDED BRIDGE DECKS. IS THE DISCUSSED. /AUTHOR/

Issiu, AK Dawson, JM Inst Civil Engineers Proc. London /UK/ 1970

3A 209570
DESIGN AND CONSTRUCTION OF NEWPORT BRIDGE
THE EAST PASSAGE CROSSING OF NARRAGANSETT BAY WAS FORESTALLED BY U.S. NAVAL OPERATIONS UNTIL 1964, WHEN A SUITABLE SITE BECAME AVAILABLE WITH THE REQUIREMENT THAT MINIMUM CLEARANCES OF 1600 FT HORIZONTAL AND 205 FT VERTICAL WERE MAINTAINED. THIS CONDITION, PLUS ELEGANT REQUIREMENTS, DEMANDED A SUSPENSION BRIDGE. A CENTRAL GORGE IN THE ALIGNMENT NECESSITATED DEEP PILES. THE NECESSITY, PRESSURE GENERATION REQUIREMENTS AND SPECIFICATION STANDARDS ARE PRESENTED AND ANALYZED. FURTHER CONSIDERATIONS ARE: PLACEMENT TECHNIQUES, CONSTRUCTION PRACTICES, TEMPERATURE ADJUSTMENTS TO THE JOINT, RANDOMLY REMOVED REQUIREMENTS. DESIGN OF SKewed STRUCTURES, AND STRONGER BEARING DEVICES, SUCH AS THOSE INCORPORATING FLUOROCARBONS.

Watson, SC Haylock, NC DISCUSSER Australian Road Research Board Proc Vol. 5 1970, pp 70-112, 37 Fig, 47 Phot, 2 Ref

3A 209571
NEWPORT BRIDGE SUPERSTRUCTURE

Hedefine, A Siano, LG Am Soc Civil Engr J Structural Div Nov. 1971 HRIS 27 220691, IP27220692

3A 209655
A CONCEPT OF PRE-ENGINEERED, PRE-FABRICATED, PRESTRESSED MODULAR AND MULTI-MODULAR SEALING SYSTEMS FOR OUR MODERN BRIDGES AND STRUCTURES, WITH DISCUSSION AND CLOSURE
HEAVY DUTY SEAL CONFIGURATIONS, CAPABLE OF EXTENDING THE SERVICE LIFE OF BRIDGES, ARE NEEDED TO ALEIViate THE PROBLEM OF RISING CONSTRUCTION COSTS AND TO MAKE REPAIRS LESS COSTLY AND DANGEROUS. THE SIMILARITY OF BRIDGE JOINT ENVIRONMENTS, WHETHER THE BRIDGE BE OF SUSPENSION, CONTINUOUS, STEEL ARCH, CONTINUOUS HOLLOW STONE, CANTILEVER, OR BOX TYPE STRUCTURE, AS A CURING COMPOUND CORROSION. IN ADDITION, THE APPLICATION OF SANDWICH PLATE ANALOGY TO THE SOLUTION OF CERTAIN OTHER PLATES OR PLATE-LIKE STRUCTURES UNDERGOING APPRECIABLE VERTICAL SHEARING DEFORMATIONS, VIZ., HOMOGENEOUS THICK PLATES AND MULTICELL AND VOIDED BRIDGE DECKS. IS THE DISCUSSED. /AUTHOR/

Watson, SC Haylock, NC DISCUSSER Australian Road Research Board Proc Vol. 5 1970, pp 70-112, 37 Fig, 47 Phot, 2 Ref

3A 209659
DEVELOPMENT LENGTH OF STRANDS IN PRESTRESSED PANNEL SUBDECKS
THIS REPORT DESCRIBES THE RESULTS OF FIELD AND LABORATORY STUDIES OF PRESTRESSED CONCRETE PANELS OF THE TYPE PROPOSED FOR USE AS A NEW METHOD OF HIGHWAY BRIDGE CONSTRUCTION. TWENTY PANELS, UTILIZING TWO DIFFERENT STRANDS, BOTH OF WHICH ARE BEARING PLATES, BUT WITH VARIABLE YIELDING FOR CONTROLLED LOWERING OF THE REMAINING PIERS, SOME WERE CONSTRUCTED ON LINES OR IN THE DRY; AND OTHERS ON CAISSONS DRILLED INTO ROCK. THE TECHNIQUE USED FOR THE WEST ANCHORAGE. SIGNIFICANT FEATURES OF THE BRIDGE STRUCTURE INCLUDE SHOP-FABRICATED PARALLEL-WIRE CABLES, A UNIQUE CABLE ANCHORAGE PLATE, AND GIANT VARIOUSLY WRAPPED, AND A NEW CONCRETE DECK CURING-PROTECTIVE COMPOUND. /ASCE/

CONSTRUCTION EQUIPMENT AND METHODS

DEVELOPMENT LENGTH WAS REQUIRED FOR 3/8 IN. DIAMETER, 7-WIRE STRANDS PRESTRESSED WITH A FORCE OF 13M75 KIPS. AN AVERAGE DEVELOPMENT LENGTH OF 34 IN. WAS REQUIRED FOR 1/2 IN. DIAMETER STRANDS PRESTRESSED WITH A FORCE OF 27.50 KIPS. CYCLIC LOADING WAS FOUND TO HAVE NEGLIGIBLE EFFECT ON STRAND DEVELOPMENT LENGTH OR ON PANEL STIFFNESS.

Jones, HL Furr, HL
Texas Transportation Institute
Dec. 1970, 63 pp, 27 Fig, 4 Tab, 11 Ref

3A 209691
SHORT-TIME DEFLECTIONS OF BEAMS UNDER SINGLE AND REPEATED LOAD CYCLES
A SIMPLE AND EFFICIENT DESIGN PROCEDURE FOR PREDICTING THE ENTIRE SHORT-TIME LOAD DEFLECTION CURVE (OR A SINGLE POINT, SUCH AS AT MAXIMUM LOAD) UNDER REPEATED LOAD CYCLES INTO CRACKING RANGE IS PRESENTED. THIS INCLUDES THE LOADING, RECOVERY, AND RELOADING PARTS OF THE LOAD DEFLECTION CURVE. THE I-EBF (EFFECTIVE MOMENT OF INERTIA) CONCEPT ADOPTED BY ACI 318071 FOR PREDICTING DEFLECTIONS OF REINFORCED BEAMS IS EXTENDED TO BOTH PRESTRESSED AND REINFORCED BEAMS UNDER REPEATED LOAD CYCLES (INCLUDING VARYING LOAD LEVELS) INTO THE CRACKING RANGE. THE RELIABILITY OF THE PROCEDURE IS INDICATED BY COMPARISONS BETWEEN COMPUTER RESULTS AND EXPERIMENTAL DATA OF THIS STUDY FOR 15 PRESTRESSED CONCRETE BEAMS (NINE NONCOMPOSITE AND SIX COMPOSITE), AND WITH DATA IN THE LITERATURE FOR REINFORCED CONCRETE BEAMS. (AUTHOR)

Kripnarayanan, KM Branson, DE
Am Concrete Inst Journal & Proceedings
Vol. 69 No. 2, Feb. 1972, pp 110-17, 5 Fig, 2 Tab, 12 Ref

3A 209763
INVESTIGATION OF CORROSION IN THE STEEL H-PILES SUPPORTING THE RICHMOND-SAN RAFAEL BRIDGE
THE SUBSTRUCTURE OF THE RICHMOND-SAN RAFAEL BRIDGE WAS CONSTRUCTED IN 1953 TO 1956. THE PIERS ARE SUPPORTED ON PILES DRIVEN TO BED ROCK OR DEEP GRAVEL. BEDS TO TIP ELEVATIONS AS MUCH AS 250 FT. BELOW MEAN SEA LEVEL. DETAILS ARE GIVEN OF CONSTRUCTION. BACKFILL WAS DEFERRED UNTIL THE ACTION OF THE TIDAL CURRENTS ON THE NEW CONSTRUCTION COULD BE STUDIED. AN EARLY CORROSION STUDY WAS MADE. IN 1969 AND 1970, SOME OF THE STEEL BARS CUT FROM STEEL PILE SEGMENTS SUSPENDED UNDERWATER AFTER THE PRECAST CONCRETE PIERS WERE RECOVERED, WASHED, CALIPERED, AND WEIGHTED DISCLOSING LOSS OF SECTION AS HIGH AS 15%. TWO PIERS WERE INSPECTED. ONE WAS PIER 57 ON WHICH BACKFILL HAD PERIODICALLY REQUIRED REPLACEMENT OVER THE 15-YEAR PERIOD. THE OTHER WAS PIER 27 ON WHICH NO FURTHER BACKFILL HAD BEEN PLACED FOLLOWING THE ORIGINAL CORROSION STUDY. VERY LITTLE, IF ANY, LOSS OF METAL WAS FOUND ON THE PILES. AT PIER 57, LOSS OF SECTION OF 7.5% WAS Recorder AS ALMOST UNIFORM FROM THE CONCRETE TO THE BOTTOM OF THE LENGTH EXPOSED. THIS PIER HAD STOOD UNBACKFILLED FOR ABOUT A YEAR AFTER COMPLETION. FROM THE FINDINGS, WHICH BRIEFLY SHOWED NO LOSS AT PIER 27 AND CONSIDERABLE LOSS AT PIER 57, FROM THE DIFFERENCE IN ENDURING METAL LOSS AND FROM THE DIFFERENCE IN EXPOSURE BEFORE BACKFILLING, A POSITIVE EFFORT TO DETERMINE THE PRESENT RATE OF METAL LOSS, IF ANY, AT PIER 57 APPEARED NECESSARY. THREE TYPES OF DEVICES WERE INSTALLED: A PERMANENT ULTRASONIC PROBE, A STRAIN GAUGE INSTRUMENTED BOLT, AND A VIBRATING WIRE STRAIN GAUGE. THE PRINCIPAL FINDINGS FROM THE INSTALLATION COULD BE OF GREAT IMPORTANCE IN FURTHER STUDIES OF FOUNDATION PILE CORROSION PROBLEMS. THE APPLICATION OF CATHODIC PROTECTION TO THE STEEL FOUNDATION PILES OF THE RICHMOND-SAN RAFAEL BRIDGE IS EXTREMELY COMPLEX AND POSSIBLY NOT FINANCIALLY FEASIBLE. HOWEVER, INFORMATION OBTAINED FROM THIS TEST PROGRAM AND FROM RELATED TEST PROGRAMS AND STUDIES WILL SERVE TO DEVELOP CONSTRUCTION PROCEDURES THAT WILL MINIMIZE CORROSION LOSSES AT MODERATE OR LOW COST. THE PROVEN ECONOMIES OF THIS METHOD OF PIER CONSTRUCTION ARE SUCH THAT MORE PROTECTIVE OR POSITIVE BACKFILL PROCEDURES OR MATERIALS MAY BE EMPLOYED WITHOUT PRICING THIS CONSTRUCTION METHOD OUT OF USE. (DOT)

Balala, B
Materials Protection & Performance
Vol. 11 No. 9, Sept. 1972, pp 30-2

3A 209788
DESIGN AND CONSTRUCTION OF PRESTRESSED CONCRETE CURVED RAILWAY BRIDGE CONSISTING OF PRECAST CONCRETE BLOCKS
THE YONESHIRO-GAWA RAILWAY BRIDGE BETWEEN TOMINE AND PATATSU STATIONS IS THE FIRST CURVED, PRESTRESSED CONCRETE BRIDGE CONSTRUCTED BY THE JAPANESE NATIONAL RAILWAYS. IT CONSISTS OF THREE CONTINUOUS SPANS, EACH 56.3 M LONG; OVERALL BRIDGE LENGTH IS 337.8 M. THE CURVED SECTION HAS A RADIUS OF 800 M. THE TOPICS COVERED ARE ROUTE SELECTION AND EXECUTION, GIRDER DESIGN, SUPPORT DESIGN (INCLUDING A SPECIALIZED DESIGN OIL DAMPER SYSTEM), CONSTRUCTION, AND LOAD TESTS. SINCE A MAJOR PART OF THE WORK HAD TO BE CARRIED OUT DURING THE WINTER, PRECAST CONCRETE BLOCKS WERE ASSEMBLED ON TEMPORARY STAGINGS. IT IS CONCLUDED THAT THE METHOD SUFFERS FROM THE DISADVANTAGE THAT CONSIDERABLE TIME IS REQUIRED TO INSTALL THE STAGINGS, WHICH MEANS THAT THE SCHEDULE MUST BE RIGOROUSLY OBSERVED. HOWEVER, IT ALSO HAS A NUMBER OF ADVANTAGES, PARTICULARLY IN COLD WEATHER.

Kondo, T Miyazaki, S
Int Assoc Bridge & Struct Eng (Switz)
May 1972, pp 567-75, 8 Fig, 1 Tab

3A 209806
DEMONTABLE PRECAST CONCRETE BRIDGE
DEMONTABLE BRIDGES ARE BECOMING INCREASINGLY IMPORTANT FOR THE IMMEDIATE RELIEF OF HEAVY TRAFFIC CONGESTION BEFORE LONG-TERM ROAD SCHEMES HAVE BEEN RESOLVED. BUT THE VIABILITY OF THESE STRUCTURES DEPENDS ON THE EASE WITH WHICH COMPONENTS CAN BE REUSED ON A DIFFERENT SITE. THE SYSTEM MUST OFFER AN OPERATING RANGE OF SPAN VARIATIONS USING A MINIMUM NUMBER OF COMPONENT TYPES. THE BRUDERMULLH BRIDGE IN MUNICH (W. GERMANY), RECENTLY ERECTED TO EASE CONGESTION IN CONNECTION WITH THE OLYMPIC GAMES, IS OF PARTICULAR INTEREST BECAUSE ITS PRECAST CONCRETE STRUCTURE CAN BE DEMOUNTED FOR REUSE ON A DIFFERENT SITE. THE 190-METER-LENGTH STRUCTURE WAS BUILT IN ONLY EIGHT WORKING DAYS BY USING THE DYWIDAG METHOD OF PRECAST CONCRETE CONSTRUCTION. THE SYSTEM USES TRANSVERSE PRESTRESSING TO ACHIEVE A POSITIVE CONNECTION BETWEEN THE PRECAST BEAMS WITHOUT THE NEED FOR IN SITU CONCRETE WORK. BRIDGE CHARACTERISTICS AND THE ASSEMBLY OF SUPERSTRUCTURE COMPONENTS ARE DESCRIBED.

Precast Concrete /UK/ Vol. 3 No. 9, Sept. 1972, pp 537-40, Photos

3A 209897
IMPLEMENTATION PACKAGE FOR CAMBER AND DEFLECTION BEHAVIOR OF PRESTRESSED CONCRETE BEAMS
TO EVALUATE DESIGN PARAMETERS FOR LOCAL CONDITIONS TO BE USED IN THE PREDICTION OF TIME-DEPENDENT DEFORMATIONS. PRACTICAL DESIGN PROCEDURES FOR COMPUTING THE DEFLECTION OF PRESTRESSED CONCRETE MEMBERS ARE PRESENTED. SHORT-TIME AND LONG-TIME DEFLECTIONS OF NON-COMPOSITE AND COMPOSITE PRE-
CONSTRUCTION EQUIPMENT AND METHODS

Stressed concrete beams are included. Evaluation parameters such as concrete strength, modulus of elasticity, shrinkage at any time, and creep are summarized as are the standard conditions. Camber and deflection are discussed and a mathematical model of deflections is presented. The influence of non-stressed reinforcement and composite prestressed concrete beams is detailed. The loss of prestress is discussed. Simply supported prestressed concrete beams were used to investigate the camber, deflection, camber recovery, and deflection recovery behavior in order to assess the time-dependent characteristics. Shrinkage and creep test results are presented. Typical camber and deflection history are graphically represented and mathematical expressions which model deflection behavior in order to assess the time dependence of prestress according to AASHTO.

Hawaii Department of Transportation Aug. 1972, 32 pp. 13 Fig, 3 Tab, 9 Ref

3A 209966
CONCRETE IN MARITIME WORKS
Maritime construction presents problems that are not encountered inland. In discussing the performance of maritime structures, various types of damages that often occur are described and it is pointed out that the choice and proportioning of materials, as well as the design of the engineering works can minimize these damages. A detailed account is given of expansion joints, which are the cause of most of the maintenance work that has to be done on sea walls. Construction methods both above and under water are presented, as well as methods for repair work. It is concluded that fundamentally, concrete construction in maritime works is similar to construction on dry land. But greater care has to be taken, and more attention paid to details, at every stage of the work. The key to success is often to be found in following the three main principles: 1. making allowance for the inherently difficult working conditions by planning everything in detail beforehand and making sure that the work proceeds as smoothly as possible. This applies not only to the contractor but also to the designer, who must consider sequence and methods of construction when the work is being designed. 2. paying particular attention to the quality of materials and workmanship. 3. protecting the work from damage. As far as possible during the vulnerable period soon after it has been carried out.

Allen, RT
Cement & Concrete Assoc, London /UK/ 1972, 14 pp. 9 Fig, 1 Tab, 72 Ref

3A 209994
MODERN CONCEPTS IN PRESTRESSED CONCRETE BRIDGE DESIGN
A general review is made of the state-of-the-art in prestressed concrete bridge design. Three broad types of beam types are described and a comparison is made regarding their performance and costs. Construction techniques, which play an important part in the economy of bridges and are of interest because of safety and aesthetics, are also reviewed, with examples and illustrations being given. A discussion is given of a recent project, the Walt Disney World Monorail, which has exploited some of the latent potential of prestressed concrete.

Anderson, AR
Am Assoc State Highway Officials Proc Dec. 1971, pp 192-217, 19 Fig, 18 Phot

3A 209999
THE VENTILATION OF ROAD TUNNELS, PAPER 1. A GENERAL APPROACH TO THE PROBLEM
The paper examines the composition and source of major air pollutants in road tunnels and their effect on the health and breathing of road-users and maintenance workers, and on the general operation of road tunnels. The methods of ventilation in use and the implications of such ventilation on the physical and economic aspects of tunnel construction are also discussed. /TRRL/

Constant, J
Tunnels & Tunnelling /UK/ Vol. 4 No. 3, May 1972, pp 213-23, 5 Fig, 15 Tab, 15 Ref

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 210010
PRECAST PRESTRESSED SEGMENTAL RAILWAY BRIDGE IN AUSTRALIA
In the last decade most highway grade separation structures consisted of simple span I-beams with a cast-in-place deck slab. Typically, the spans were supported by two end abutments, a central pier, and a pair of intermediate shoulder piers. However, with the new emphasis on safety, the two intermediate piers are no longer permitted. This new regulation, coupled with the need for longer spans, means that the standard AASHTO-PCI types III and IV beams cannot be used. Nevertheless, it is still possible to use the AASHTO-PCI beams on longer spans if the beams are used as segments to be spliced and post-tensioned together at the construction site. The author presents a design procedure for designing such long-span precast segmental bridges. Two fully-worked numerical examples are presented to show the application of the design method and several tables and charts are included to facilitate the design process. /Author/

Prestressed Concrete Institute Journal Vol. 18 No. 5, Sept. 1973, pp 125-14, 9 Fig

3A 210021
STRETCHED-OUT AASHTO-PCI BEAMS TYPES III AND IV FOR LONGER SPAN HIGHWAY BRIDGES
A method of increasing the span capability of AASHTO-PCI standard I-beams for highway bridges has been tested. The results indicate that it is both economically feasible, with a moderate amount of modification to existing formwork, beam sections combined with strips of decks can be precast in segments of convenient length for truck transportation from a plant to the construction site. Two-way segmental construction, with main tendons for longitudinal post-tensioning and smaller tendons tensioned in the deck slab, can produce a structure equivalent to monolithic concrete construction. /DOT/

Anderson, AR
Prestressed Concrete Institute Journal Vol. 18 No. 5, Oct. 1973, pp 32-49

3A 210067
INVESTIGATION ON THE USE OF DEEP HAUNCHES IN COMPOSITE CONSTRUCTION
This paper reports the results of an exploratory investigation on the use of composite construction with deep steep-sided haunches. Various types of push-off tests were carried out, together with beam tests. The results indicate that the load carrying capacities of studs in deep haunches are lower than
3A CONSTRUCTION EQUIPMENT AND METHODS

THOSE IN THE NORMAL TYPE OF COMPOSITE CONSTRUCTION, BUT THAT NEVERTHELESS, THE METHOD IS A FEASIBLE ECONOMY OF CONSTRUCTION AND APPEARS TO OFFER SOME ECONOMY. /AUTHOR/

Tayler, R. Plum, DR Papasozomenos, AG Inst Civil Engineer Proc, London /UK/ Vol. 47 Sept. 1970, pp 43-54, 15 Fig, 1 Tab, 3 Phot

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/IRRD 202 415, 3C27234746

3A 210116 TUNNELLING IN THE USA
THE AUTHORS GIVE AN ACCOUNT OF TOURS IN THE U.S.A. DURING WHICH THEY VISITED TUNNELLING EQUIPMENT MANUFACTURES, RESEARCH ESTABLISHMENTS AND TUNNELLING SITES. A DISCUSSION IS INCLUDED ON ASPECTS OF TUNNELLING DESIGN AND METHODS OF CONSTRUCTION THAT WERE SEEN DURING THE TOURS.

Glover, EF O'reilly, MP Tunnels & Tunneling /UK/ Vol. 3 No. 6, Nov. 1971, pp 431-7, 11 Fig, 1 Tab, 4 Phot

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 210126 STRUCTURAL ELEMENTS OF UNDERGROUND PARKING GARAGES
THE AUTHOR DISCUSSES THE DEMANDS MADE ON AN UNDERGROUND PARKING STRUCTURE, AND REFERS TO THE PROBLEMS OF GROUND WATER, EARTH PRESSURE, LOADS FROM TRAFFIC, SUPPORTS, AND FIRE RESISTANCE. SOME CONSTRUCTION METHODS ARE DESCRIBED IN DETAIL: THE OPEN CONSTRUCTION METHOD, THE CAISSON METHOD, THE WELL METHOD AND THE GALLERY CONSTRUCTION METHOD.

Strassen, Dusseldorf /Germany/ Vol. 69 No. 9, Sept. 1971, pp 507-10, 9 Fig

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 210154 UNDERWATER TUNNEL IN ARGENTINA AS A ROAD LINK BETWEEN SANTA FE AND PARANA

Tiejbau /Germany/ Vol. 14 No. 4, Apr. 1972, pp 296-302, 17 Fig, 3 Ref

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 210177 SOME CONSIDERATIONS IN THE DESIGN OF COMPOSITE BRIDGES
THE BACKGROUND TO THE BRITISH CODE OF PRACTICE ON COMPOSITE CONSTRUCTION IS OUTLINED. SOME UNRESOLVED QUESTIONS ARE RAISED IN RELATION TO REVISIONS TO THE CODE. TOPICS DISCUSSED INCLUDE: DECK ANALYSIS, ULTIMATE LOAD DESIGN, LONGITUDINAL SHEAR STRENGTH, SHEAR CONNECTORS, AND COMPOSITE COLUMNS. ATTENTION IS DRAWN TO THE POSSIBILITY OF UNFORESEEN SIDE EFFECTS WHEN THE BASIS OF DESIGN IS CHANGED. /TRRL/

Chapman, JC Devel Bridge Design & Constr Proc /UK/ 1971, pp 356-70, 3 Fig, 15 Phot, 12 Ref

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 210180 THE SELECTION OF BOX BEAM ARRANGEMENTS IN BRIDGE DESIGN
MANY DIFFERENT ARRANGEMENTS OF BOX BEAMS ARE POSSIBLE IN BRIDGE CONSTRUCTION AND A LOGICAL CLASSIFICATION SYSTEM IS PROPOSED. FACTORS AFFECTING THE PROPORTIONING OF BOX BEAM BRIDGES ARE REVIEWED IN THE LIGHT OF PRACTICAL REQUIREMENTS OF PRESTRESSED CONCRETE AND COMPOSITE CONSTRUCTION. THE APPLICATION OF THESE IDEAS IS ILLUSTRATED BY SOME RECENT DESIGNS. MULTICELLULAR PRECAST CONCRETE DECKS ARE DISCUSSED CRITICALLY IN AN ATTEMPT TO FURTHER DESIGN IDEAS IN THIS FIELD. SOME PROPOSED COMPOSITE HIGHWAY BRIDGES IN SOUTH WALES INCORPORATE ADVANCED FEATURES AND THESE ARE DESCRIBED. THE PAPER CONCLUDES THAT SPECTACULAR BOX BEAM DESIGNS ARE FEASIBLE. /AUTHOR/

Lee, DJ Devel Bridge Design & Constr Proc /UK/ 1971, pp 400-26, 18 Fig, 6 Phot, 6 Ref

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 210199 STUDIES ON PRECAST REINFORCED-LIGHTWEIGHT CONCRETE SLABS FOR HIGHWAY BRIDGES
THIS REPORT PRESENTS SOME PRACTICAL STUDIES OF THE DESIGN AND CONSTRUCTION OF PRECAST REINFORCED-LIGHTWEIGHT CONCRETE SLABS THE AIM OF WHICH IS TO DECREASE THE DEAD WEIGHT OF AND TO SHORTEN THE CONSTRUCTION PERIOD FOR LONG-SPAN HIGHWAY BRIDGES. RESULTS OF FIELD INVESTIGATIONS ON THE CONSTRUCTION OF SUCH SLABS, AND THEIR BEHAVIOR ON A HIGHWAY BRIDGE UNDER ACTUAL TRAFFIC LOADINGS ARE ALSO PRESENTED. /AUTHOR/


ACKNOWLEDGMENT: Transport & Road Research Lab /UK/IRRD 201 421, 3C27301421

3A 210218 INTERRELATION BETWEEN DESIGN AND METHODS OF CONSTRUCTION FOR ELEVATED HIGHWAYS
THE INTERACTION BETWEEN DESIGN AND CONSTRUCTION IS PART OF THE PROCESS OF THE DEVELOPMENT OF NEW CONSTRUCTION FORMS. IF THIS PROCESS IS TO FUNCTION PROPERLY, MORE ATTENTION SHOULD BE PAID TO THE FEEDBACK FROM CONSTRUCTION TO DESIGN. VARIOUS CONSTRUCTION SYSTEMS FOR BRIDGES ARE BRIEFLY DESCRIBED: 1) ON-THE-GROUND, MOVEABLE SCAFFOLDING. 2) CAST-IN-PLACE SPAN BY SPAN CONSTRUCTION WITH THE AID OF SUSPENDED, SELF-LAUNCHING FORMWORK CARRIER. 3) CAST-IN-PLACE SEGMENTAL CANTILEVER CONSTRUCTION. 4) PREFABRICATED BEAMS. 5) PRECAST SEGMENTAL CONSTRUCTION SUPPORTED BY SCAFFOLDING.
CONSTRUCTION EQUIPMENT AND METHODS

6) PRECAST SEGMENTAL CANTILEVER CONSTRUCTION. 7) SELF-LAUNCHING PIECEMEAL SYSTEM (GERMAN "TAKT-SCHIEBEVERFAHREN"). IN THE SECTION OF THE STATICALLY DETERMINED SYSTEM, ATTENTION IS PAID TO THE DEVELOPMENT OF A JOINT CONSTRUCTION WHICH WILL NOT INTERRUPT TRAFFIC. THIS CAN HAVE FAVORABLE CONSEQUENCES FOR THOSE SYSTEMS WHICH MAKE USE OF A GREAT NUMBER OF JOINTS. MENTION IS MADE OF SOME SOLUTIONS FOR CONNECTING THE SUPERSTRUCTURE TO CONCENTRATED PIER COLUMNS. THE WRITING IS OF THE OPINION THAT AT PRESENT THERE IS NOT SUCH A POINT IN FURTHERING THE DEVELOPMENT OF PRESTRESSING AS FAR AS THE DEVELOPMENT OF BRIDGE CONSTRUCTION IS CONCERNED. /TRRL/

Vannhardt, F.
Int Assoc Bridge & Struct Eng /Swiz/. 9th Cong Conf Paper pp 169-83, 2 Fig

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 210219
INTERRELATION BETWEEN DESIGN AND METHODS OF CONSTRUCTION FOR VIADUCTS
IN THE INTRODUCTION, THE DIFFERENT ASPECTS TO BE CONSIDERED FOR THE DESIGN OF A BRIDGE ARE MENTIONED. THE FACTORS THAT CONTRIBUTED TO THE DEVELOPMENT OF THE TECHNIQUE OF BRIDGE-BUILDING DURING THE LAST FEW YEARS ARE DEALT WITH. IT IS SHOWN THAT EFFECTIVE BUILDING COSTS COULD BE LOWERED BY MEANS OF DIRECT COOPERATION OF THE STRUCTURAL ENGINEER WITH THE CONTRACTOR. THE MAIN SECTION DESCRIBES, WITH REFERENCE TO SEVERAL EXAMPLES, MODERN CONSTRUCTION METHODS AND RESULTING PROBLEMS THAT WILL BE DISCUSSED DURING THE CONGRESS. /TRRL/

Menn, C.
Int Assoc Bridge & Struct Eng /Swiz/. Conf Paper pp 185-211, 11 Fig, 11 Phot, 14 Ref

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 210224
ENA-SAN TUNNEL, PROJECT OF CHUO EXPRESSWAY
A DESCRIPTION IS GIVEN OF THE 8,500M ENA-SAN TUNNEL FORMING PART OF THE CHUO EXPRESSWAY, WHICH, WHEN COMPLETED IN 1974, WILL BE THE SECOND LONGEST ROAD TUNNEL IN THE WORLD. DETAILS ARE GIVEN OF GEOLOGICAL CONDITIONS, EXCAVATION EQUIPMENT AND VENTILATION FACILITIES THAT WILL BE PROVIDED. /TRRL/

Tajima, T.
Jap Soc Civil Engrs Journal Vol. 9 1970, pp 103-10, 7 Fig, 2 Tab, 4 Phot

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 210228
GLASSES-TYPE SHIELDING WORKS-AN EXECUTION AT SHIN-OCHANOMIZU STATION OF CHIYODA SUBWAY LINE
THE METHOD USED TO CONSTRUCT AN UNDERGROUND RAILWAY STATION ON THE CHIYODA LINE IN TOKYO IS DESCRIBED. A GLASSES-TYPE SHIELD WAS USED TO JOIN TWO 7.74M DIAMETER CIRCULAR SHIELDS WITH REINFORCED CONCRETE BEAMS AND SLAB TO FORM AN ISLAND PLATFORM 4.3M WIDE. THE SHIELD CONSISTED OF DUCTILE CAST IRON SEGMENTS WHICH FORMED A CENTRAL SECTION OF HIGH RIGIDITY. DETAILS OF EXCAVATION AND SHIELD CONSTRUCTION ARE GIVEN. /TRRL/

Ichimura, M Watarabe, T.
Civil Engineering /Japan/. Vol. 9 1970, pp 111-21, 13 Fig, 3 Tab, 4 Phot

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 210237
"INTERACT" A COMPUTER PROGRAM FOR CONDUCTING STRUCTURAL ANALYSES OF TUNNEL SUPPORT AND LINING SYSTEMS WITH
A COMPUTER PROGRAM HAS BEEN DEVELOPED AND SUCCESSFULLY TESTED ON RECENT TUNNEL PROJECTS IN THE US, TO SOLVE CONSIDERATION OF SUPPORT ROCK INTERACTION PROBLEM MAY BE USED TO PERFORM STRUCTURAL DESIGN ANALYSES OF VARIOUS SHAPED TUNNEL LININGS, INCLUDING SPRAED CONCRETE AND PRE-CAST CONCRETE LININGS. STEEL ARCHES, AND OTHER SUPPORT SYSTEMS, SUBJECT TO COMPLEX EXTERNAL LOADING. TYPICAL RESULTS OF A SUPPORT-ROCK INTERACTION ANALYSIS RECENTLY CONDUCTED ON A HORSE-SHOE SHAPED TUNNEL SECTION CONFIGURATION OF THE STRAIGHT CREEK VEHICLE TUNNEL IN COLORADO, US ARE GIVEN IN THE ENCLOSED APPENDIX. /TRRL/

Ueblacker, H.
Tunnels & Tunneling /UK/. Vol. 5 No. 1. Jan. 1973, pp 29-32, 14 Fig, 3 Tab, 7 Ref

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/IRRD 205 360, 2C27305360

3A 210238
RECOMMENDED PRACTICE FOR GROUTING OF POST-TENSIONED PRESTRESSED CONCRETE

Prestressed Concrete Institute Journal Vol. 17n5 Nov. 1972, pp 18-25, 1 Fig

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/IRRD 205 372, 2C27305372

3A 210240
SOFT GROUND TUNNELLING IN GREAT BRITAIN WITH SPECIAL REFERENCE TO THE VICTORIA LINE
THE PAPER DEALS WITH METHODS OF TUNNELLING IN SOFT GROUND CONDITIONS AS EXPERIENCED IN THE CONSTRUCTION OF THE VICTORIA LINE TUNNELS IN LONDON. AN APPRAISAL OF THE TYPES OF TUNNEL LINING IN CURRENT USAGE IS INCLUDED, AND ATTENTION IS DRAWN TO THE IMPACT WHICH EXPANDED LININGS HAVE MADE IN THIS FIELD. MINING METHODS ARE REVIEWED, AND THE POTENTIAL AND LIMITATIONS OF FULLY MECHANIZED MINING BY DIGGER SHIELDS ARE DISCUSSED. TOGETHER WITH SPECIAL TECHNIQUES DEVISED FOR NON-COHESIVE GROUND, IN ADDITION THE ADVANTAGES AND DISADVANTAGES OF THE COMPRESSED AIR METHOD ARE DISCUSSED. /TRRL/

Thompson, DM.
The Mining Engineer /UK/. Mar. 1968, pp 334-45, 1 Fig, 4 Phot, 4 Ref

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/IRRD 205 434, 2C27305434

3A 210249
THE SCOPE FOR CHOICE-DEVELOPMENTS IN FOOTBRIDGE AND SUBWAY CONSTRUCTION
FOLLOWING THE PUBLICATION OF DESIGN GUIDES FOR PEDESTRIAN SUBWAYS OR BRIDGES, BY THE DEPARTMENT OF THE ENVIRONMENT, THE ARTICLE DISCUSSES THE DETAILS OF REVISED DESIGN STANDARDS SET OUT IN THESE GUIDES, DEVELOPMENTS IN SUBWAY AND FOOTBRIDGE CONSTRUCTION GENERALLY, AND ALSO PROPRIETARY PRE-CAST SUBWAY SYSTEMS. THE DESIGN OF FOOTBRIDGES USING STEEL, TIMBER OR ALUMINUM CONSTRUCTION MATERIALS IS ALSO DISCUSSED. /TRRL/

CONSTRUCTION METHOD.
3A 210325
WEST VIRGINIA ASPHALTIC CONCRETE ROAD TEST

This paper presents the background information that led to the asphaltic concrete test road, and describes in detail the planning and programming that preceded construction. The purposes of the test road were: (1) to determine the effect of temperature of asphaltic concrete at the time of mixing and placement on the compaction and properties of the pavement, and (2) to correlate pavement characteristics with mixture design properties. The authors describe in detail the procedures and personnel used to control plant production and field operations during construction, and the equipment and procedures used to collect test data. The data collected include the following: temperature measurements from the time of mixing to completion of compaction, the bulk density, stabilometer and cohesiometer value of pavement cores, nuclear density, air permeability, Benkelman beam deflections, skid resistance, and viscosity tests on recovered asphalt. The test road has nineteen test sections. At the time this report was written, the test data were only partially analyzed. Therefore, the summaries of test results that are presented are generalities based on incomplete data.

3A 210331
PHYSICAL RESEARCH ON FLEXIBLE PAVEMENT MATERIALS AND CONSTRUCTION METHODS

The central purpose of this research program, as indicated by its title, was to enhance the understanding of layered pavements composed of bituminous materials to realize this purpose, the program was divided into three related components or topics. The first of these treated the effects which asphalt viscosity exerts on the behavior of compacted bituminous mixtures. The second was concerned with basic properties of the asphalt material itself, especially as related to adhesion phenomena. The third component, essentially though not exclusively analytical in character, concentrated upon the structural behavior of layered systems, seeking to establish the stresses and deformations resulting from loads imposed upon typical pavement configurations. Also as part of this component, a design method for layered pavements was developed for use in the commonwealth of Massachusetts, derived from the results of the AASHTO test road experiment. In this report, the work in each of these three topic areas is summarized and the principal results identified. More detailed information is available in the thirteen research reports issued during the program.

3A 210349
PEEL STRENGTH BEHAVIOR OF VARIOUS ASPHALT-STONE ADHESIVE JOINTS

The effects of methods of joint formation, type of stone/aggregate, type of asphalt, and test temperatures on asphalt-stone/aggregate/ adhesion were measured by a peel test applied to adhesive joint specimens in the form of stone-asphalt-aluminum foil sandwiches. The researchers concluded: /1/ exposure tests concerned with the effects of water on asphalt-stone adhesive joints reveal no harmful effects on joint strength. /2/ at 140 degrees F, peel tests of joints formed in air show higher peeling rates than at 77 degrees F and the joints fail cohesively with a more symmetrical residual distribution of adhesive. /3/ at 77 degrees F, peel tests of joints formed under water with no clamped period reveal a lack of adhesion. Regardless of the type of stone or asphalt used, joints formed under the same condition but tested at 140 degrees F show some adhesion but not to the extent observed for similar joints formed in air, and /4/ joints formed and clamped under water for sixteen hours indicate that the contact interval is not sufficient for good adhesion, when tested at 77 degrees F and 140 degrees F. /BPR/

Megaltry, F. Deso, P.
Massachusetts Institute Technology, Massachusetts Department Public Works
June 1966

Acknowledgment: Bureau of Public Roads /US/ (4312051 66) PB 174 959, 1C31020596

3A 210406
KENTUCKY ROCK ASPHALT HOT MIX SURFACES

Data are presented pertaining to the properties of materials in Kentucky rock asphalt mixtures, and of construction practices, costs, and short time performance observations of pavements using the mixtures. The rock asphalt contains about 3.8% bitumen and is crushed to pass a 3/8 inch screen, 85/100 penetration grade asphalt is added so the hot-mix contains a total of between 9-10 percent asphalt. Some problems were encountered when heating the rock asphalt and care was needed to prevent a build-up of material in the plant. The performance of the pavements using this mixture is rated as from satisfactory to good under light traffic. Skid resistance, which is the principal advantage of this mixture, is rated high-coefficients of 0.57 to 0.72. The report also traces the development of the special provisions to the specifications when this material is to be used.

Florence, RL
Kentucky Department Highways, Bureau of Public Roads /US/
August 1968

Acknowledgment: Bureau of Public Roads /US/ (4652154 68) PB 180 919, 1C31021513

3A 210548
FORMULAS FOR BITUMINOUS BRIDGE SURFACINGS IN GERMANY

The requirements for bridge surfacings are enumerated. The elements and principles of construction of the bituminous bridge surfacings used in Germany are discussed. Standard solutions appear to be as follows: on concrete bridges, the construction method consists of three parts: insulation (firmly bonded to the steel plate), protective layer, and surfacing. For the insulation the preferred materials are mastics or metal foil, for the protective layer mastic asphalt is generally used and for
CONSTRUCTION EQUIPMENT AND METHODS

3A

THE SURFACEING THE USUAL WEARING COURSES ARE USED FOR BITUMINOUS ROAD SURFACES. NEW DEVELOPMENTS MENTIONED ARE A MODE OF CONSTRUCTION WITH BONDING AGENTS TO CONCRETE BRIDGES. A PURELY MECHANICAL METHOD FOR STEEL BRIDGES. PRACTICAL EXPERIENCE HAS SHOWN THAT THE CONDITION OF THE SURFACE, THE DERUSTING OR CLEANING OF THE BRIDGE PLATE, AND WEATHERING DURING CONSTRUCTION ARE VERY IMPORTANT. /FG/RRL/

Zichter, G
Schriftenreihe Der Strabag-bau Ag /Get/ 1966

ACKNOWLEDGMENT Road Research Laboratory /UK/

3A 210561
OIL TREATMENT FOR DUST CONTROL IN SASKATCHEWAN THE HIGH PROPORTION OF UNPAVED ROADS IN SASKATCHEWAN DEMANDED AN ECONOMICAL, ADEQUATE SURFACE TREATMENT TO CONTROL DUST AND PROVIDE THE ROAD USER WITH IMPROVED RIDING QUALITY. OIL TREATMENT HAS BEEN USED FOR SEVERAL YEARS IN THIS RELATIVELY ARID AREA WHERE PRECIPITATION IS LESS THAN 20 INCHES OF RAIN. OIL TREATMENT IS DEFINED AS A VERY THIN ROAD-MIXED, BITUMINOUS SURFACING APPLIED TO AN OIL PRIMED GRAVEL SURFACED SUBGRADE. SLOW-CURING LIQUID ASPHALTS /SC-I OR SC-2/ ARE GENERALLY USED IN THE PERFORMANCE AND COST OF SEALS LAID ON RELATIVELY LIGHTLY TRAFFICKED ROADS IN WESTERN AUSTRALIA, DURING THE PERIOD 1934 TO 1958. MOST OF THE INFORMATION OBTAINED ON SINGLE RESEALS LAID IN THE PERIOD 1950 TO 1955. THE AVERAGE LIFE OF THE INITIAL SINGLE SEAL WAS A SINGLE SEAL, WITH EITHER 1/2 TO 3/8 IN. OR 3/8 TO 1/2 IN. SIZED STONE. SUBSEQUENT RESEALING OR ENRICHMENT TREATMENTS SIGNIFICANTLY REDUCED COST AND MAINTENANCE COSTS WITH OR WITHOUT ADDITIONAL TREATMENT, WERE RELATIVELY COSTLY. SMALL BUT SIGNIFICANT DIFFERENCES IN PERFORMANCE WERE FOUND FOR INITIAL SEALS LAID WITH DIFFERENT TYPES OF CRUSHED ROCK AGGREGATES IN DIFFERENT CLIMATIC ZONES. THE AVERAGE TRAFFIC DENSITY FOR THE RETIRED SEALS RANGED FROM ABOUT 30 TO 600 VEH/DAY, AND BITUMEN FROM MANY DIFFERENT CRUDE SOURCES WERE USED DURING THE INITIAL SEAL LAYING PERIOD UNDER CONSIDERATION. NEITHER FACTOR APPEARS TO HAVE AFFECTED INITIAL SEAL LIFE. THE LIVES OF RESEALS WERE FOUND TO BE SIMILAR TO THOSE LAID IN VICTORIA ON MORE HEAVILY TRAFFICKED ROADS. /AUTHOR/

Baker, GF
Australian Road Research June 1967

3A 210780
COMPACTION OF DEEP LIFT BITUMINOUS STABILIZED BASE A STREET CONSTRUCTION PROGRAM WAS CONDUCTED USING BITUMINOUS STABILIZED BASE WHICH IS A HOT-PLANT MIX OF BANK RUN GRAVEL AND ASPHALT CEMENT HAVING A PENETRATION OF 85 TO 100 PAVEMENT TEST CORES FROM A SINGLE FIVE INCH LIFT CONSTRUCTION PROVED TO BE 1 PERCENT BETTER COMPACTED THAN THE CORES FROM PAVEMENT CONSTRUCTED WITH TWO 2-1/2 INCH LIFTS INDICATIONS WERE THAT TEMPERATURE COULD BE A FACTOR IN OBTAINING THESE DENSITIES. THE TEMPERATURES WERE CORRELATED TO AASHO VOLUME-THE DEPTH OF THE LIFT, (2) PRESSURE-THE COMPAC TION FORCE AND (3) TEMPERATURE. THE DEPTH OF THE LIFT, THE COMPAC TION FORCE AND THE DEPTH OF LIFT, A TEMPERATURE-COMPAC TION RELATIONSHIP WAS SUBSTANTIATED INDICATING CONSIDERATION OF: (1) VOLUME-THE DEPTH OF THE LIFT, (2) PRESSURE-THE COMPAC TION FORCE AND (3) TEMPERATURE-THE LAY-DOWN TEMPERATURE. /AUTHOR/

Beagle, CW
Assoc Asphalt Paving Technol Proc Feb. 1966

3A 210816
BITUMINOUS CONCRETE PAVEMENT INVENTORY IN MAINE CORRELATED TO AASHO ROAD TEST RESULTS A VISUAL INSPECTION WAS CONDUCTED ON ALL BITUMINOUS CONCRETE SURFACE ROADS IN THE STATE OF MAINE IN 1960. TEN SPECIFIC FEATURES SUCH AS LONGITUDINAL CRACKING, ALLIGATOR CRACKING, RUTTING, DISTORTION, SURFACE DETERIORATION, ETC., WERE MEASURED BY MEANS OF A QUALITATIVE RATING SYSTEM. THESE FEATURES WERE CAREFULLY WEIGHTED IN RESPECT TO THEIR INFLUENCE UPON EITHER THE PAVEMENT OR THE BASE PERFORMANCE. FROM THIS WORK EACH ROAD WAS CLASSI-

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3A CONSTRUCTION EQUIPMENT AND METHODS

3A 210820
RECENT DEVELOPMENTS IN ASPHALT TECHNIQUES FOR HYDRAULIC APPLICATIONS IN THE NETHERLANDS


Kerkhoven, RE Assoc Asphalt Paving Technol Proc Feb. 1965

3A 210829
THIN HOT-MIX WEARING COURSES. AN ADVISORY

THE PRACTICABILITY OF THIN HOT-MIX WEARING COURSES HAS BEEN DEMONSTRATED IN MANY AREAS. THESE COURSES MAY BE USED TO PRODUCE DISSOLVABLE SURFACES TO NEW AND OLD PAVEMENTS AND TO RENEW PAVEMENT SURFACES WHERE GRADE CHANGES ARE RESTRICTED. THIS ADVISORY WAS PREPARED TO ASSIST ENGINEERS IN WRITING SPECIFICATIONS FOR THIN HOT-MIX ASPHALT WEARING COURSES. IT OUTLINES MATERIALS REQUIREMENTS AND CONSTRUCTION PROCEDURES FOR HIGH-QUALITY WEARING COURSES HAVING EXCELLENT PERFORMANCE CHARACTERISTICS. /AUTHOR/

Asphalt Institute Mar. 1968

3A 210833
SETTING RATE OF ASPHALT CONCRETE

MIXES THAT SHOVEL EXCESSIVELY UNDER STEEL WHEEL ROLLERS, DO NOT DENSIFY, OR ARE TENDER TO ANY TYPE OF DISTORTION ARE DEFINED AS "SLOW SETTING" AT TIMES. THESE MIXES REMAIN TENDER FOR PROLONGED PERIODS AFTER CONCRETE FIELD AND AVOIDING PROLONGED PERIODS THAT AGGREGATE GRADATION AND ANGULARITY, FILLER CONTENT, MOISTURE, AND COMPACTIVE EFFORT ARE IMPORTANT IN DETERMINING THE SETTING RATE OR TOUGHNESS OF A COMPACTED MIX. CONSTRUCTION AND MIX VARIABLES ARE EXAMINED UNDER CONTROLLED CONDITIONS TO ISOLATE THOSE FACTORS RESPONSIBLE FOR SLOW SETTING. DATA PRESENTED SHOW THAT HIGH-QUALITY, HIGH-STABILITY MIXES COMPACT BETTER WITH INCREASING COMPACTION TEMPERATURE, BUT THAT IN MORE UNSTABLE MIXES INCREASING THE TEMPERATURE RESULTS IN POORER COMPACTION. THE AUTHORS SHOW THE IMPORTANCE OF MINERAL FILLER TO BOTH PAVEMENT DENSITY AND TOUGHNESS. AN OPTIMUM FILLER-TO-ASPHALT RATIO EXISTS FOR MAXIMUM COMPACTION UNDER STEEL WHEEL ROLLING. IN ADDITION, THE AMOUNT OF MINERAL FILLER IN A MIX WAS FOUND TO INFLUENCE THE SETTING RATE OF AN ASPHALT PAVEMENT. PAVEMENT TOUGHNESS PROVED DEPENDENT ON THE TYPE AND DEGREE OF COMPACTION. PNEUMATIC ROLLING SUBSTANTIALLY IMPROVES PAVEMENT TOUGHNESS. PAVEMENT SETTING IS SHOWN TO BE MUCH FASTER IN A MIX WITH CRUSHED, ANGULAR AGGREGATES THAN IN A ROUND-ROUNDED AGGREGATE. FURTHERMORE, THE SETTING RATE OF ASPHALT CONCRETE PAVEMENTS IS LARGELY CONTROLLED BY THE CONSTRUCTION PRACTICES AND MATERIAL PROPERTIES INVESTIGATED IN THIS PAPER. SUGGESTIONS ARE GIVEN ON HOW TO ACHIEVE MAXIMUM DENSIFICATION AND PAVEMENT TOUGHNESS. /AUTHOR/


3A 210822
SURFACE TREATMENT MANUAL

SURFACE TREATMENTS, EXCEPT FOR DESIGN, ARE PRESENTED. TWO QUESTIONS, WHY AND WHEN, ARE ANSWERED ON SEAL COATS. CONSTRUCTION TECHNIQUES AND EQUIPMENT ARE COVERED AND ARE RECOMMENDED FOR CONSTRUCTION ENGINEERS.

American Bitumuls & Asphalt Co 57 pp, 1958

3A 210892
PRACTICAL GRADATION LIMITS FOR NATURAL AGGREGATE BITUMINOUS CONCRETE (NABC)

BECAUSE COUNTY AND MUNICIPAL AGENCIES OFTEN CANNOT AFFORD PREMIUM QUALITY BITUMINOUS CONCRETE TO PRODUCE HEAVY DUTY PAVEMENTS, THE SURFACES OF SIDE ROADS AND LOCAL STREETS CAN DETERIORATE RAPIDLY WHEN SUBJECTED TO HEAVY VEHICLES. THE ANSWER FOR SUCH SURFACES HAS BEEN MIXED-IN-PLACE CONSTRUCTION OR SURFACE TREATMENT. THE ADVOCATES OF PLANT MIX, HOWEVER, FEEL THAT HOT-PLANT-MIX SHOULD REPLACE ROAD-MIX AND TREATMENT WORK IF COSTS CAN BE KEPT LOW ENOUGH THE AIM IS, OF COURSE, A ROAD BETTER ABLE TO WITHSTAND THE OCCASIONALLY HEAVY AXLE LOADS, SPRING THAWS, AND RAINY SEASONS. TO COMPETE SUCCESSFULLY ON A COST BASIS, THE GRADATION SPECIFICATIONS MUST NOT BE SO RESTRICTIVE THAT LARGE QUANTITIES OF MATERIALS MUST BE REJECTED FOR BEING RESIZED OR WASTED. THEREFORE, ONE OF THE PURPOSES OF THIS WORK IS TO ESTABLISH OPTIMUM GRADATION CURVES AND ALLOWABLE TOLERANCES FOR NATURAL AGGREGATE BITUMINOUS CONCRETE. ANOTHER PURPOSE IS TO FOSTER THE BETTER UTILIZATION OF LOCAL MATERIALS AND TO ENCOURAGE MUNICIPAL AND COUNTY ENGINEERS AND CONTRACTORS TO UTILIZE BETTER THE WELL-RECOGNIZED ADVANTAGES OF HOT-PLANT MIX CONSTRUCTION METHODS FOR PRODUCING SUPERIOR AND MORE TROUBLE-FREE PAVEMENTS FOR
CONSTRUCTION EQUIPMENT AND METHODS 3A

STREETS AND SECONDARY ROADS AT REDUCED OVERALL COST.

Hudson, SB
National Asphalt Pavement Association 1958

ACKNOWLEDGMENT: Highway Research Board Bibliography

3A 210896
BITUMINOUS CONCRETE PAVEMENTS IN VIRGINIA-SYMPOSIUM - ASPHALT BOUND BASES
LIMITATIONS ARE DESCRIBED OF SEVERAL BITUMINOUS CONCRETE PAVEMENTS CONSTRUCTED IN VIRGINIA; HEAVY DUTY FLEXIBLE PAVEMENTS CONSTRUCTED WITH WATER BOUND MACADAM BASE WITH A MIXED-IN-PLACED SURFACE COURSE, AND PAVEMENTS CONSTRUCTED USING PENETRATION MACADAM. SUCCESSFUL USE OF HEAVY DUTY BITUMINOUS CONCRETE BASE COURSE CALLED BLACK BASE IS DESCRIBED. FIVE BLACK BASE DESIGNS ARE DISCUSSED FOR THE FOLLOWING TYPES OF HIGHWAYS: SECONDARY ROADS AND MEDIUM TRAFFIC PRIMARY ROADS, MEDIUM TRAFFIC PRIMARY ROADS WITH HIGHER TRUCK TRAFFIC, HEAVY TRAFFIC PRIMARY ROADS, INTERSTATE HIGHWAY SYSTEM DESIGN, AND AN ALTERNATE FLEXIBLE DESIGN FOR INTERSTATE ROUTES. CONSTRUCTION METHODS AND SPECIFICATIONS ARE DISCUSSED. THE ADVANTAGE OF BLACK BASE OVER OTHER TYPES OF FLEXIBLE BASES DESCRIBED ARE (1) EASE OF CONSTRUCTION, (2) COST, AND (3) PERFORMANCE.

Ellison, KE Assoc Asphalt Paving Technol Proc 1961

3A 210901
BLACK BASE SURVEY
THE PURPOSE OF THE SURVEY IS TO PROVIDE INFORMATION ON THE CURRENT PRACTICE IN THE DESIGN AND CONSTRUCTION OF BLACK BASES AND DATA ON SPECIFICATION REQUIREMENTS BEING USED IN THE 48 CONTINENTAL STATES. THE INFORMATION COLLECTED IS PRESENTED IN TABULAR FORM. DATA FROM THE QUESTIONNAIRES SHOW METHODS OF DESIGN AND CONSTRUCTION PRACTICE AND DATA FROM THE STANDARD SPECIFICATIONS AND SPECIAL PROVISIONS SUMMARIZE CURRENT SPECIFICATION REQUIREMENTS.

Sondergerg, PE Dammkerger, VJ
National Asphalt Pavement Association Feb. 1963

ACKNOWLEDGMENT: Highway Research Board Bibliography

3A 211060
GUSSASPALT SURFACINGS IN WEST BERLIN /GERMAN/
THE AUTHOR REPORTS ON EXPERIENCES WITH AND KNOWLEDGE OBTAINED FROM GUSSASPALT ON ROADS IN BERLIN. CURRENTLY ALMOST A THIRD OF ALL THE SURFACINGS ON THE WEST BERLIN URBAN ROAD NETWORK (APPROX. 8.3 MILLION SQUARE METRES) ARE MADE OF GUSSASPALT. EXPERIENCES OBTAINED OVER MANY YEARS HAVE LED TO THE WELL KNOWN "BERLIN RECIPE" FOR THE COMPOSITION OF THE MINERAL MIXTURE. AT PRESENT THE PARTICULAR WAY IN WHICH THE GUSSASPALT MUST BE MIXED IN ORDER TO WITHSTAND HARSH BRAKING FORCES WHICH OCCUR AT BUS-STOP STOPS AND TRAFFIC LIGHTS IS BEING STUDIED. PREVIOUSLY THE STANDARD CONSTRUCTION METHOD CONSISTED OF A CEMENT BASE WITH A GUSSASPALT SURFACING. BUT IN RECENT YEARS PREFERENCE HAS BEEN GIVEN TO THE FLEXIBLE CONSTRUCTION METHOD HAVING A BITUMEN-BOUND BASE, A BITUMINOUS BASECOURSE AND A GUSSASPALT SURFACING. WITH A POINTLESS CONSTRUCTION WITH A SCREW THE SEAMS ARE HEATED WITH INFRARED EQUIPMENT AND THEN SMOOTHED OVER. THE TOP OF THE GUSSASPALT SURFACING IS NO LONGER TEXTURED, AND THE SURFACE CHIPPINGS ARE ONLY PRESSES IN WITH A SMOOTH ROLLER.

Kosanke, K
Veroffent Strassenbau. Essen /Ger/ 1967

SPONSORING AGENCY: Veroffent Strassenbau, Essen /Ger/ 67.

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 211082
SURFACINGS ON STEEL CARRIAGEWAYS /IN GERMAN/
THE COATING CAN BE USED AS A COMPOSITE MEMBER IF ITS TENSILE, COMPRESSIVE AND SHEAR STRESS UNDER LOADING IS SMALL, IF IT REMAINS ELASTIC UNDER LIVELOADING AT ANY TEMPERATURE, AND IF ITS STRESSES IN PROPORTION TO THE MODULUS OF ELASTICITY ARE NO WORSE THAN WITH PLATE STEEL. UNDER THESE CONDITIONS THE THICKNESS OF THE COATING COULD BE REDUCED FROM 6 TO 3-4 CM. TESTS ARE BEING MADE ON THIS POINT. THE CURRENTLY USED ASPHALT DOES NOT ADMIT A REDUCTION OF THE CROSS-SECTION OF THE STEEL; FOR THIS AN ADMISSIBLE BOND ACTION OF STEEL AND COATING WOULD BE NECESSARY.

Sedlaceck, H
Der Bauingenieur, Berlin /Germany/ 1966

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 211174
QUALITY CONTROL IN CONSTRUCTION METHODS INVOLVING USE OF BITUMEN /IN GERMAN/
THE CAUSES OF UNA VAILABLE FLUCTUATIONS IN THE QUALITY OF BITUMINOUS MIXTURES AND THE PAVEMENTS CONSTRUCTED WITH THEM ARE OUTLINED. THE USE OF QUALITY CONTROL TO PINPOINT THE EXTENT OF FLUCTUATIONS AND TO ENABLE THE NECESSARY CORRECTIVE MEASURES TO BE CARRIED OUT IS ALSO DISCUSSED.

Wester, K Strassen Und Tiefeb /Germany/ 1969

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 211178
NEW WORKS IN GUSSASPALT /IN GERMAN/

Teerbau /Germany/ 1969

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 211250
PERFECTING THE DESIGN AND CONSTRUCTION METHODS FOR FLEXIBLE PAVEMENTS /IN BULGARIAN/
THE RESULTS OF TESTS CARRIED OUT AND RECOMMENDATIONS MADE BY COUNTRIES SUCH AS THE USA, FRANCE, BELGIUM AND ENGLAND ARE ANALYZED REGARDING FLEXIBLE PAVEMENT DESIGN AND CONSTRUCTION. THEY
ARE COMPARED WITH TESTS CARRIED OUT IN SEVERAL INSTITUTES IN THE USSR. TABLES CONTAINING RECOMMENDED VALUES FOR THE CALCULATION OF THE MODULUS OF ELASTICITY OF PAVEMENT MATERIALS IN RELATION TO CLIMATIC CONDITIONS ARE GIVEN. /RRL/

Iwanow, NN Patista /Bulgaria/ 1969

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 211326
ADHESION OF ASPHALT TO STONE
A SCRAPING TEST WAS USED TO DETERMINE CONDITIONS FOR FORMING A PROPER JOINT BETWEEN ASPHALT AND STONE. THE EFFECT OF THE ADHESION OF COMPOSITES OF STONE, ASPHALT, AND ALUMINUM-FOIL, RIBBON FOLLOWS THE RHEOLOGICAL THEORY OF ADHESION. VENUEZUELAN ASPHALT OF PENETRATION GRADE 85 TO 100 WAS APPLIED TO GRANITE AND MARBLE SLABS AT TEMPERATURES FROM 100 TO 170 C. AFTER COOLING 1 TO 3 HR ASPHALT WAS SCRAPE FROM THE SLABS WITH A RAZOR BLADE. THE AMOUNT OF ASPHALT REMAINING AFTER SCRAPING WAS NEARLY INDEPENDENT OF APPLIED TEMPERATURES OF 110 TO 170 C BUT STRONGLY DEPENDENT ON SURFACE ROUGHNESS. STONE-ASPHALT-ALUMINUM-FOIL SANDWICHES WERE HEATED AT 130 C FOR 20 TO 30 MIN AND ALLOWED TO COOL 1 TO 3 HR. THE ALUMINUM FOIL WAS THEN PEELED FROM THE ASPHALT USING A TONGS THAT PRODUCE A PERPENDICULAR TENSILE FORCE, CONFORMING TO RHEOLOGICAL THEORY. THE PEELING RATE AND RATIO OF RESIDUE ON STONE AND ASPHALT DEPENDED ON PEELING TENSION AND TEMPERATURE ATTEMPTS TO USE THIS TEST TO DETERMINE PENETRATION OF ASPHALT BY WATER WERE NOT SUCCESSFUL, BUT THE PENETRATION OF WATER BY ASPHALT WAS MEASURED AT 3 AS AL A PASTE OF ASPHALT WAS MIXED WITH ALUMINUM OXIDE TO AN ASPHALT-COATED METAL UNDER WATER. INITIALLY THERE WAS VERY LITTLE ADHESION. WITH AGING, HOWEVER, ADHESION INCREASED, THEN LEVELLED OFF. THE RATE OF DISPLACEMENT APPEARED TO BE DIFFERENT FOR GRANITE AND MARBLE. /JM/

Bikerman, J Journal Materials Mar. 1966

3A 211330
EXTENDING THE LIFE OF ASPHALT PAVING AN ASPHALT REJUVENATING AGENT CAN EXTEND THE LIFE OF AN ASPHALT PAVEMENT. THE AGENT IS RECLAMITE, AN EMULSION OF SELECTED PETROLEUM RESINS AND OILS WHEN USED AS A CONSTRUCTION SEAL IT HAS BEEN FOUND THAT THE QUALITY OR LIFE EXPECTANCY OF CHIP SEALS DRIVEN OFF AT THE HOT PLANT ARE RESTORED. THE NEW PAVEMENT IS SEALED AGAINST THE INTRUSION OF AIR AND WATER WITH A SEAL THAT CANNOT BE WORN OR WEATHERED OFF, THE EFFECTIVE SERVICE LIFE OF AN ASPHALT PAVEMENT IS EXTENDED, AND PAVEMENT SLICKNESS IS NOT APPRECIABLY EFFECTED.

Canessa, W Pacific Road Builder & Engineering Rev Jan. 1968

3A 211356
SOUTH DAKOTA CHIP SEAL COAT STUDY
THIS STUDY IS CONCERNED WITH THE COMPARISON AND EVALUATION OF CHIP SEAL COATS PLACED USING AN RS-2 EMULSIFIED ASPHALT. AN RC-4 CUTBACK ASPHALT AND SEVERAL RUBBERIZED RC-4 ASPHALTS. ALL COMPARISONS AND THE EVALUATION ARE BASED ON RATINGS DETERMINED BY THE SOUTH DAKOTA SEAL COAT EVALUATION PROCEDURE. THE RS-2 CHIP SEAL COATS DID NOT PERFORM AS WELL AS THE RC-4 AND RUBBERIZED PROJECTS. THE ADDITION OF RUBBER TO ASPHALT OF THE TYPE USED IN SOUTH DAKOTA FROM 1956 TO 1959 DOES NOT IMPROVE EITHER THE QUALITY OR LIFE EXPECTANCY OF CHIP SEALS. FOR THIS REASON RUBBERIZED ASPHALTS ARE NOT CONSIDERED TO BE ECONOMICALLY FEASIBLE AT THE PRESENT TIME. OTHER OBSERVATIONS CONCERNING CHIP SEAL PERFORMANCE WERE MADE DURING THE STUDY. IT IS CONCLUDED THAT CONSTRUCTION CONTROL, WEATHER, EQUIPMENT AND THE EXPERIENCE OF CONSTRUCTION PERSONNEL ARE VARIABLES WHICH APPARENTLY HAVE MORE PROFOUND EFFECTS ON A SEAL COAT THAN THE TYPE OF ASPHALT USED. /AUTHOR/

Crawford, RA Highway Research Record, Hwy Res Board 1968

3A 211373
REPORT ON DESIGNATION FOR SURFACE TREATMENTS
ALL TYPES OF SURFACE APPLICATIONS OF BITUMINOUS MATERIALS HAVE BEEN INCLUDED IN THE REPORT ON BECAUSE IT WAS CONCERNED WITH THE COMPARISON AND EVALUATION OF DIFFERENT TECHNIQUES AND PRODUCTS. IT WAS FOUND OUT THAT THE SAME PROCEDURES ARE CALLED BY DIFFERENT NAMES IN DIFFERENT AREAS, THESE DIFFERENCES IN TERMINOLOGY MAKE IT DIFFICULT TO COMPARE PRACTICES, TECHNIQUES, BITUMINOUS MATERIALS, AND AGGREGATES USED BY VARIOUS STATES AND AGENCIES. THEREFORE, QUESTIONNAIRES WERE SENT TO EACH HIGHWAY DEPARTMENT DOING SURFACE TREATMENT WORK TO OBTAIN THE NOMENCLATURE AND DESCRIPTION OF THE PARTICULAR TYPE USED FROM THE EXCELLENT RESPONSES A SYSTEM FOR IDENTIFYING SURFACE TREATMENTS WAS DEVELOPED IN WHICH TYPE OF TREATMENT, METHOD OF CONSTRUCTION, AND NOMINAL THICKNESS WERE CODED. IN THIS WAY, ANY SURFACE TREATMENT CAN BE IDENTIFIED WITHOUT HAVING TO DEPEN ON LOCAL TERMINOLOGIES.


3A 211400
CONSTRUCTION PRACTICE FOR HOT-MIX BITUMINOUS PAVEMENTS

Am Soc Civil Engr J Aerospace Transport Nov. 1968

3A 211410
CONSTRUCTION AND PERFORMANCE OF PLANT MIXED SEAL COATS
THE TYPE OF PLANT MIX SEAL COAT DISCUSSED IS ONE IN WHICH AGGREGATE, SIMILAR TO THAT IN A NORMAL CHIP SEAL IS OVER-FILLED WITH ASPHALT WITH THE EXCESS ASPHALT DRIVEN OFF AT THE HOT PLANT AND PLACED TO A COMPACT DEPTH OF 5/8-3/4 INCH BY AN ASPHALT PAVER. THIS AGGREGATE IS MIXED HOT IN A PLANT WITH RELATIVELY HIGH PERCENTAGE OF AN ASPHALT CEMENT AND PLACED TO A COMPACT DEPTH OF 5/8-3/4 INCH BY AN ASPHALT PAVER. THIS HISTORY IS BRIEFLY REVIEWED OF THE USE OF OPEN-GRADED PLANT MIX SEALS AS A WEARING COAT ON MAIN ROADS. THE FOLLOWING ADVANTAGES OF OPEN-GRADED PLANT MIX SEALS ARE CONSIDERED: (1) LOW DURABILITY AND ECONOMY, (2) GOOD ADHESION, (3) SHRINKAGE CRACKS IN THE SMOOTHNESS WHICH IS CONSISTENTLY BETTER THAN OTHER TYPE OF SURFACE, (2) SKID RESISTANCE AND RESISTANCE TO HYDROPLANING, (3) LESS EXPENSE PER INCH BY DEPTH THAN CHIP SEALS WITH GREATER DURABILITY AND STRUCTURAL VALUE, (4) BE CAN BE BUILT UNDER TRAFFIC AS SOON AS ROLLED, AND (5) GOOD APPEARANCE WITH GOOD VISIBILITY PARTICULARLY AT NIGHT WHEN WET. THE DISADVANTAGES INDICATE THAT: (1) MIXING TEMPERATURES ARE QUITE CRITICAL, (2) UNDER CONDITIONS OF VERY HEAVY TRAFFIC AND CONTINUED HIGH TEMPERATURES, ADDITIONAL CONSOLIDATION CAN TAKE PLACE WHICH MAY RESULT IN THE Voids BEING OVER-FILLED WITH ASPHALT WITH THE EXCESS ASPHALT THEN FLUSHING TO THE SURFACE AND ELIMINATING THE NON-SKID ADVANTAGES, (3) SHRINKAGE CRACKS IN THE
UNDERLYING SURFACE WILL BE REFLECTED THROUGH THE PLANT MIX SEAL THE SAME AS THEY WILL THROUGH ANY THIN BITUMINOUS OVERLAY. (4) PROBLEMS HAVE APPEARED IN LACK OF RESISTANCE TO SOLVENTS, WATER, ICE, SNOW, AND TIRE CHAIN TRAFFIC. CONSTRUCTION EQUIPMENT AND METHODS ARE MORE SUBJECT TO ASPHALT OXIDATION AND HARDENING THAN DENSE MIXES. CONSTRUCTION PROCEDURES ARE DESCRIBED IN DETAIL FOR OPEN-GRADED PLANT MIX SEALS IT IS CONCLUDED THAT THE OUTSTANDING ADVANTAGE OF THE GOOD OPEN-GRADED PLANT MIX SEAL (SMOOTHNESS, SKID, AND HYDROPLANING RESISTANCE) MAKE THEM OF SUCH VALUE THAT IT SEEMS WORTHWHILE TO DEVOTE CONSIDERABLE EFFORT TO ELIMINATING DEFECTS.


3A 211425

THE EFFECTS OF AIR AND BASE TEMPERATURE ON COMPACTION

AN INVESTIGATION WAS CONDUCTED IN LOUISIANA BECAUSE THE EXTENT OF COLD WEATHER CONSTRUCTION OF HOT MIX ASPHALTIC CONCRETE PAVEMENT HAD SHOWN CONSIDERABLE INCREASE. RESULTS OF THE SURFACE COURSE INVESTIGATION SHOW A DEFINITE RELATIONSHIP BETWEEN AIRBASE TEMPERATURE AND PERCENTAGE OF COMPACTION. A CURVE IS PRESENTED WHICH REPRESENTS MARSHALL STABILITY-TEMPERATURE RELATIONSHIP AT THE END OF A 6-MONTH PERIOD. AN ADDITIONAL STUDY WAS CONDUCTED TO ESTABLISH AN APPROXIMATE RELATIONSHIP BETWEEN THE AIR AND BASE TEMPERATURES UNDER DIFFERENT WEATHER CONDITIONS. THIS STUDY INDICATED THAT: (1) THE AIR TEMPERATURE NEVER EXCEEDED THE BASE TEMPERATURE ALTHOUGH IN COLD AND CLOUDY WEATHER THE BASE TEMPERATURE IS ONLY SLIGHTLY HIGHER THAN AIR TEMPERATURE. (2) BASE TEMPERATURE OF ASPHALTIC CONCRETE PAVEMENT IS ALWAYS HIGHER THAN PORTLAND CEMENT CONCRETE PAVEMENT: AND (3) ON BRIGHT AND SUNNY DAYS THE SURFACE TEMPERATURE OF PORTLAND CEMENT CONCRETE PAVEMENT IS NORMALLY 15 TO 20 DEGREES HIGHER THAN THE AIR TEMPERATURE. ASPHALTIC CONCRETE WAS 25 TO 30 DEGREES HIGHER.

Adam, V. Highway Research Board Special Reports 1960

3A 211440

EFFECT OF WATER ON BEHAVIOR OF SAND-ASPHALT MIXTURES UNDER REPEATED LOADING

THIS PAPER REVIEWS THE FUNDAMENTAL CONCEPTS RELATED TO ADHESION AND THE STRIPPING PHENOMENON IN BITUMINOUS MIXTURES. STRIPPING, WHICH MAY OCCUR IN ONLY A SMALL PORTION OF THE PAVEMENT, IS CONSIDERED A GREAT ECONOMIC LOSS AND ENGINEERING FAILURE IN TERMS OF PROPER MIXTURE DESIGN. THE FACTORS AFFECTING ADHESION AND ADHESION FAILURE ARE NUMERABLE. THEY INCLUDE THE MATERIAL CHARACTERISTICS, CONSTRUCTION TECHNIQUES, AND DIFFERENT ENVIRONMENTAL CONDITIONS. DUE TO THE EXTREME COMPLEXITIES OF ADHESION AND ADHESION FAILURE PHENOMENA IN BITUMINOUS MIXTURES, A SPECIFIC ENGINEERING PROBLEM IS ANALYZED IN THIS REPORT AND THE VALIDITY OF THE ADHESION FAILURE CONCEPTS IS DISCUSSED. IN THE STUDY, A HOT-MIX SAND-ASPHALT MIXTURE THAT HAD SHOWED SEVERE DISTRESS AND DISINTERFERENCE IN THE FIELD IS SUBJECTED TO IN-LABORATORY TESTS TO EVALUATE THE CAUSES OF STRIPPING. THE RESULTS INDICATED THAT STANDARD TEST METHODS FOR EFFECT OF WATER ON COHESION OF COMPACTED MIXTURES DID NOT REVEAL ANY STRIPPING TENDENCIES. HOWEVER, THE APPLICATION OF DYNAMIC LOADING ON SATURATED MIXTURES RESULTED IN DRASTIC REDUCTION IN THE COMpressive STRENGTH. SIMILARLY, THE CREEP RESPONSE OF MIXTURES WAS AFFECTED BY THE NUMBER OF LOAD REPETITIONS. IT IS ALSO SHOWN THAT THE DEEPEST VEINS OF SOURCES UNDER DYNAMIC LOADING EXHIBIT PERMANENT DEFORMATION THAT MAY LEAD TO FAILURE IN THE SAND-ASPHALT MIXTURE.

Majidzadeh, K. Standler, RR. Highway Research Record, Hwy Res Board 1969

3A 211480

ASPHALT EMULSION-VERSATILE CONSTRUCTION MATERIAL

THE EXPERIENCE OF DOUGLAS COUNTY, OREGON, WITH OPEN GRADED COLD MIX PAYING, HAS ESTABLISHED IT AS AN ECONOMICAL AND SATISFACTORY PAYING METHOD. CONSTRUCTION METHODS AND MATERIALS ARE DESCRIBED.


3A 211494

THE USE OF FOAMED BITUMEN PREMIX AS A SURFACE COURSE FOR RURAL PAVEMENTS


LaRocque, LA. Newton, R. Martin, KG. DISCUSSER Australian Road Research Board Proc 1968

3A 211510

COLD WEATHER PAYING-TEMPERATURE-DENSITY

CONSTRUCTION EQUIPMENT AND METHODS


3A 211511
A GENERAL METHOD OF DESIGN FOR SEAL COATS AND SURFACE TREATMENTS

The principal objective of this paper is to demonstrate that one equation for the quantity of cover aggregate required and another equation for the quantity of asphalt binder to be applied, can be used for the design of either single application or multiple application surface treatments and seal coats. The required characteristics of both cover aggregates and asphalt binders are reviewed. The superiority of one-size over graded cover aggregates is demonstrated. Equations are developed for the quantities of cover aggregate and asphalt binder required for single application surface treatments and seal coats. A sample calculation illustrates their use for this purpose. It is shown that these same equations can be employed for the design of multiple seal coats and surface treatments. Sample calculations are included to illustrate their use in this context. The effect of each variable on the design is determined and procedures are given for the design of seal coats and surface treatments.

3A 211518
"GUSSASPHALT" OR POURABLE ASPHALTIC MIXTURES

GUSSASPHALT IS A PAVING MIXTURE WHICH CAN BE POURED OR CAST IN PLACE. IT MAY BE DESCRIBED AS A SPECIAL MASTIC TYPE PAVING MIXTURE. THE BEHAVIOR OF GUSSASPHALT IS INFLUENCED BY THE PROPORTIONS OF COVER AGGREGATE AND ASPHALT BINDER USED. PORTIONS OF ASPHALT CEMENT AND MINERAL FILLER, WITH ITS LOW VAPOR TRANSMISSION FEATURES, FORM A PRACTICALLY VOIDLESS PAVEMENT SURFACE THAT CAN BE ACHIEVED WITHOUT THE USE OF ROLLERS OR ANY OTHER COMPACTION EQUIPMENT. A NUMBER OF GUSSASPHALT CONSTRUCTION PROJECTS WERE VISITED IN many places. The specifications for the materials, current construction practices, testing, and performance of GUSSASPHALT surfacing surfaces were reviewed. The principal use for GUSSASPHALT is a surfacing material for highway and city streets. When Portland cement concrete base is topped with GUSSASPHALT surface, asphalt concrete binder is used as an intermediate layer. GUSSASPHALT is used to overlay old asphalt, Portland cement concrete and cobble stone pavements. The movement of GUSSASPHALT, rehabilitation or improvement in their skid-resistance properties. GUSSASPHALT is composed of crushed stone, sand, mineral filler and asphalt cement. The softness or hardness of GUSSASPHALT is controlled by either the use of asphalt cement of different consistencies or by slight adjustment in the asphalt content. The movement of GUSSASPHALT, transfer, and paving equipment and paving process are described. It is felt that strong effort should be made to develop the use of the mastic type mixes such as GUSSASPHALT in the United States.

Puzinasakas, VP
Asphalt Institute Feb. 1970

3A 211560
DESIGN CONSTRUCTION, AND INITIAL EVALUATION OF EXPERIMENTAL TEST SECTIONS OF ASPHALT CONTAINING SYNTHETIC RUBBER

The 16 test sections of asphalt containing rubber were constructed as part of a primary highway project in southeastern Utah. The experiment consists of 5 factors at 2 levels, each incorporated in a one-half replicate of a 2 to the fifth power fractional factorial experiment. The design provides for determining the effect of each of 5 factors and each of 10 two-way interactions on pavement construction, performance, and design. The effect of each variable was determined for the construction process, and an initial evaluation was made. A description of the construction process, including the rubberizing process, is given. Evaluation is continuing through many observations and physical tests on the pavements and pavement materials. Failure rate of pavements will be accelerated by the reduction of half the design thickness. The design provides a sound method of analysis and offers a definite basis to determine which factors and interactions are significantly affecting pavement performance and design.

/Author/
Darter, MI Peterson, DE Jones, GM Vokacz, R Highway Research Record, Hwy Res Board 1970

3A 211598
EMULSIFIED ASPHALTS

Studies are being conducted on the physical chemistry of specifications for, and construction methods using emulsified asphalt. The last category includes methods of applying asphalt cement to pavement components with emulsified asphalts.

/RII/
Monte, NL
Road Research Institute /Brazil/ 1970

ACKNOWLEDGMENT Road Research Institute /Brazil/

3A 211735
BITUMINOUS SURFACE TREATMENTS FOR NEWLY CONSTRUCTED RURAL ROADS

This guide describes some commonly used surfacing treatment methods for providing a newly constructed road with a bituminous surfacing and introduces a new design method based on the results of road experiments. Discussed also are factors affecting the choice of treatment, materials, design methods, and construction processes.

Nat Inst Road Research /S Africa/ Feb. 1971, 58 pp, 4 Fig, 3 Tab, 9 Ref

3A 211802
COLD WEATHER PAVING WITH GLASPHALT

DECREASED COOLING RATES, AS OBSERVED IN FIELD TESTS, FOR GLASPHALT AS COMPARED TO CONVENTIONAL STONE AGGREGATE ASPHALT HAVE BEEN FOUND TO BE CAUSED BY TWO EFFECTS: 1. THE RELATIVELY LONGER-THINNER GLASS AGGREGATE PARTICLE RESULTS IN A MORE EFFECTIVE TRANSFER OF HEAT TO THE GLASS PARTICLE BECAUSE OF THE SHORTER CONDUCTION PATH AND INCREASED HEAT TRANSFER SURFACE AREA. THE RESULT IS THAT FOR THE SAME AGGREGATE MIXTURE THE GLASS AGGREGATE PARTICLE ACTUALLY CONTAINS MORE THERMAL ENERGY THAN DOES THE STONE AGGREGATE PARTICLE. 2. THE EFFECTIVE THERMAL CONDUCTIVITY OF GLASPHALT IS LOWER THAN THAT FOR A CONVENTIONAL MAT BECAUSE OF
THE SHAPE OF THE GLASS AGGREGATE AND ITS ORIENTA-
TION IN THE MAT. THIS EFFECTIVE LOWERING OF THE
THERMAL CONDUCTIVITY CAN BE EXPLAINED BY A COMB-
INATION OF RESISTANCES APPROACH. THE RESULT OF THE
ABOVE IS THAT THE GLASPHALT MAT: (1) CONTAINS MORE
THERMAL ENERGY INITIALLY; AND (2) COOLS AT A SLOWER
RATe THAN DOES THE CONVENTIONAL MAT. THE COMBINA-
TION OF MORE ENERGY INITIALLY AND SLOWER HEAT LOSS
RESULTS IN THE INCREASED COOLING TIMES EXPERIENCED
IN THE FIELD TESTING OF GLASPHALT UNDER COLD
WEATHER CONDITIONS, THIS EXTENDED COOLING TIME FOR
GLASPHALT WOULD BE EXTREMELY BENEFICIAL IN ALLOW-
ING SUFFICIENT TIME FOR COMPACTION OF THIN MATS,
WHERE, WITH CONVENTIONAL ASPHALT PAVING, PAVING
OPERATIONS WOULD BE POSSIBLE.

Dickson, PF
Symp On Secondary Uses of Waste Glass Jan. 1973, 18 pp, 3 Fig, 3 Tab, 3 Ref

3A 211818
COOLING OF HOT-MIX ASPHALT LAID ON FROZEN
SUBGRADE WITH DISCUSSION
THE DESCRIPTION AND SOLUTION OF THE TEMPERATURE
DISTRIBUTION AND HEAT FLOW PROBLEM REQUIRES THAT
AN ACCOUNT BE TAKEN, IN THE MAT-THERMAL FORMULA-
TION, OF THE POSSIBILITY OF MULTIPLE PHASES IN THE
SUBGRADE. ONE MUST CONSIDER A BASE WITH A THAWING
REGION WHICH MOVES INTO THE BASE WITH TIME. FOR THE
SAME AMOUNT OF HEAT LOSS FROM THE MAT, THE THER-
MAL WAVE (TEMPERATURE RISE) PROGRESSES FURTHER
INTO THE UNFROZEN SUBGRADE THAN INTO THE FROZEN
SUBGRADE. AS AN INCREMENT OF FROZEN SOIL REACHES 32
F, THE TEMPERATURE CHANGES "PAUSES" UNTIL THE MOIS-
TURE HAS BEEN THAWED BEFORE THE TEMPERATURE
AGAIN STARTS TO RISE. THIS PHENOMENA HAS THE EFFECT
OF PRODUCING A SUBSTANTIAL TIME LAG IN THE THERMAL
WAVE PENETRATION INTO FROZEN SOIL. RESULTS SHOW
THAT THE SOLAR FLUX HAS LESSER EFFECT ON THE
TEMPERATURE PROFILE IN THE UPPER HALF OF THE
MAT THAN DOES THE WIND VELOCITY. NEITHER OF THESE
EFFECTS IS IMPORTANT IN THE LOWER HALF OF THE
ASPHALT MAT. COMPUTATIONS FOR VARIOUS MOISTURE
CONTENTS OF FROZEN SUBGRADE SHOWED THE EFFECT OF
MOISTURE CONTENT ON MAT TEMPERATURE PROFILE AND
HEAT FLUX INTO SUBGRADE TO BE APPRECIABLE IN THE
LOWER PORTION OF THE MAT. THIS EFFECT DECREASES IN
IMPORTANCE AS MOISTURE CONTENT DECREASES FROM THE
MAT-SUBGRADE INTERFACE. INCREASED MOISTURE CON-
TENT IN THE FROZEN SUBGRADE PRODUCES A LOWER IN-
TERFACIAL TEMPERATURE AND REQUIRES A HIGHER
LAYDOWN TEMPERATURE TO PROVIDE SUFFICIENT TIME TO
COOL TO A SPECIFIED AVERAGE MAT TEMPERATURE. A
DISCUSSION IS INCLUDED WHICH DEALS WITH VARIOUS
QUESTIONS CONCERNING THIS STUDY.

Dickson, PF
Corlew, JS
Assoc Asphalt Paving Technol Proc Proceedings Vol. 41 Feb. 1972, pp 49-69, 15 Fig, 2 Tab, 8 Ref

3A 211828
PLANT-MIXED SEAL COATS IN UTAH WITH DISCUSSION
THIS REPORT DISCUSSES THE PERFORMANCE OF
PLANT-MIXED SEAL COATS IN UTAH. INCLUDED IS A DISCU-
SSION OF THE AGGREGATE GRADATIONS AND ASPHALTIC
MATERIALS USED, AND THE CONSTRUCTION PROCEDURES
FOLLOWED. THE TEST PROCEDURES DESCRIBED ARE THOSE
PERFORMED IN THE FIELD AND IN THE LABORATORY. FIELD
TESTS INCLUDE A DETERMINATION OF THE SKID RESIS-
TANCE AND THE RIDEABILITY OF THE SURFACE. LABOR-
ATORY TESTS INCLUDE VOID CONTENT, COHESION AND
BONDING. THE DATA PRESENTED ARE FROM PROJECTS
BUILT BETWEEN 1965 AND 1969. FROM THESE, PLANT-MIXED
SEAL COATS HAVE BEEN FOUND TO PROVIDE GOOD SKID
RESISTANCE AND EFFECTIVELY SEAL THE SURFACE IF THE
PROPER ASPHALT CONTENT IS USED. DENSER AGGREGATE
GRADATIONS HAVE GIVEN BETTER PERFORMANCE.

Lee, A
Highway Research Record, Hwy Res Board 1963

415
CONSTRUCTION EQUIPMENT AND METHODS

3A 211956
A 10-YEAR REPORT ON PERFORMANCE OF BONDED CONCRETE RESURFACINGS
THE PERFORMANCE OF SEVERAL BONDED CONCRETE OVERLAY PROJECTS WAS SURVEYED AND REPORTED. RESULTS ARE TABULATED OF TESTS OF CORE SAMPLES AND BOND INTERFACE. SOME AREAS OF DISTRESS AND OF BOND LOSS ARE PICTURED. CAUSES OF BOND LOSS AND ITS EFFECT ON THE PERFORMANCE OF THE OVERLAY ARE DISCUSSED. GOOD BOND AND MUST BE THE PRIMARY GOAL, BUT A LACK OF BOND DOES NOT APPEAR TO IMPEDE THE PERFORMANCE OF A BONDED CONCRETE OVERLAY IN LONG-TERM CONTINUOUS USE. SOME OF THE FINDINGS FOLLOW /1/ IT IS ESSENTIAL TO FOLLOW THE RECOMMENDED TECHNIQUES AND CONSTRUCTION SEQUENCE TO ASSURE A SUCCESSFUL PROJECT. /2/ THIN WATER GROUT OR FREE WATER LEFT STANDING ON THE SURFACE OF THE BASE PAVEMENT TEND TO WET AND ENTRAP COARSE AGGREGATES FROM THE MANLIUS, LOCKPORT, AND ONONDAGA FORMATIONS IS OFTEN PROBLEMATIC. AS MENTIONED IN THE SYNDICATION, CONCRETE SHOULD BE CONDUCTED PERIODICALLY.

3A 212151
LABORATORY STUDY OF EFFECTS OF ENVIRONMENT AND CONSTRUCTION PROCEDURES ON CONCRETE PAVEMENT SURFACES

3A 211961
AN EVALUATION OF CONCRETE CONTAINING COARSE AGGREGATE FROM THE MANLIUS, LOCKPORT, AND ONONDAGA FORMATIONS IN WESTERN AND CENTRAL NEW YORK
1. AIR-ENTRAINED CONCRETE IN THE STATE HIGHWAY SYSTEM CONTAINING COARSE AGGREGATE FROM THE MANLIUS, LOCKPORT, AND ONONDAGA FORMATIONS IS GENERALLY IN EXCELLENT CONDITION. SEVERAL INVESTIGATIONS OF NONAIR-ENTRAINED CONCRETE HAVE SHOWN MORE SEVERE DETERIORATION THAN THAT FOUND IN THE AIR-ENTRAINED CONCRETE. THIS SEVERE DISTRESS HAS BEEN ATTRIBUTED TO THE LACK OF ENTRAINED AIR RATHER THAN THE QUALITY OF THE COARSE AGGREGATES. 2. SMALL NUMBERS OF POPOUTS WERE OBSERVED IN NEARLY ALL PAVEMENT CONCRETE. THE POPOUTS USUALLY DID NOT EXCEED 0.25 INCH IN DIAMETER. THE APPEARANCE OR QUALITY OF THE PAVEMENT. SEVERE POPOUTS OCCURRED ON THREE CONTRACTS. THEY WERE CAUSED BY A SMALL PERCENTAGE OF LIGHT GRAY ARGILLACEOUS DOLOMITE MATERIAL THAT IS EXTREMELY SENSITIVE TO FREEZE-THAW DETERIORATION AND, THEREFORE, IS NO LONGER QUARRIED. 3. PAVEMENT CONCRETE ON THE THOMAS EDISON HIGHWAY CURRENTLY PERFORMS WELL. THE COARSE AGGREGATE FROM THE ONONDAGA FORMATION WAS ALSO IN GENERALLY EXCELLENT CONDITION EXCEPT IN THE AREAS WHERE JOINT SPALLING IS PREVALENT. POSSIBLE CAUSES ARE BEING INVESTIGATED. 4. NO EVIDENCE WAS FOUND TO INDICATE THAT A DELETERIOUS CHEMICAL REACTION HAS TAKEN PLACE BETWEEN THE ONONDAGA CHERTS AND ALKALIES IN THE CEMENT. THE ONLY DISTRESS OBSERVED TO BE POSITIVELY ASSOCIATED WITH THE CHERT WERE POPOUTS CAUSED BY THE PHYSICALLY UNSOUND NO. 45 WHITE CHERT. 5. THE PROCEDURES USED FOR ACCEPTANCE OF COARSE AGGREGATES HAVE APPARENTLY PREVENTED THE DEVELOPMENT OF DEEP-SEATED DETERIORATION RESULTING FROM UNSOUND AGGREGATE. HOWEVER, THERE IS AN INDICATION THAT THE PRESENT MAXIMUM LIMIT OF 3.0 PERCENT LOSS IN THE UNCONFINED FREEZE-THAW TEST MAY BE TOO RESTRICTIVE SINCE APPROXIMATELY 20 PERCENT OF THE ACCEPTANCE TESTS HAD VALUES ABOVE THIS LIMIT BUT THE STONE WAS ACCEPTED ON THE BASIS OF ITS PREVIOUS SERVICE RECORD AND USED WITHOUT UNDESIRABLE CONSEQUENCES. 6. TO CONTINUALLY IMPROVE ACCEPTANCE, DESIGN, AND CONSTRUCTION PROCEDURES, SYSTEMATIC CONDITION SURVEY OF ALL STATE HIGHWAY CONCRETE SHOULD BE CONDUCTED PERIODICALLY.

Chamberlin, WP Eucker, AJ
New York State Dept Transportation

ACKNOWLEDGMENT:

3A 211981
ACKNOWLEDGMENT, Texas Highway Department, Federal Highway Administration/FHWA M0046, NTIS PB 220 078, 1C32023456

3A 212115
WAYS OF INDICATING THE AMOUNT OF CEMENT IN SOIL-CEMENT
THE VARIOUS METHODS THAT CAN BE USED TO INDICATE THE AMOUNT OF CEMENT IN SOIL-CEMENT ARE PRESENTED. CEMENT CONTENT BY WEIGHT, CEMENT CONTENT BY VOLUME, CEMENT CONTENT IN ABSOLUTE VOLUME OF CEMENT EXPRESSIONS WHICH RELATE THE VARIOUS METHODS OF EXPRESSING THE AMOUNT OF CEMENT ARE COMPARED AND THE DIFFERENCE BETWEEN LABORATORY AND CONSTRUCTION TECHNIQUES ARE DISCUSSED. THE INCONEVENIENCE OF SPECIFYING IN THE FIELD CEMENT CONTENT BY WEIGHT IS PRESENTED, AND IN CONCLUSION A SPECIFICATION BY PONDERAL PROPORTIONING IS PROPOSED. /RR/L/A/

Ferreira, HN Fomento, Lisbon /Portugal/ July 1965

ACKNOWLEDGMENT: Road Research Laboratory /UK/
CONSTRUCTION EQUIPMENT AND METHODS

3A 212529
INVESTIGATION OF CONCRETE BRIDGE DECK DETERIORATION

The causes of deterioration of concrete bridge decks in Connecticut were studied to determine means of preventing deterioration and evaluate any possible permanent damage. The investigation consisted of the following steps: (1) Field survey of approximately 250 bridges of all ages, types and use, (2) static analysis of typical bridges, (3) dynamic analysis of a typical bridge, (4) continuing surveillance of four bridges from shortly after construction to the present, (5) laboratory simulation of concrete bridge deck construction, (6) observation of actual bridge deck construction procedures, and (7) analysis of stresses due to differential thermal strains. It was concluded that: (1) Deterioration is due primarily to random cracks and porous concrete resulting from early drying and poor curing, (2) transverse cracks are not harmful if sealed to prevent corrosion of reinforcing steel, (3) tensile stresses due to dynamic loading and pouring sequence are not serious, (4) tensile stresses due to placement of hot concrete can cause transverse cracks, and (5) debris included in the concrete during construction can cause spalling. It is recommended that concrete should be placed rapidly enough to allow screeding to occur within 30 minutes after placement and floating should be done immediately after placing. Methods used for roughening the concrete surface should be carried out immediately after floating, so that covering can be placed before drying. The concrete should be cool when placed and be kept free of all debris. Two state inspectors should be present at all times to ensure proper construction procedures are employed.

Healy, KA Borgeson, RW Perazaella, JC
Connecticut University May 1967

3A 212533
INFLUENCE OF CREEP AND SHRINKAGE OF CONCRETE ON COMPOSITE CONSTRUCTION

In reinforced concrete construction the two materials to be considered are concrete and steel. These materials have different properties which must be taken into account when designing a concrete structure. Shrinkage, creep, and elasticity are time-dependent properties which, when modified, will change the stresses in the structure. If the structure is designed for the ultimate load, the time-dependent properties become internal modifications and can be ignored. If, however, the structure is designed according to the theory of elasticity, these time-dependent factors are important and must be considered. In this study, a new method is given for calculating the effect of creep and shrinkage in concrete. The creep of steel and the time-dependent increases of the modulus of elasticity upon composite constructions of reinforced or prestressed concrete. A basic formula is derived. Examples of its application are given and comparisons are made between older methods of calculation and the one described here. A satisfactory correlation is achieved. /Author/

Schepetier, G
Delft Technical University /Neth/ Dec. 1965

3A 212561
ACI MANUAL OF CONCRETE PRACTICE, PARTS I, II AND III

American Concrete Institute 1973

3A 212609
PLASTIC SHRINKAGE CRACKING

Plastic shrinkage cracking of mortars exposed to different conditions, as prevalent in hot-dry climates, was investigated under controlled conditions. The variables studied were air temperature and humidity, wind velocity, mortar temperature, type and content of cement, and consistency. Shrinkage, tensile strength and tensile stress of fresh mortars, evaporation and time of cracking were measured. Width, depth, and length measurements of the cracks were also taken. The results confirm that rapid evaporation has a predominant effect on plastic shrinkage cracking. Other conclusions are that plastic shrinkage cracking is not a direct function of water loss, evaporation rate or shrinkage, and that semiplastic mortar did not crack under high evaporation conditions which brought about severe cracking of plastic and wet mortars. It was also established that the first crack coincides with the transition from the intensive, practically unrestrained, linear shrinkage of fresh mortar to the much slower rate due to restraint on stiffening of the mortar. /ACI/

Ravina, D Shalon, R Am Concrete Inst Journal & Proceedings Apr. 1968

3A 212613
EXPERIMENTAL RESEARCH IN ABUSE OF 4000 PSI CONCRETE

Experimental research was performed in a laboratory to duplicate field abuse of 4000 psi concrete on one job. It was desired to find the amount of strength loss due to high slump, extended mixing with slump kept at the high figure, high summer temperature, and partial abuse of cylinders. It is interesting that job strengths were almost duplicated using two different brands of cement. /Author/

Hersey, AT Am Concrete Inst Journal & Proceedings May 1968

3A 212718
THE WORK OF THE RESEARCH AND DEVELOPMENT DIVISION OF THE CEMENT AND CONCRETE ASSOCIATION: ROADS DEPT

This report describes the work of the roads department since its formation in January, 1954. Research and development work includes lean concrete bases and soil-cement bases. Soil-cement base studies involve laboratory tests, construction techniques, site control and pavement thickness design.

Blake, LS
Cement & Concrete Assoc, London /UK/ Apr. 1957

Acknowledgment. Highway Research Board Bibliography

3A 212719
PROGRESS REPORT ON CALIFORNIA EXPERIENCE WITH CEMENT-TREATED BASES

The California Division of Highways has built 123 miles of pavement base by mixing cement with granular materials of many kinds and compacting on the subgrade by rolling or tamping. Most of these bases have been for first class road improvements. The materials have included fine silty sands, streamed gravels, disintegrated granite, soft crushed sandstone, fairly clean sand, and aggregates suitable for concrete. Many construction methods have been tested. Twenty-eight projects ranging in length from 0.5 mile to 13.1 miles have been constructed.

Stanton, TE Hveem, FN Beatty, JL Highway Research Board Proceedings 1943
CONSTRUCTION EQUIPMENT AND METHODS

3A 212720
RUNWAY IS EXTENDED AT WESTERN AIR CENTER
BULK METHOD OF CEMENT SPREADING WAS USED ON THIS PROJECT AND A CEMENT METER, AN AUTOMATIC MEASURING DEVICE, WAS EMPLOYED FOR ARRIVING THE CORRECT PERCENTAGE OF CEMENT. METHODS OF CONSTRUCTION AND EQUIPMENT USED AT THE LOS ANGELES MUNICIPAL AIRPORT ARE DESCRIBED.

Contractions & Engineers Aug. 1947

ACKNOWLEDGMENT: Highway Research Board Bibliography

3A 212725
CALIFORNIA CEMENT TREATED BASES
A SUMMARY IS PRESENTED OF SPECIFICATION REQUIREMENTS, DESIGN CHARACTERISTICS, CONSTRUCTION METHODS AND EQUIPMENT, AND FIELD CONTROL TESTS AS USED BY THE CALIFORNIA DIVISION OF HIGHWAYS FOR CEMENT-TREATED BASES. REPRESENTATIVE BID PRICES ARE INCLUDED.

Wasee, LD Western Construction Jan. 1961

ACKNOWLEDGMENT: Highway Research Board Bibliography

3A 212948
ELECTRICAL HEATING OF NEWLY POURED CONCRETE /IN SWEDISH/

Janhunen, P Vag-och Vattenbyggaren /Sweden/ Dec. 1967

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 212975
REPORT FOR THE YEAR 1967
THE DEVELOPMENT AND RESEARCH IN MATERIALS, DESIGN OF STRUCTURES, AND CONSTRUCTION METHODS ARE REVIEWED. A SPECIAL MENTION IS MADE OF THE TWO WORKING GROUPS, SET UP JOINTLY WITH THE ROAD RESEARCH LABORATORY, WHOSE PROGRAMS OF WORK ON THE STRENGTHENING RESISTANCE OF CONCRETE ROADS, AND DESIGN AND CONSTRUCTION OF JOINTS IN CONCRETE ROADS ARE DESCRIBED. /RRL/

Cement & Concrete Assoc, London /UK/ 1967

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 213126
THE CURING OF CONCRETE PAVEMENT SLABS IN HOT WEATHER
TWENTY-EIGHT 1 M THICK SLABS WERE CAST ON WARM SUNNY DAYS TO DETERMINE THE TEMPERATURE VARIATIONS IN CONCRETE WHEN THE EXOTHERMIC HYDRATION REACTION IS STIMULATED BY STRONG SUNLIGHT. THE EFFECT OF THE TIME OF PLACING WAS INVESTIGATED BY CASTING SLABS AT DIFFERENT TIMES DURING THE DAY AND THE EFFICIENCY OF A RANGE OF TEMPERATURE CONTROL TECHNIQUES WAS EXAMINED. IT IS CONCLUDED THAT CURING MEMBRANES WILL PROVE ADEQUATE DURING WARM WEATHER ONLY IF A WHITE PIGMENT IS ADDED. /RRL/A/

Hunt, JG Cement & Concrete Assoc, London /UK/ Nov. 1969

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 213196
PORTLAND CEMENT CONCRETE PAVING WITH CENTRAL-MIXED CONCRETE
THE INCREASED VOLUME OF HIGHWAY CONSTRUCTION DURING THE PAST DECADE HAS CHALLENGED THE INGENUITY, VERSATILITY, EFFICIENCY AND PORTABILITY THROUGH THE COOPERATIVE EFFORTS OF OWNER, CONTRACTOR AND MANUFACTURER. GREATER NEED FOR INTRICATE INTERCHANGES, URBAN CONSTRUCTION AND OTHER COMPLICATED PAVEMENT ARRANGEMENTS PROMOTED THE CONSIDERATION OF MORE EFFICIENT CONSTRUCTION METHODS. CENTRAL-MIXED CONCRETE OFFERED THE NECESSARY CHARACTERISTICS OF HIGH-CAPACITY AUTOMATION, VERSATILITY AND PORTABILITY THROUGH THE ELECTRICALLY HEATED MOULDS ARE USED IN COLD WEATHER TO PREVENT FREEZING OF NEWLY-POURED CONCRETE /IN SWEDISH/

Yamarick, WP Highway Research Board Bulletin 1961

3A 213216
REPORT OF A THREE-YEAR BRIDGE DECK STUDY IN PENNSYLVANIA
THE RESULTS OF THE INITIAL THREE YEARS OF CONTINUING RESEARCH PROJECT ON THE DURABILITY OF CONCRETE BRIDGE DECKS IN PENNSYLVANIA ARE PRESENTED. THE STUDY INVOLVED FIELD SURVEYS OF 38 BRIDGE DECKS COMPRISING 2,782 TEN-FT LONG SURVEY UNITS. A TOTAL OF 554 CORES WERE TAKEN FROM 34 OF THE DECKS. THE CORES WERE SUBJECTED TO DETAILED LABORATORY ANALYSES INCLUDING DETERMINATION OF AIR VOID PARAMETERS BY LINEAR TRAVERSE TECHNIQUES, WATER CEMENT (W/C) RATIO DETERMINATIONS, AND PETROGRAPHIC EXAMINATION.

SEVEN BRIDGE DECKS WERE OBSERVED DURING CONSTRUCTION TO EXAMINE AND EVALUATE THE EFFECT OF CONSTRUCTION PRACTICES ON DURABILITY. BRIDGE DECKS WERE RESURVEYED ANNUALLY TO ESTABLISH RATES. THE MAJOR TYPES OF DETERIORATION FOUND WERE TRANSVERSE CRACKING, FRACTURE PLANES, POTHOLES, AND SURFACE MORTAR DETERIORATION. THE PRIMARY CAUSES OF DETERIORATION WERE INDICATED TO BE MATERIALS (AGGREGATES) AND WORKMANSHP (OVERFINISHING, POOR QUALITY CONTROL WITH RESPECT TO ENTRAINED AIR AND WATER, IMPROPER PLACEMENT OF REINFORCEMENT). RECOMMENDATIONS TO ALLEVIATE THE CAUSES OF POOR PERFORMANCE AND SUGGESTED AREAS OF NEEDED RESEARCH ARE INCLUDED. /AUTHOR/

Larson, TD Cady, PD Price, JT Highway Research Record, Hwy Res Board 1968

3A 213489
LONG-TIME STUDY OF CEMENT PERFORMANCE IN CONCRETE-CHAPTER 7. NEW YORK TEST ROAD

Jackson, FH Tyler, IL Portland Cement Assoc R & D Lab Bull No 38

ACKNOWLEDGMENT: Portland Cement Assoc R & D Lab Bull, No 228, July 1969
PLASTIC SHRINKAGE

PLASTIC SHRINKAGE AND PLASTIC SHRINKAGE CRACKING SOMETIMES OCCUR IN THE EXPOSED SURFACE OF FRESHLY-PLACED CONCRETE. THIS SHRINKAGE AND CRACKING IS CAUSED BY A RAPID EVAPORATION OF WATER FROM THE SURFACE OF THE CONCRETE. CONDITIONS THAT DETERMINE THE RATE OF EVAPORATION ARE DESCRIBED. CONSTRUCTION PROCEDURES AND PRACTICES THAT CAN MINIMIZE THE CAUSES OF THIS TYPE OF SHRINKAGE AND CRACKING ARE RECOMMENDED. SPECIFIC CASES CITED SHOW HOW APPLICATION OF THESE PROCEDURES HAS SOLVED THE PROBLEM. IT IS BELIEVED THAT THE RECOMMENDED CORRECTIVE MEASURES WILL SOLVE THE PROBLEM OF PLASTIC SHRINKAGE AND PLASTIC SHRINKAGE CRACKING ON CONSTRUCTION PROJECTS. /PCA/

Lerch, W. Portland Cement Assoc R & D Lab Bull No 81

ACKNOWLEDGMENT: Portland Cement Assoc R & D Lab Bull, No 228, July 1969

3A 213697

RANDOM CRACKING OF BRIDGE DECKS CAUSED BY PLASTIC SHRINKAGE


Newlon, HH Mather, B DISCUSSOR Geymayer, HG DISCUSSOR Highway Research Board Special Reports 1970

3A 213807

CRACKING INDUCED BY ENVIRONMENTAL EFFECTS


Mather, B. American Concrete Institute Title No 20-4, 1968

ACKNOWLEDGMENT: Am Concrete Inst Journal & Proceedings

3A 213808

CONTROL OF TEMPERATURE CRACKING IN CONCRETE

THE CRACKING AND CONTROL OF CRACKING ARE DESCRIBED IN MASS CONCRETE STRUCTURES. CRACKING IN THE LARGER STRUCTURES IS PREDOMINANTLY CAUSED BY VOLUMETRIC CHANGES IN THE CONCRETE DUE TO TEMPERATURE DROPS, BUT TEMPERATURE GRADIENTS WITHIN THE STRUCTURES ARE CONTRIBUTING FACTORS. THE TYPICAL LOCATIONS OF CRACKS WHICH DEVELOP IN MASS CONCRETE ARE DESCRIBED. TOGETHER WITH METHODS FOR ESTIMATING THE MAGNITUDE OF THE STRESSES WHICH CAUSED THE CRACKS, THE TEMPERATURE HISTORY OF MASS CONCRETE IS RELATED TO THE SEVERAL INFLUENCING FACTORS. EACH OF THESE FACTORS IS BRIEFLY REVIEWED, AND THE DEGREE OF CONTROL WHICH CAN BE EXERCISED BY EACH IS DISCUSSED. AMONG THOSE MEASURES WHICH MAY BE USED TO INFLUENCE AND PARTIALLY CONTROL THE TEMPERATURE RISE IN MASS CONCRETE ARE CEMENT CONTENT, TYPE OF CEMENT, USE OF POZZOLAN TO REPLACE PART OF THE CEMENT, RETARDING AGENTS, WATER CURING, USE OF LOW CONSTRUCTION LIFTS. AND ARTIFICIAL COOLING WITH EMBBEDDED PIPE SYSTEMS. MEASURES WHICH MAY BE USED TO INFLUENCE AND PARTIALLY CONTROL THE PEAK TEMPERATURES IN MASS CONCRETE STRUCTURES INCLUDE ALL OF THE ABOVE MEASURES TOGETHER WITH THE USE OF TECHNOLOGY TO OBTAIN A DESIRED MAXIMUM CONCRETE PLACING TEMPERATURE. THE DEGREE OF TEMPERATURE CONTROL EXERCISED FOR ANY ONE STRUCTURE IS RELATED TO THE TYPE OF STRUCTURE AND ITS OVER-ALL DIMENSIONS, THE CONDITIONS ANTICIPATED DURING THE CONSTRUCTION PERIOD, AND THE DESIRED DESIGN STRESSES WHICH WILL OCCUR DURING OPERATING TIME. THE EFFECTS THAT CRACKING WILL HAVE ON THE ABILITY OF THE STRUCTURE TO PERFORM ITS FUNCTIONS SHOULD ALSO BE TAKEN INTO CONSIDERATION. DESIGN CONSIDERATIONS INCLUDE THE SIZE OF CONSTRUCTION BLOCK AND CONTRACTION JOINT GRouting. CONSTRUCTION PROCEDURES CREATING CRACKING TENDENCIES IN CONCRETE ARE DISCUSSED AND REMEDIAL MEASURES TO REDUCE THE EFFECT OF THESE CONDITIONS ARE PRESENTED. /ACIJP/

Townsend, CL American Concrete Institute Title No Sp 20-7, 1968

ACKNOWLEDGMENT: Am Concrete Inst Journal & Proceedings

3A 213838

INTERNAL ELECTRICAL CURING OF PRESTRESSED CONCRETE

CONSTRUCTION EQUIPMENT AND METHODS

MANY FIELD CONDITIONS INCLUDING OUTDOOR WINTER CONSTRUCTION. /AUTHOR/

Chi, CT Barnoff, R.M Cady, PD
Pennsylvania State University 235 pp, Jan. 1970

3A 214003
RECOMMENDED PRACTICE FOR HOT WEATHER CONCRETING: PROPOSED REVISION OF ACI 605-59
CONCRETE MIXED, TRANSPORTED, AND PLACED UNDER CONDITIONS OF HIGH TEMPERATURE, LOW HUMIDITY, OR WIND, REQUIRES AN UNDERSTANDING OF THE EFFECTS SUCH ENVIRONMENTAL FACTORS HAVE ON CONCRETE PROPERTIES AND CONSTRUCTION OPERATIONS. WHEN THESE FACTORS ARE UNKNOWN, THESE EFFECTS CAN BE TAKEN TO ELIMINATE OR MINIMIZE UNDESIRABLE EFFECTS. THIS RECOMMENDED PRACTICE DEFINES HOT WEATHER, LISTS POSSIBLE UNFAVORABLE EFFECTS AND RECOMMENDS PRACTICES INTENDED TO MINIMIZE THEM. AMONG THESE RECOMMENDATIONS ARE SUCH IMPORTANT MEASURES AS PRECOOLING INGREDIENTS, LIMITATIONS OF CONCRETE TEMPERATURE AS PLACED, LENGTH OF HAUL, FACILITIES FOR HANDLING CONCRETE AT THE SITE, AND SPECIAL PLACING AND CURING TECHNIQUES. /AUTHOR/

Wescott, WF Am Concrete Inst Journal & Proceedings July 1971

3A 214056
USE OF CONCRETES CONTAINING ANTIFROST ADDITIVES DURING THE CONSTRUCTION OF BRIDGES /IN RUSSIAN/

Kostyacy, PS Chemical Abstracts, Beton I Zhelezobeton /USSR/ Nov. 1971

3A 214189
UNDERWATER CONCRETE CONSTRUCTION
UNDERWATER CONCRETE CONSTRUCTION IS CURRENTLY CARRIED OUT BY FOUR BASIC METHODS: TREMIE, BUCKET, GROUT-INTRUDED AGGREGATE, AND GROUTING. THIS ARTICLE SUMMARIZES THE PRESENT STATE OF THE ART, EVALUATES SIGNIFICANT NEW DEVELOPMENTS, AND INDICATES DIRECTIONS FOR FUTURE UTILIZATION TO OBTAIN MORE EFFECTIVE AND RELIABLE UNDERWATER CONSTRUCTION. /DOT/

Gerwick, BC Mechanical Engineering Vol. 94 No. 11, Nov. 1972, pp 29-34

3A 214277
EXERCISE CAUTION IN USING FLY-ASHES
VERY LITTLE IS KNOW ABOUT THE STRENGTH OF A CONCRETE CONTAINING FLY ASH AND THE HAZARDS CONNECTED WITH THE VARIOUS TECHNIQUES FOR LAYING SUCH CONCRETES. THE PRESENT PAPER DEALS WITH DAMAGES TO CONCRETE CONTAINERS FOR THE INDUSTRIAL WASTES OF A TANNERY, ORIGINATING FROM INAPPROPRIATE CONSTRUCTION FROM A CONCRETE CONTAINING FLY ASH. THE DAMAGE DID NOT RESULT FROM ACTION OF THE SULFURIC ACID, ARSENIC SULFIDE, AND ALUMS---ON THE CONTRARY, THE FLY ASH EFFECTIVELY PROTECTED THE TANK AGAINST CHEMICAL DECAY---BUT RATHER FROM LEAKAGES, OCCURRING ALONG THE LINES OF CONCRETING INTERVALS. THAT HAD BEEN COMPACTED BY VIBRATION. ANALYSIS OF THE DISTINCT LAYERS, WHICH HAD SEPARATED DURING VIBRATION, SHOWED THEM TO CONSTITUTE AN ISOLATED PASTE CONSISTING ALMOST ENTIRELY OF ASH. IT IS SHOWN HOW THIS CONDITION CAN BE ATTRIBUTED TO THE CONSTRUCTION METHOD AND PRACTICE USED FOR THE TANK, WHICH DID NOT TAKE INTO ACCOUNT THE PECULIARITIES OF FLY-ASH CONCRETE. SEVERAL RECOMMENDATIONS ARE MADE ABOUT CONSTRUCTION PRECAUTIONS TO BE TAKEN WHEN FLY-ASH CONCRETE IS USED.

Braun, K Building Review /Poland/ 1969

3A 214274
POLYMERIZED LIGHTWEIGHT STRUCTURAL ELEMENTS
IMPREGNATION OF CONCRETE MATERIALS WITH POLYMERS WAS EXTENDED TO INCLUDE THE IMPREGNATION OF LIGHTWEIGHT FOAM CONCRETES. FILLING APPROXIMATELY 90 PERCENT OF THE EXTENSIVE VOID SYSTEM OF THE FOAM CONCRETE WITH A POLYMER INCREASED THE COMPRESSIVE STRENGTH THE AMBIENT AIR TEMPERATURE EXCEEDS 50 DEGREE C, THE STRENGTH FROM 30 PSI TO 1008 PSI, AND THE MODULUS OF ELASTICITY FROM 100,000 PSI TO 425,000 PSI. BEAM STRUCTURAL ELEMENTS WERE PARTIALLY IMPREGNATED TO PRODUCE A "SANDWICH PANEL" ELEMENT WHICH CAN UTILIZE THE FOAM CONCRETE CORE TO ACT AS AN INSULATOR AND AS A SPACER TO SEPARATE THE POLYMER IMPREGNATED SURFACE REGIONS, AND CAN UTILIZE THE POLYMER IMPREGNATED SURFACE REGION LOADINGS. THE SANDWICH ELEMENT PRODUCED THUS UTILIZES MATERIALS EFFICIENTLY TO SATISFY THE MULTIPLE FUNCTIONAL REQUIREMENTS OF LOAD AND OF ENVIRONMENT. /AUTHOR/

Lott, J Birkimer, D Construction Eng Res Lab, Army Ce /US/ May 1973, 7 pp, 1 Tab, 6 Ref

3A 214431
STRENGTH DEVELOPMENT OF CONCRETE EXPOSED IN WINTER

Berwanger, C Malhotra, VM Am Soc Civil Engr J Eng Me H Div Vol. 100 No. m2, Apr. 1974, pp305-, 10 Fig 3 T, ab, 9 Ref

3A 214370
PRECAST CONCRETE LINING FOR TUNNELS SYMPOSIUM HELD BY THE SLOVAT SCIENTIFIC AND TECHNOLOGICAL SOCIETY OF BUILDING, BRATISLAVA, HUNGARY, 2ND-3RD JUNE 1970
PAPERS PRESENTED AT THE SYMPOSIUM DISCUSS METHODS OF CONSTRUCTING PRECAST CONCRETE TUNNEL LININGS IN BOTH SHIELDED AND NON-SHIELDED-DRIVEN TUNNELS, AND METHODS OF MEASURING EARTH PRESSURE ON AND STRESSES WITHIN THE LININGS.
CONSTRUCTION EQUIPMENT AND METHODS

Zulian, A

3A 214416
SLIP-FORM PAVING-CONSTRUCTION PRACTICES ON IOWA'S SECONDARY ROADS

SINCE 1949 OVER 1,000 Ml OF SLIP-FORM PAVEMENT HAVE BEEN CONSTRUCTED IN IOWA. MOST OF THESE MILES ARE ON SECONDARY ROADS. SEVERAL CONSIDERATIONS FOR THIS CONSTRUCTION ARE PRESENTED. PAVING ON NARROW GRADES, POOR SOILS, SUBGRADE CONSTRUCTION, MIXING AND PLACING OPERATIONS, CONCRETE MIXES, AND SMOOTHNESS ARE ALSO DISCUSSED. /AUTHOR/

Clausen, L.M

3A 214441
OHIO'S FIRST EXPERIENCE WITH SLIP-FORM PAVING

THE SUCCESSFUL CONSTRUCTION IS DESCRIBED OF APPROXIMATELY 8 Ml OF PLAIN CONCRETE PAVEMENT ON THE SECONDARY HIGHWAY SYSTEM IN OHIO USING THE SLIP-FORM TECHNIQUE. DESIGN FEATURES, AS WELL AS CONSTRUCTION EXPERIENCES, ARE REPORTED. THE PAVEMENT WAS CONSTRUCTED ON EARTH SUBGRADE ON FILLS AND ALL CUTS EXCEPT FOR ROCK CUTS WHERE A 4-IN. SUBBASE WAS SPECIFIED. THE GRADE WAS PREPARED USING AN AUTOMATIC SUBGRADER. CONCRETE WAS PRODUCED IN A CENTRAL MIX PLANT ERECTED ON THE PROJECT AND HAULED TO THE PAVING SITE IN TRUCKS WITH DUMP BODIES. A SLIP-FORM PAVER, WITHOUT AUTOMATIC CONTROLS, WAS USED TO EXTRUDE THE CONCRETE INTO A 24-FT BY 7-IN. CONCRETE PAVEMENT. /AUTHOR/

Dixon, JC

3A 214418
SLIP-FORM PAVING-CONSTRUCTION PRACTICES ON COLORADO INTERSTATE SYSTEM

CONSTRUCTION METHODS FOR CONCRETE PAVEMENT ARE SUBJECTED TO A WIDE VARIETY OF PROCEDURES. MANY NEW TYPES OF EQUIPMENT ARE BEING DEVELOPED TO PRODUCE BETTER CONCRETE PAVEMENT FASTER AND MORE ECONOMICALLY. A RECENT CONCRETE PAVEMENT PROJECT IN COLORADO IS DESCRIBED BRIEFLY. THE ENTIRE OPERATION FROM SUBBASE TO COMPLETED ROADWAY WAS ACCOMPLISHED IN RECORD TIME AND INVOLVED CAREFUL JOB PLANNING BY THE CONTRACTOR. /AUTHOR/

Zelian, A

3A 214419
SLIP-FORM PAVING-CONSTRUCTION PRACTICES FOR 3-LANE AT A TIME PAVING IN CALIFORNIA

AFTER 5 YR OF USE, SLIP-FORM PAVING NOW ACCOUNTS FOR MORE THAN 80 PERCENT OF ALL CONCRETE PAVING IN CALIFORNIA. IT PROVIDES SIGNIFICANT PRODUCTION ADVANTAGES TO THE CONTRACTOR AND BENEFIT OF LESS COST TO THE HIGHWAY USER. AS COMPARED WITH SIDE-FORM PAVING. THREE DIFFERENT TYPES OF SLIP-FORM PAVERS HAVE BEEN SUCCESSFULLY EMPLOYED, BUT ONLY ONE IS CapABLE OF PAVING 3 LANES AT A TIME. THE PROCEDURES UTILIZED ARE NOT SIGNIFICANTLY DIFFERENT THAN THOSE UTILIZED WHEN PAVING NARROWER WIDTHS WITH THE SAME TYPE OF EQUIPMENT. SUCCESSFUL USE OF THIS TYPE OF EQUIPMENT IS DEPENDENT ON STANDARD OPERATING PROCEDURES ESTABLISHED THROUGH A LOGICAL ANALYSIS OF CAUSE AND EFFECT, TECHNICALLY QUALIFIED FIELD LEVEL SUPERVISION, EXPERIENCED OPERATORS AND MECHANICS, PROPERLY MAINTAINED EQUIPMENT, UNIFORM CONCRETE AT THE PAVER, AND CLOSE ATTENTION TO OPERATIONAL DETAILS BEFORE, DURING AND AFTER CONCRETE PLACEMENT. /AUTHOR/

Gillis, L.R

3A 214422
A CONTRACTOR LOOKS AT SLIP-FORM PAVING

THE PAVEMENTS CONTAIN THE TRANSVERSE JOINTS, DOWELS, TIE BARS, AND DISTRIBUTED WELDED WIRE FABRIC REINFORCEMENT EMPLOYED BY ILLINOIS IN STANDARD FORMED CONSTRUCTION. DETAILS OF THE CONSTRUCTION PROCESS AND THE RESULTS THAT WERE ACHIEVED ARE DESCRIBED AND EVALUATED. /AUTHOR/

Burke, JE

3A 214431
CONSTRUCTION OF SECTIONAL PAVEMENTS

DESIGN AND CONSTRUCTION METHODS FOR THREE TYPES OF PRE-FABRICATED PRESTRESSED CONCRETE PAVEMENT WERE DESCRIBED AND ILLUSTRATED. DEVELOPED IN THE USSR, THE PAVEMENTS HAVE SAND AND BITUMEN OR CEMENT STABILIZED BASES. THE PREFABRICATED CONSTRUCTION METHOD WAS FOUND ECONOMICAL AND EFFECTIVE. IMPROVEMENTS SUGGESTED WERE DEVELOPMENT OF LIGHTWEIGHT SLABS HIGH PRESSURE GROUTING, ROTARY GRADERS, VACUUM-GRIP LAYING PLANT, AND MULTIPONT WELDING EQUIPMENT. /AUTHOR/

Stepuro, NT

3A 214445
PRESPOTTING-A CONTROLLED BLASTING TECHNIQUE FOR ROCK CUTS

RESEARCH WAS CONDUCTED ON CONSTRUCTION METHODS OF IMPROVED QUALITY AND LOWER COSTS IN THE HIGHWAY BUILDING OPERATIONS. THE EFFICACY AND ECONOMIC FEATU
CONSTRUCTION EQUIPMENT AND METHODS

3A 214451 BITUMINOUS PAVEMENT CONSTRUCTION

This report summarizes the findings from field research studies on 11 bituminous pavement construction projects. These studies were concerned with determining the effect of construction methods and equipment operation on pavement and longitudinal joint quality. Semi-hot and cold joint densities were found to be slightly lower than air flows higher than in the abutting lanes. Infrared heating of the joint resulted in the highest quality of all joint types studied. Paver speed was not found to be a significant factor in final lane density. The primary advantage of pneumatic-tired rollers, both at the base and intermediate stage, was found to lie in the ability of pneumatic tires to seal the pavement surface and thus reduce the air flow. With respect to density, no particular advantage could be found in performing breakdown rolling with pneumatic rollers as compared to a steel three-wheel or tandem roller. The value of high rolling temperatures was verified in the highest densities achieved by pneumatic-tired rolling. The highest degree of compliance with the specifications being achieved by the contractors on: (1) Grading project, (2) a base and bituminous concrete pavement project, and (3) a base and Portland cement concrete pavement project. The results reported were from materials and construction which had met all requirements set by the state. Nevertheless, the statistical methods of sampling, testing, and analysis do show a tendency for a small number of results to fall outside of the contract specifications. This study should serve to give the department reassurance in ignoring the statistically small percentage of unsatisfactory results encountered on normal construction operations. The matter of adjusting constructing specifications accordingly is a policy decision.

ACKNOWLEDGMENT: Bureau of Public Roads /US/ Apr. 1965

3A 214460 QUALITY CONTROL OF CONSTRUCTION BY STATISTICAL TOLERANCES

This report reflects the effectiveness of the construction practices in effect in 1965-66 towards meeting the requirements of the construction specifications pertaining to quality assurance. The degree of compliance with the specifications being achieved by the contractors on: (1) Grading project, (2) a base and bituminous concrete pavement project, and (3) a base and Portland cement concrete pavement project. The results reported were from materials and construction which had met all requirements set by the state. Nevertheless, the statistical methods of sampling, testing, and analysis do show a tendency for a small number of results to fall outside of the contract specifications. This study should serve to give the department reassurance in ignoring the statistically small percentage of unsatisfactory results encountered on normal construction operations. The degree of compliance with the specifications was found to lie in the ability of pneumatic tires to seal the pavement surface and thus reduce the air flow. With respect to density, no particular advantage could be found in performing breakdown rolling with pneumatic rollers as compared to a steel three-wheel or tandem roller. The value of high rolling temperatures was verified in the highest densities achieved by pneumatic-tired rolling. The highest degree of compliance with the specifications being achieved by the contractors on: (1) Grading project, (2) a base and bituminous concrete pavement project, and (3) a base and Portland cement concrete pavement project. The results reported were from materials and construction which had met all requirements set by the state. Nevertheless, the statistical methods of sampling, testing, and analysis do show a tendency for a small number of results to fall outside of the contract specifications. This study should serve to give the department reassurance in ignoring the statistically small percentage of unsatisfactory results encountered on normal construction operations. The matter of adjusting constructing specifications accordingly is a policy decision.

David, JH
Alabama State Highway Department May 1967

ACKNOWLEDGMENT: Bureau of Public Roads /US/ May 1967

3A 214461 QUALITY ASSURANCE THROUGH PROCESS CONTROL AND ACCEPTANCE SAMPLING

This pamphlet expresses the philosophy behind the research effort of the quality assurance group of the office of research and development, Bureau of Public Roads. It presents the statistical concepts and methods employed in the process of quality assurance. Quality assurance for highways requires the answer to (1) how do we order what we need to perform the service required and (2) how do we know we are getting what we ordered? Specifications must recognize variabilities and be written on a probability rather than an absolute basis. The necessary level of confidence in the statistical approach to materials specifications must provide for a clear understanding of how measurements will be made. Sampling plans are designated and corresponding tolerances documented. This report is a guide to instrumenting such a program with references to prior studies on this newer concept of evaluating and accepting highway materials and construction processes. Analysis of variances of characteristics and attributes dis-
CONSTRUCTION EQUIPMENT AND METHODS

3A

CLOSE AREAS NEEDING CORRECTIVE ACTION TO PROVIDE ECONOMIC SATISFACTION FOR BOTH THE BUYER AND SELLER. /BPR/


ACKNOWLEDGMENT: Bureau of Public Roads /US/ (2601012 67)PB 176 335, 2C33085458, 1C33021088

3A 214467

TRANSVERSE WEAKENED PLANE JOINTS BY PLASTIC INSERT

A NEW CONSTRUCTION TECHNIQUE IS EVALUATED INVOLVING THE USE OF A MACHINE DEVELOPED FOR THE PURPOSE OF INSERTING A PLASTIC INSERT IN THE FRESH CONCRETE TO FORM A TRANSVERSE WEAKENED PLANE JOINT. THIS TYPE OF JOINT OFFERS MANY POTENTIAL ADVANTAGES OVER THE CURRENT METHOD OF SAWING WEAKENED PLANE JOINTS. A RESEARCH PROJECT WAS INITIATED TO DETERMINE THE ACCEPTABILITY OF JOINTS FORMED BY THE NEW DEVICE. EVALUATE THE SHORT-TERM PERFORMANCE OF THE JOINTS, AND ESTABLISH GUIDELINES TO PERMIT OR SPECIFY GENERAL USE OF THE METHOD. ADEQUACY OF INSTALLATIONS WAS VERIFIED FROM CORES TAKEN ON TWO PAVING PROJECTS. PERFORMANCE OF THIS TYPE OF JOINT UNDER TRAFFIC APPEARS TO BE EQUAL OR SUPERIOR TO SAWED JOINT CONSTRUCTION. A PROPOSED SPECIFICATION FOR THE NEW TECHNIQUE IS INCLUDED IN THIS REPORT.

/BPR /

Spellman, DL; Stoker, JR; Woodstrom, JH

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (411442 68)

3A 214473

STATISTICAL APPROACH TO THE QUALITY CONTROL OF PLANT MIX PAVEMENT

THE INCENTIVE FOR THIS STATISTICAL STUDY WAS BASED ON THE DESIRE TO IMPROVE CONTROL AND ACCEPTANCE PROCEDURES. THIS SPECIFIC STUDY OF PLANT MIX PAVEMENT (ASPHALT CONCRETE) WAS PROVIDED TO ESTABLISH GUIDELINES TO SPECIFY THE QUALITY OF THE MATERIALS. SAMPLING WAS PERFORMED ON THREE CONSTRUCTION PROJECTS DURING ROUTINE PRODUCTION. THE SAMPLING PROCEDURES AND CONSTRUCTION TECHNIQUES WERE DESCRIBED FOR EACH PROJECT. THE TESTING WAS PERFORMED IN ACCORDANCE WITH THE STATE'S STANDARD PROCEDURES. AFTER ANALYSIS OF DATA, A COMPARISON WAS MADE WITH CURRENT TOLERANCE LIMITS. USING THE PARAMETERS FROM THIS STUDY, THERE ARE SOME AREAS OF NONCONFORMANCE WITH CURRENT SPECIFICATIONS. THESE COMPARISONS ARE CLEARLY SHOWN IN GRAPHICAL FORM AND A DISCUSSION IS PROVIDED.

/BPR /

Wyoming State Highway Department, Bureau of Public Roads /US/ State-510, June 1968

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4613264 69)PB-179 424, 1C33021394

3A 214498

USE OF PRECAST, PRESTRESSED CONCRETE FOR BRIDGE DECKS


Ford, JH
Purdue University, Indiana State Highway Commission, Bureau of Public Roads /US/ July 1969

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4613264 69)

3A 214526

STUDY OF LONGITUDINAL JOINT CONSTRUCTION IN BITUMINOUS CONCRETE PAVEMENTS

IT HAS LONG BEEN RECOGNIZED THAT LONGITUDINAL JOINTS BETWEEN SEPARATELY PLACED LANES OF BITUMINOUS CONCRETE HAVE BEEN VULNERABLE TO THE EFFECTS OF WATER, WEATHER, AND TRAFFIC CONDITIONS. THIS PROJECT WAS UNDERTAKEN TO STUDY AND EVALUATE SEVERAL DIFFERENT TYPES OF JOINT CONSTRUCTION TECHNIQUES TO AID IN THE FUTURE CONSTRUCTION OF MORE DURABLE JOINTS. FOR THE PURPOSES OF THIS STUDY ONLY COLD FACE JOINT CONSTRUCTION WAS USED, WITH THE ROLLING TECHNIQUE VARIED IN THE SECOND PLACED LANE TO GIVE THREE METHODS OF JOINT CONSTRUCTION, THE LAP JOINT, THE PINCHED JOINT, AND THE FORCED JOINT. THE EVALUATION SHOWS THAT, AS APPLIED IN THIS STUDY, 6 INCHES DEEP AND 34 INCHES LONG WITH KEYWAYS CAST INTO THEIR EDGES WERE ASSEMBLED ON A BEAM, POST-TENSIONED BY MEANS OF A 3/8-INCH DIAMETER CABLE, AND SUBJECTED TO A CONCENTRATED LOAD. IN ADDITION, A PHOTO-ELASTIC STRESS STUDY OF VARIOUS KEYWAY CONFIGURATIONS WAS MADE. VARIOUS JOINT MATERIALS WERE INVESTIGATED FOR USE BETWEEN SLABS. A STEEL CLIP AND BOLT ASSEMBLY SIMILAR TO THAT EMPLOYED BY THE ASSOCIATION OF AMERICAN PRECASTER MANUFACTURERS TO PRESTRESSED CONCRETE TIES WAS PROPOSED FOR ATTACHING THE FLOOR SLABS TO THE TOP FLANGES OF THE BRIDGE BEAMS. AND A COST ESTIMATE OF USING THIS PARTICULAR METHOD OF DECK CONSTRUCTION OVER CONVENTIONAL METHODS WAS PREPARED.

/BPR /

Gutzwiller, MJ; Lee, RH; Scholer, CF
Purdue University, Indiana State Highway Commission, Bureau of Public Roads /US/ July 1968

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4613292 68)PB-179 424, 1C33021394

3A 214616


duation was drawn together to act as a unit by means of post-tensioning tendons. To test the feasibility of this method, four unreinforced concrete slabs 24 inches wide by
TRANVERSE CRACKING, FRACTURE PLANES, AND SPALLING ARE CONSTRUCTED IN PORTLAND CEMENT CONCRETE DECKS: FORM TYPE, SLUMP, AIR CONTENT, PLACEMENT TIME, FINISHING TIME, DELAY IN CURING, AND DEPTH OF CONCRETE COVER. ANALYSIS INDICATED THAT THE THREE FACTORS: FORM TYPE, SLUMP, AIR CONTENT, FORMED A SIGNIFICANT DIFFERENCE IN THE DURABILITY OF THE JOINTS. AS VISUAL EXAMINATION OVER PERIODS OF EXPOSURE UP TO FIVE YEARS REFLECT SATISFACTORY CONSTRUCTION. ACKNOWLEDGMENT Federal Highway Administration (4722065 72) REPORT PENDING, 3C33022851

3A 214528 EFFECT OF CONSTRUCTION PRACTICES ON DURABILITY OF DECKS. IN ORDER TO STUDY THE EFFECT OF CONSTRUCTION PRACTICES ON THE DURABILITY OF BRIDGE DECKS, SEVEN CONCRETE DECKS WERE OBSERVED DURING CONSTRUCTION. EACH DECK WAS THEN EXAMINED ANNUALLY FOR 5 YEARS. OBSERVATIONS SHOWED THAT THE DECKS BUILT WITH CONVENTIONAL REMOVABLE FORMS EXHIBITED HIGHER RATES OF CRACKING AND LOWER RATES OF SMD THAN THE FOUR DECKS BUILT WITH STAY-IN-PLACE (SP) FORMS. THOSE SECTIONS HAVING AVERAGE SLUMPS GREATER THAN 3 IN. SHOWED A HIGHER FREQUENCY OF DEEP SMD THAN THOSE HAVING AVERAGE SLUMPS LESS THAN 3 INCHES. AN UNEXPLAINED ASSOCIATION BETWEEN HIGH AIR CONTENT AND SLUMP FORMS PRECLUDED ANY MEANINGFUL ANALYSIS OF THE INFLUENCE OF AIR CONTENT AND THE RATE OF DETERIORATION. DELAYS IN PLACEMENT AND FINISHING TIMES WERE ASSOCIATED WITH HIGHER RATES OF CRACKING. DELAYS IN START OF CURING WERE ASSOCIATED WITH HIGHER RATES OF SMD. SPANS OF DECKS HAVING LESS THAN 1.5 INCHES OF COVER OVER TOP STEEL EXHIBITED FRACTURE PLANES AND OR SPALLS. ACKNOWLEDGMENT Federal Highway Administration (4641186 72) REPORT PENDING, 3C33022867

3A 214531 TRANSVERSE JOINT CONSTRUCTION TRANSVERSE JOINTS ARE CONSTRUCTED IN PORTLAND CEMENT PAVEMENTS TO RELIEVE INTERNAL STRESSES CAUSED BY PERMITTING CONTRACTION AND EXPANSION OF PAVEMENT SLABS. THOUGH MANY DIFFERENT METHODS HAVE BEEN USED TO CONSTRUCT THESE JOINTS THE METHODS CAN BE CLASSIFIED IN THREE GROUPS: HAND FORMING, INSERT FORMING, AND PRECAST FORMING. IT IS IMPORTANT TO EVALUATE THE VARIOUS METHODS, NOT ONLY FROM A CONSTRUCTION STANDPOINT, BUT ALSO FOR LONG TERM PERFORMANCE OF THE JOINT TO ACCOMPLISH THIS. ACKNOWLEDGMENT Federal Highway Administration (4641186 72) REPORT PENDING, 3C33022867

3A 214551 USE OF PRECAST-PRESTRESSED CONCRETE FOR BRIDGE DECKS A PRECAST, PRESTRESSED CONCRETE BRIDGE DECK SYSTEM HAS BEEN DESIGNED TO BE USED EITHER ON NEW BRIDGES OR FOR RECONSTRUCTION OF DETERIORATED DECKS. THE REPORT DESCRIBES THE CONSTRUCTION ACTIVITIES INVOLVED IN THE USE OF THE PRESTRESSED PLANK ON TWO INSTALLATIONS IN INDIANA. ACTUAL TIME REQUIRED TO PLACE THE ELEMENTS AND POST-TENSION THEM TOGETHER WAS TWO DAYS FOR EACH BRIDGE. LOAD TESTS HAVE BEEN MADE ON BOTH BRIDGES AT INTERVALS SINCE THEIR CONSTRUCTION. RESULTS HAVE INDICATED NO SIGNIFICANT CHANGES IN DECK PERFORMANCE DURING THIS PERIOD. ACKNOWLEDGMENT Federal Highway Administration (4641186 72) REPORT PENDING, 3C33022867


ACKNOWLEDGMENT Federal Highway Administration REPORT PENDING, FHWA P-0017, 2C3303214

3A 214549 THE DRYER-DRUM MIXING PROCESS FOR PRODUCING ASPHALT MIXTURES IN THE STATE OF WASHINGTON This report describes the dryer-drum process for production of asphalt pavement mixtures. Damp or wet aggregates and asphalt are introduced into a dryer drum. Drying the aggregate and coating it with asphalt are accomplished as the material passes through the dryer. No further mixing is required. Results of tests, i.e., penetration loss, compaction, extraction, etc., are given. Practically all particulate emissions are eliminated. Substantial cost reductions are envisioned. ACKNOWLEDGMENT Federal Highway Administration (4641186 72) REPORT PENDING, 3C33022867
CONSTRUCTION EQUIPMENT AND METHODS

3A 214558
THE COMPACTION OF SOIL AND ROCK MATERIALS FOR HIGHWAY PURPOSES

The investigation was designed to review the state of the art of the compaction of soil and rock for highway purposes, to lay the groundwork for improved field construction practices and specifications. The researchers reviewed the mechanics of compacted materials and factors that affect them, behavioral requirements of pavement elements, variability and reliability of testing procedures, and statistical quality control methodology. They reviewed construction specifications and field practices and developed recommendations for improvements. They also recommended goals for future research.


3A 214576
CONCRETE ROAD CONSTRUCTION

Advances in construction techniques are reviewed with emphasis on American plant, particularly the slip-form paver. Reference is included to research and development on design and construction of concrete roads in Great Britain by the road research laboratory, Harmondsworth, and the concrete and concrete association, London.

Stroud, A. 'Mack Shifter.' Apr. 1965

3A 214578
TUNNEL BREAK-THROUGH UNDER WATER

The first part of the article gives a survey of the constructional aspects of tunnelling breakthrough under water as practised for years by Norwegian water power developers. The second part deals with model tests generally and presents examples of actual experiments. Hitherto important hydraulic data, such as the site of deposition of the debris, have not been amenable to verification and control. But now this has been made possible by model tests.

Hoyer, H; Groner, CF; Slovik, O. Teknisk Ukeblad, Oslo. June 1965

3A 214580
MULTI-STAGE BRIDGE CONSTRUCTION KEEPS TRAFFIC MOVING

To improve the facilities provided by a frequently congested 250-ft long by 24-ft wide overhead steel truss span overpass, a design and three-stage sequence of construction were devised that would incur a minimum disruption of traffic flow. Two sections of bridge, providing temporary routes for vehicular traffic, were constructed adjacent to the old structure, following the removal of this old bridge structure. The third stage was completed construction of the closure.

Kropp, PK. Purdue & Ind State Hwy Comm Jhrp Interim Mar. 1973, 39 pp

3A 214582
PAVING OF PUBLIC ROADS IN FINLAND

Paving of highways was started on a larger scale at the beginning of the 1960s. In 1964 the use of oil gravel decreased, and the length of asphalt concrete pavements was at the shortest in the decade. The use of bituminous gravel and cut-back asphaltic bitumen, however, increased. There have been no essential changes concerning the actual asphalt pavements, although over 100 test road sections have been constructed for analysis of different binder materials, adhesive agents, working methods, and the economy of paving. The length of paved public roads in 1964 was 1,701 km, which can be divided by pavement type as follows: asphalt concrete 170, bituminous gravel 129, cut-back asphaltic bitumen 169, and oil gravel 1,033 km, of which 712 km are old roads.

Niemi, B. Tiedehi, Helsinki. Apr. 1965

3A 214588
FARM ROAD CONSTRUCTION

Farm road construction, third revised edition. Details are given of the materials, equipment and procedure involved in concrete, farm-road construction. It is considered that for general purposes the road should not be less than 8 ft wide and, unless it is at least 16 ft wide passing bays should be provided. The slab should be 6 in thick or 5 inches on a good subgrade. Joints are required, but reinforcement is necessary only under conditions of heavy traffic or on a weak subgrade.

Cement & Concrete Assoc, London. June 1965

3A 214589
SURFACE IRREGULARITY DATA FOR RECENT MAJOR ROAD WORKS: SPECIFICATIONS AND TOLERANCES

Measurements were made with a multi-wheeled profilometer or a bump integrator on a considerable number of recent major road works, in order that the standards of surface finish and the variability between and within individual projects could be ascertained and compared with the current requirements of specifications. Standards were found to vary widely but on nearly all the roads an appreciable proportion of the whole surface had a finish better than the 1/8-inch standard. It is considered that supervising engineers should aim primarily at minimizing the variability of surface finish in order to improve overall results. This in turn implies efficient and adequate control of all materials and processes in construction.

Road Research Laboratory Notes. June 1965

3A 214590
CONCRETE ROADS IN NIGERIA

The present position with regard to the design and construction of concrete roads in Nigeria is de-
**3A CONSTRUCTION EQUIPMENT AND METHODS**

SCIBED. SOME DESIGNS ARE REVIEWED, AND THE CONSTRUCTIONAL METHODS ARE COMPARED WITH THOSE USED ELSEWHERE EMPLOYING MECHANIZED EQUIPMENT. /RRL/

Agbim, CC Concrete & Constructional Eng /UK/ Aug. 1965

ACKNOWLEDGMENT: Road Research Laboratory /UK/

**3A 214596**

OVERSLABBING AT SWANSEA AIRPORT. RECONSTRUCTION TO STRENGTHEN CONCRETE RUNWAY

THE CONTRACT INCLUDED MAKING UP SURFACE LEVELS WITH REGULATING COURSES OF HOT-ROLLED ASPHALT, OVERSLABBING WITH SIX-INCH REINFORCED CONCRETE, AND RECONSTRUCTING RUNWAY SHOULDERS AND TERMINAL AREA. DETAILS ARE GIVEN OF JOINT CONSTRUCTION AND PAVEMENT DESIGN. /RRL/

Surveyor and Municipal Engineer /UK/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

**3A 214597**

INVESTIGATIONS INTO ROAD BUILDING PRACTICE IN THE TROPICS. SIX STUDIES OF SOME ROAD BUILDING OPERATIONS ON A ROAD CONSTRUCTION SCHEME IN TORTOLA, BRITISH VIRGIN ISLANDS

AS PART OF A STUDY OF ASPECTS OF NORMAL ROAD-BUILDING PRACTICE IN THE TROPICS, MEASUREMENTS WERE MADE DURING THE CONSTRUCTION OF A CEMENT-STABILIZED BASE IN TORTOLA. THE BASE IS BEING CONSTRUCTED WITH A SINGLE-PASS STABILIZING TRAIN BY ADDING A SMALL PROPORTION OF CEMENT TO A GRANULAR MATERIAL KNOWN LOCALLY AS TARRAS. THE DATA OBTAINED SHOWED THAT WITH THE CONSTRUCTION METHODS USED ADEQUATE STATES OF COMPACTION AND THICKNESSES OF STABILIZED BASE WERE BEING PRODUCED BUT SHAPING BY BULDOZERS WAS UNABLE TO PRODUCE A SURFACE OF ACCEPTABLE REGULARITY. /RRL/

Tanner, JS Road Research Laboratory Notes /UK/ Sept. 1965

ACKNOWLEDGMENT: Road Research Laboratory /UK/

**3A 214599**

IMMERSED TUBE METHOD. WORLDS FIRST SIX-LANE TUNNEL IN SWEDEN

THE TINGSTAD TUNNEL UNDER THE GOTA RIVER AT GOTE BORG IS CONSTRUCTED ON THE SUNK TUNNEL PRINCIPLE, AND COM普RISKS AN ENCLOSED COFFERDAM STRETCH OF 455 M WITH A 60 M LONG APPROACH RAMP AT EITHER END. THE TUNNEL CONSISTS OF 5 SECTIONS, EACH APPROX. 93 M LONG, WHICH ARE PRECONSTRUCTED, CLOSED, TOWED OUT AND SUNK INTO POSITION ON THE FOOTINGS PREPARED BEFOREHAND. HEADROOM IN THE CARRIAGEWAYS IS 4.5 M. THE THICKNESS OF THE STRUCTURAL CONCRETE IS 100 CM FOR OUTER WALLS AND BOTTOM, 52 CM FOR THE ROOF AND 50 CM FOR INBOARD DIVIDING WALLS. DETAILS ARE GIVEN OF ADDITIONAL WATER INSULATION, CONSTRUCTING THE UNITS IN THE BUILDING DOCK, SINKING OF UNITS, DIMENSIONING, VENTILATION, SOIL EXPLORATION AND EXPERIMENTATION. /RRL/

Gustafsson, T Contract Journal /UK/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

**3A 214604**

HOT WEATHER CONCRETING

FACTORS INVOLVED IN HOT WEATHER CONCRETING IN THE UNITED KINGDOM ARE DISCUSSED. ATTEMPTS WERE MADE TO DEAL WITH THE PROBLEM BY CONCRETING AT MORE NORMAL TEMPERATURES. AS THE TEMPERATURE OF CONCRETE AT THE TIME OF MIXING OR PLACING INCREASES, THE CEMENT HYDRATES MORE RAPIDLY. THE RESULTANT LOWER WORKABILITIES CAN RESULT IN POOR COMPACTION.

THE CONCRETE IS ALSO MORE PRONE TO THERMAL CONTRACTION MOVEMENTS AND FASTER DRYING SHRINKAGE. LEADING POSSIBLY TO SURFACE CRACKING WITH SLABS. BECAUSE OF THE MORE RAPID GENERATION OF HEAT FROM THE CONCRETE ITSELF, THE PROBLEMS OF CONCRETING IN HOT WEATHER CAN BE FURTHER INCREASED WHEN CEMENTS WITH RAPID-HARDENING PROPERTIES ARE USED OR WHERE LARGE VOLUMES OF CONCRETE ARE BEING PLACED. /RRL/

Cement & Concrete Assoc Adv Notes /UK/ May 1965

ACKNOWLEDGMENT: Road Research Laboratory /UK/

**3A 214614**

THE POSSIBILITY OF USING TRACKED WAYS/TRACTWAYS/ OF PRECAST CONCRETE UNITS AS A STANDARD CONSTRUCTION FORM FOR FARM ROADS

SINCE 1959, TRACKED WAYS/TRACTWAYS/, I.E. STABILIZATION OF THE WHEEL TRACKS, ARE BEING INCREASINGLY USED IN SCHLESWIG-HOLSTEIN, IN BUILDING THE AGRICULTURAL ROAD SYSTEM. THEY ARE STILL TOO NEW TO ALLOW OF AN EVALUATION OF THEIR RELIABILITY. THE DEVELOPMENT OF TRAMWAY CONSTRUCTION IS ILLUSTRATED ON THE EXAMPLE OF THE STEINBERG RURAL DISTRICT. AS ROADS OF SUBSIDIARY IMPORTANCE (ACCOMMODATION ROADS), THESE TRACKWAYS ARE SUFFICIENTLY DISTINGUISHABLE FOR ORDINARY ROAD TRAFFIC TO AVOID THEM. EXPERIENCE HITHERTO APPEARS TO INDICATE THAT STABILIZATION OF THE WHEEL TRACKS CAN BECOME A DECISIVE FACTOR IN THE DEVELOPMENT OF STANDARD CONSTRUCTION METHODS FOR AGRICULTURAL ROADS. /FG/RRL/

Radloef, W Wasser Und Boden /Germany/ 65

ACKNOWLEDGMENT: Road Research Laboratory /UK/

**3A 214617**

SOFT-GROUND TUNNELLING:" DESIGN AND CONSTRUCTION


Noskiewicz, TM Ramsay, JA Canadian Good Roads Association Proc Oct. 1964

**3A 214623**

GIANT TOWERS ERECT BRIDGE

USING TEMPORARY TOWERS ERECTED ON SITE, DOMINION BRIDGE WAS ABLE TO CUT CONSTRUCTION TIME FOR THE BRIDGE BETWEEN MONTREALS MACKAY PIER AND EXPOS ILE VERTE: FROM 1 1/2 YEARS TO 1 1/2 YEARS. THE TOWERS WERE USED TO CANTILEVER THE SPANS UTILIZING CABLES ANCHORED IN THE BRIDGE ABUTMENTS. TWO TOWERS WERE USED ONE AT EACH END WITH THE BRIDGE MEETING AT THE CENTRE. THE SPANS THEMSELVES ARE OF AN ORTHOTROPIC STEEL DESIGN EMPLOYING A TRAPEZOIDAL THREE-CELL BOX GIRDER WITH SLOPING WEBS ON THE INSIDE. /CGRA/

Caplan, B Engineering and Contract Record /Can/ Mar. 1965
CONSTRUCTION EQUIPMENT AND METHODS

3A 214628
SPEEDY COMPACT CONCRETE PUMPING UNITS PRODUCE SAVINGS AND A NEW CONTRACTOR

COMPACT AND MOBILE CONCRETE PUMPING RIGS ARE COMPETITIVE IN COST AND SPEED AND OFTEN MORE EASY TO HANDLE THAN CONVENTIONAL CRANE AND BUCKET OR TRUCK AND BUGGY COMBINATIONS. HERE ARE THE BENEFITS OF PUMPING: 1/ CONCRETE PLACEMENT TENDS TO BE MORE STEADY, UNINTERRUPTED, AND IS GENERALLY FASTER THAN CONVENTIONAL METHODS. 2/ FORM PRESSURES AND WEAR ARE REDUCED BECAUSE OF ELIMINATION OF SURGES, 3/ CONCRETE CAN BE CAST IN LOCATIONS OTHERWISE INACCESSIBLE TO CRANE OR BUGGY, 4/ COSTS ARE USUALLY COMPARATIVE WITH, OR BETTER THAN MOVING CONCRETE BY OTHER METHODS. LABOR REQUIREMENTS ARE ALSO REDUCED.

3A 214637
EXPERIENCE WITH AUTOMATICALLY CONTROLLED PAVERS IN ONTARIO

This report documents experience in the use of automatically controlled pavers included in certain departments of highways, Ontario contracts as a special provision. Some of the applications such as grade levelling and cross-fall control are noted and the means by which automatically controlled paving is achieved including the methods in most common use are discussed. The merits of the various methods and sensing devices are evaluated because of lack of experience, measuring instruments, and actual records of the results obtained, but the construction techniques found most suitable by the department for resurfacing of old pavements and construction of new pavements are outlined. Special applications of automatically controlled paving are mentioned and a part leaves the sprayer. The second stage is compaction by traffic, which takes place at normal service temperatures, and it ordinarily continues from two to four years to achieve ultimate density, which corresponds to 100% of laboratory compacted density. Poor compaction by rolling during construction leaves a pavement with a high air voids content. The higher the air void content, the faster the asphalt cement in the pavement hardens, and the shorter is the pavement's service life. Consequently, there is a need to combine this two-stage pavement compaction into a single stage. This means that pavements should be rolled during construction to 100% of laboratory compacted density. Experience shows that rolling to 100% of laboratory compacted density is achieved by steel wheel rollers. It could probably be attained by the proper use of pneumatic-tire rollers equipped for rapid change of tire inflation pressure. Some improvements in the latter type that are needed to accelerate this development are reviewed. Compacting pavements during construction to 100% of laboratory compacted density would retard the rate of hardening of the asphalt cement in the pavement, thereby substantially lengthening pavement service life, and it would greatly increase the load carrying capacity of binder and surface courses, and particularly of asphalt base courses, per inch of thickness. Low viscosity asphalt cements, because of their low viscosities at high temperatures, cause surface mixtures to resist compaction by rolling, and this would be highly advantageous for: (1) assisting properly operated pneumatic-tire rollers with rapidly adjustable tire pressure to attain 100% of laboratory compacted density by rolling during construction, (2) achieving much faster compaction by traffic to 100% of laboratory compacted density, where this is not attained by rolling, and (3) achieving compaction to much higher density by rolling during cold weather construction.

3A 214646
A CONSTRUCTION PROJECT INCORPORATING FULL DEPTH ASPHALTIC CONCRETE

information presented and discussed includes data on subgrade, asphaltic concrete design, and construction practices followed. Experimentation with rolling procedures is described as well as accelerated aging. Information as to the performance to date is presented.

3A 214661
MEASUREMENTS OF VIBRATIONS CAUSED BY CONSTRUCTION EQUIPMENT AND BLASTING

The investigation of vibrations resulting from construction activity embodied three principal objectives: (1) to formulate a method of house inspection which would enable the evaluation of property damage claims arising from construction work; (2) to measure the vibration levels produced by different types of construction equipment; and (3) to set up and maintain a vibration level monitoring service on explosive charges used in the excavation of a sewer tunnel and to ensure that recommended charge levels were not exceeded. Earlier studies.

Brown, LM
Ontario Dept Transp & Communications  Apr. 1971

ACKNOWLEDGMENT: Roads & Transportation Assoc /Canada/

3A 214666
CONSTRUCTION PRACTICES-FLEXIBLE PAVEMENTS
THIS BIBLIOGRAPHY IS CONCERNED WITH CONSTRUCTION REQUIREMENTS, EQUIPMENT, MATERIALS FOR VARIOUS LAYERS, AND PROCESSING. IN ADDITION TO THE ITEMS CONCERNING CONSTRUCTION PRACTICES OF FLEXIBLE PAVEMENTS THERE ARE ITEMS ON SUBGRADES AND SUBBASES PERTINENT TO THIS TYPE OF CONSTRUCTION. THE BIBLIOGRAPHY IS PRESENTED IN THREE PARTS, A TECHNICAL LITERATURE SURVEY WITH LISTING OF COVERAGE, PUBLICATION COVERAGE OF ENGINEERING NEWS-RECORD AND OF ROADS & STREETS, BOTH FROM 1955 THROUGH 1964. KEY WORDS ARE INDICATED FOR EACH ARTICLE. ARTICLES ARE LISTED FOR EACH KEY WORD.

Highway Research Board Bibliography  1966

3A 214669
COFFERDAMS FOR THE TOWN CREEK PIERS OF THE SILAS N. PEARMAN BRIDGE OVER THE COOPER RIVER. CHARLESTON, SOUTH CAROLINA

Carle, RJ  Highway Research Record, Hwy Res Board  1967

3A 214670
THE STRUCTURE OF PRESTRESSED STEEL STRUCTURES
THE PRINCIPLES GOVERNING THE DESIGN, APPLICATION CONSTRUCTION AND BEHAVIOR OF PRESTRESSED STEEL BEAMS ARE DISCUSSED. ONLY ONE TYPE OF PRESTRESSING IS CONSIDERED AND THAT IS PRESTRESSING USING CABLES, STRANDS OR RODS. SEVERAL TYPES OF BEAM STRUCTURES ARE CONSIDERED INCLUDING PRESTRESSED I-SHAPED BEAMS, PRESTRESSED COMPOSITE BEAMS AND PRESTRESSED CONTINUOUS BEAMS. IN EACH CASE THE BEHAVIOR OF THE STRUCTURE IS PRESENTED ALONG WITH COMMENTS ON THE POSSIBLE ECONOMY TO BE ACHIEVED. A COMPARISON IS GIVEN BETWEEN CONVENTIONAL AND PRESTRESSED COMPOSITE BEAMS AND THE RESULTS SHOW PROMISE FOR PRESTRESSING. THE EFFECTS OF PRESTRESSING ON SIGNIFICANTLY REDUCING BENDING MOMENTS IN CONTINUOUS BEAM CONSTRUCTION ARE DISCUSSED. SEVERAL EXAMPLES OF PRESTRESSED STRUCTURES ARE PRESENTED.

Hoadley, PG  Highway Research Record, Hwy Res Board  1967

3A 214679
USE OF CEMENT BOUND BASECOURSE IN AUCKLAND AREA
THIS PAPER DESCRIBES LABORATORY AND FIELD TESTING, METHODS OF CONSTRUCTION, AND RESULTS ACHIEVED IN THE USE OF CEMENT Bound BASECOURSE FOR HIGH CLASS PAVEMENTS IN THE AUCKLAND AREA.

Parsons, RR McNamara, GP
National Roads Board /New Zealand/  1965

3A 214685
DEVELOPMENTS IN PRECAST CONCRETE FOR TUNNELS
THE USE OF PRECAST CONCRETE IN THE CONSTRUCTION OF TUNNELS CONTINUES TO DEVELOP, AND TWO DIRECTIONS WHICH THIS DEVELOPMENT IS TAKING ARE DESCRIBED IN THIS REPORT. THE FIRST IS THE USE OF NEW TYPES OF PRECAST CONCRETE SEGMENTS ACCOMPANIED BY REMARKABLE INCREASES IN THE RATE OF TUNELLING. THE SECOND IS THE INCREASING USE TO WHICH THE THRUSTING PROCESS IS BEING USED IN INSTALLING PRECAST CONCRETE PIPE TUNNELS.

Concrete & Constructional Eng /UK/  July 1966

ACKNOWLEDGMENT: Highway Res Abstracts Hwy Res Board

3A 214700
SUBWAY TUNNEL CONSTRUCTION IN NEW YORK CITY
SUBWAY TUNNEL CONSTRUCTION PROVIDES A VARIETY OF CONDITIONS REQUIRING SPECIAL EQUIPMENT AND METHODS. TUNNEL SECTIONS VARY AS TO SHAPE, HEIGHT AND PROXIMITY TO EXISTING STRUCTURES. PROVEN AND NEW EQUIPMENT AND METHODS ARE USED FOR EXCAVATION AND CONCRETE OPERATIONS. A COMBINATION OF ROOF BOLT, TIMBER AND STRUCTURAL STEEL IS USED TO SUPPORT THE EXCAVATED TUNNEL. RUBBER-TIRED HAULING EQUIPMENT PROVED TO BE MANEUVERABLE AND ADAPTABLE TO A VARIETY OF TUNNEL OPERATIONS. CRAWLER-MOUNTED EQUIPMENT FOR LOADING IS SELECTED BECAUSE OF ITS SUCCESS IN SIMILAR WORK. CONCRETE EQUIPMENT IS SELECTED AND ADAPTED TO BE MANEUVERABLE AND FLEXIBLE BECAUSE OF THE VARIETY PLACING REQUIREMENTS. ROCK FALL STOPS ADVANCE OF TUNNEL EXCAVATION. TUNNEL AND VOID ARE FILLED WITH CONCRETE TO FORM SUPPORT FOR FALLING ROCK. ROCK EXCAVATION IS CARRIED OUT DIRECTLY UNDER OPERATING RAILROAD AND PASSENGER STATION SUPPORT OF OVERHEAD STRUCTURE IS DONE AS EXCAVATION IS ADVANCED. BLASTING IN THIS AREA IS LIMITED TO AVOID DAMAGE TO EXISTING STRUCTURE.

Knight, GB  Am Soc Civil Engr J Construction Div  Sept. 1964

3A 214701
EMPLOYMENT OF PIPEJACK METHOD FOR INSTALLING A CULVERT
A GREATLY INCREASED LENGTH OF CULVERT WAS NEEDED TO ACCOMMODATE A WIDENED FILL ON A HIGHWAY THAT WAS BARELY SUFFICIENT TO PROVIDE A TWO-LANE THOROUGHFARE. THE DIFFICULTY OF DETOURING TRAFFIC RULED OUT OPEN TRENCH EXCAVATION AND SO JACKING A PRECAST PIPE WAS THE METHOD EMPLOYED. JACKING COMMENCED FROM THE DOWNSTREAM END WHERE A NATURAL RIDGE FORMED AN EXCELLENT BACK-STOP. A REINFORCED
CONSTRUCTION EQUIPMENT AND METHODS

CONCRETE LAUNCHING PAD WAS USED TO FACILITATE JACKING. JACKS WERE POSITIONED ON THE LAUNCHING PAD AND PRESSURE APPLIED TO THE LOWER ARC OF THE PIPE ONLY. THIS ALLOWED MUCKING OUT TO PROCEED WITHOUT DISTURBING THE JACKS. GREAT DIFFICULTY WAS EXPERIENCED IN SECURING RECUMBENT HYDRAULIC JACKS. TANGYE 15 TON HYDRAULIC JACKS WERE USED BUT LARGER 25 TON JACKS WOULD HAVE SPEEDED OPERATIONS. HOWEVER, CONSTRUCTION BY THE PIPE JACK METHOD FACILITATED CONSTRUCTION AND PERMITTED COMPLETION IN SHORT TIME WITHOUT TRAFFIC INTERFERENCE.

Jacking. Jacks were positioned on the launching pad and pressure applied to the lower arc of the pipe only. This allowed mucking out to proceed without disturbing the jacks. Great difficulty was experienced in securing recumbent hydraulic jacks. Tangye 15 ton hydraulic jacks were used but larger 25 ton jacks would have speeded operations. However, construction by the pipe jack method facilitated construction and permitted completion in short time without traffic interference.

3A 214702
INFLUENCE OF VISCOSITY OF ASPHALT-CEMENTS ON COMPACTION OF PAVING MIXTURES IN THE FIELD AND DISCUSSION

Compaction of any given dense graded asphalt-concrete paving mixture by rolling during construction is influenced by the viscosity temperature characteristics of the asphalt-cement, the temperature of the mix during compaction, the gradual increase of stability and density of the mix as rolling proceeds, the rate of cooling of the mix behind the spreader, type of rolling equipment, and the use of low rather than high viscosity asphalt-cements. The influence of the viscosity of the asphalt-cement on cold weather pavement construction, and on the rate at which a finished asphalt pavement is densified by traffic is reviewed. Of current compaction equipment it is indicated that pneumatic-tire rollers equipped for rapid adjustment of tire inflation pressures over the range of about 25 to 150 psi or more, appear most likely to be capable of achieving 100 percent of laboratory-compacted density by rolling during construction.

Mcleod, NW  Highway Research Record, Hwy Res Board  1967

3A 214704
HANDBOOK OF HEAVY CONSTRUCTION

Advice is given on all phases of construction, from equipment costs to erection, planning to field operation. Answers are given to a wide range of construction problems. Experts outline the best current practices in their field, show where difficulties may arise and eliminate need for costly trial and error. Case histories are included.

Stubbs, FW
Handbook of Heavy Construction  1040 pp

3A 214716
FOUNDATIONS AND OTHER CONSTRUCTION BELOW GROUND

Some new methods of constructing foundations and other work below ground were given. Applications of these methods together with some other developments in foundation engineering were described, such as that of constructing retaining walls and similar work by processes utilizing bentonite slurry. A shaft constructed on the bentonite process was illustrated. The technical description of the special bentonite, sodium montmorillonite, was given.

Concrete & Constructional Eng /UK/  Jan. 1966

3A 214717
PILE Foundations and Sheetpiling

Details are given on the construction of large cylinder foundations or piles for buildings and the Tasman Bridge, Tasmania. The shafts of the piles for one building were lined with salvaged corrugated metal sleeves which were pressure-grouted into position. The shafts were belled-out at the bottom and were filled with concrete to the level at which the concrete and steel construction of the structure commenced. The Tasman Bridge has bored piles installed by forcing a hollow steel cylinder into the ground, excavating inside, and filling it with reinforced concrete. Load-bearing cast-in-situ piles of various shapes are being constructed by the bentonite process. Silent, sonic, and described, a device for cutting off concrete piles is illustrated.

Concrete & Constructional Eng /UK/  June 1965

3A 214722
HOW BRITISH ROAD TRENDS MAY AFFECT FUTURE PLANNING

The changing characteristics of highway construction due to increasing construction in urban areas is discussed. Standards are needed for the use of construction equipment in highway construction. Machines such as the datum-layer for laying curb-base, scrapers, face shovels, wheel excavators and compaction equipment are discussed. The use of central batching and mixing plants affords economy in construction of concrete highways. Suggestions are made for improving conventional paving trains.

Elbourne, DS  World Construction  Jan. 1967

3A 214737
RESPONSIBILITY FOR QUALITY IN HIGHWAY CONSTRUCTION

The problems of responsible control for quality in highway construction are discussed. Performance depends on the design of the pavement structure at least as much as on the quality of materials and construction used. The ultimate concept in responsibility would be having the contractor or government agency required to design, build and guarantee the performance of the highway. However, initiative in using new construction methods must not be hampered. Construction control tolerances and the responsibility for quality control testing are discussed.


3A 214738
BITUMEN ROAD CONSTRUCTION IN DEPTH

Functions and designs of road structures were discussed, and worldwide design and construction techniques for flexible pavements were reviewed. Reasons for increases use of bituminous bound bases and base courses, equivalent thicknesses of different materials were indicated. Suggestions for bituminous mixes relying upon composition alone were rated inadequate. Mechanical tests giving an indication of performance were recommended.


3A 214752
FEASIBILITY OF COLD WEATHER EARTHWORK IN INDIANA

The effects of cold and inclement weather on men, machines, and materials involved in highway earthwork were reviewed. The cold weather earthwork experience of the northern states of the United States, the provinces of Canada, and the
SCANDINAVIAN COUNTRIES HAS BEEN REVIEWED WITH THE AIM OF DETERMINING, (1) HOW WEATHER AND SOIL CONDITIONS TEND TO RESTRICT THE LENGTH OF THE CONSTRUCTION SEASON, AND (2) WHAT COLD WEATHER CONSTRUCTION PRACTICES MIGHT BE APPLICABLE IN INDIANA. THE SEASONAL VARIATIONS OF WEATHER AND CERTAIN SOIL CONDITIONS IN INDIANA HAVE BEEN STUDIED. THE INCREASED COSTS OF VARIOUS EARTHWORK OPERATIONS IN INDIANA DURING COLD WEATHER HAVE BEEN ESTIMATED. THE PROBABLE BENEFITS OF (1) REDUCED INTEREST AND TO LATE SEASON, (2) REDUCED ACCESSION COSTS, (3) BETTER UTILIZATION OF THE RESOURCES OF LABOR, CONTRACTORS, AND THE STATE HIGHWAY COMMISSION HAVE BEEN WEIGHED AGAINST HEIGHTENED TECHNOLOGICAL DEMANDS. A HYPOTHEtical EXAMPLE HAS BEEN DEVELOPED WHICH SHOWS THAT COLD WEATHER EARTHWORK IS FEASIBLE ON AN INTERSTATE HIGHWAY CONSTRUCTION PROJECT IN NORTHERN INDIANA AND THAT YEAR-ROUND CONSTRUCTION SCHEDULING CAN PRODUCE AN ECONOMIC BENEFIT. /AUTHOR/

Osborne, AM
Purdue & Ind State Hwy Comm Jhrp June 1967

3A 214773
COMPUTER TELLS CONTRACTORS WHEN TO BUY
A COMPUTER PROGRAM HAS BEEN DEVELOPED USING A MATHEMATICAL MODEL WHICH INCLUDES THE MANY VARIABLES AND CONSIDERATIONS INVOLVED IN EQUIPMENT BUYING. THE COMPUTER GIVES THE CONTRACTOR A SERIES OF GRAPHS THAT CLEARLY SHOW THE RELATIONSHIPS BETWEEN THE VARIABLES AND THE EFFECT OF VARIOUS ALTERNATIVES. THE PROFITS GENERATED BY THE OPERATION OF A MACHINE AND ITS REPLACEMENTS ARE QUANTIFIED BY WRITING EQUATIONS TO EXPRESS EACH REVENUE OR COST CURVE. INFLATION IS TAKEN INTO ACCOUNT BY DISCOUNTING DOLLARS BACK TO THE PRESENT TIME. COSTS ARE SUBTRACTED FROM REVENUES TO OBTAIN THE PRESENT WORTH OF PROFITS AFTER TAXES. VARIABLES ARE EXAMINED AND EQUATIONS WRITTEN FOR FACTORS SUCH AS REVENUE FROM A MACHINE, MAINTENANCE AND OPERATING COST, CAPITAL COSTS, DEPRECIATION, INFLATION, INTEREST CHARGES OR EQUIPMENT LOANS AND OVERHaul COSTS. AFTER STUDYING MATHEMATICAL MODELS OF EQUIPMENT ECONOMICS, TWO CONCLUSIONS MAY BE DRAWN: (1) THE ECONOMIC LIFE OF A PIECE OF EQUIPMENT IS MUCH SHORTER THAN THE LIFE OVER WHICH A PROFIT CAN BE MADE ON ITS OPERATION AND (2) THE FLEXIBILITY OF THE MODEL LENDS IT TO READY ANALYSIS OF ALTERNATIVE.

Douglas, J
Western Construction Sept. 1967

3A 214776
SIX-LANE TUNNEL SITS ON SACKS OF GROUT

Engineering News-record Nov. 1967

3A 214784
HOW TO USE TRANSITS & LEVELS

Concrete Construction Sept. 1967

3A 214888
ESTIMATING CONCRETE WORK-II: ESTIMATING FOUNDATION WALLS
THE PROCEDURES AND TECHNIQUES FOR ESTIMATING CONSTRUCTION OF FOUNDATION WALLS BEARING ON FOOTINGS AND DIRECTLY ON COMPACTED EARTH ARE PRESENTED. UNDERPINNING AND EXISTING FOUNDATION WALL AND ESTIMATING THE FORM AREA IN CONCRETE FOR PIERS BELOW GRADE AND FOR BUILDING SLABS ON FILT ARE ALSO DISCUSSED. IT IS POINTED OUT THAT BUILDING SLABS AND FOUNDATIONS ARE CONSIDERED TO HAVE A UNIT COST PER SQUARE FOOT, AND THAT SLABS OF GROUND FLOOR LEVEL SHOULD BE KEPT SEPARATE BECAUSE OF THE DIFFERENT LABOR COST PER CUBIC YARD FOR PLACING THESE SLABS. IF ALL SLABS ARE OF THE SAME THICKNESS, ONLY THE QUANTITIES FOR THE AREA SHOULD BE EXTENDED AND THE CONCRETE QUANTITIES MAY BE OBTAINED BY MULTIPLYING THE TOTAL AREA BY THE SLAB THICKNESS. THIS IS A READILY USED TIME-SAVING STEP.

Lejeune, EG
Concrete Construction July 1967

3A 214810
PROBLEMS FACED BY STATE HIGHWAY DEPARTMENTS IN DEVELOPING STATISTICAL SPECIFICATIONS
PROBLEMS WHICH MUST BE FACED BY STATE HIGHWAY AGENCIES IN APPLYING STATISTICAL PRINCIPLES TO HIGHWAY SPECIFICATIONS ARE DISCUSSED. THREE OF THE MAJOR ENGINEERING PROBLEMS IN WHICH STATISTICAL TOOLS CAN BE HELPFUL ARE: (1) ESTABLISHING NUMERICAL SPECIFICATION LIMITS, (2) PROVIDING GUIDELINES FOR PROPER SAMPLING, AND (3) ANALYZING TEST RESULTS. THE BASIC OBJECTIVE OF HIGHWAY SPECIFICATIONS IS TO ASSURE SATISFACTORY PERFORMANCE AT MINIMUM COST. UNBIASED DATA IS NEEDED WHICH DEFINES THE AVERAGE LEVEL, THE OVERALL VARIABILITY, AND THE SOURCES OF VARIABILITY OF THE SELECTIVE CHARACTERISTICS OF MATERIALS AND CONSTRUCTION ITEMS OF ACCEPTABLE QUALITY. TO PREVENT FLAT BIAS, A NON-SUBJECTIVE MEANS OF SAMPLE SELECTION SHOULD BE USED, SPECIFICALLY TABLES OF RANDOM NUMBERS. ASSUMING REALISTIC SPECIFICATION TOLERANCES, STATISTICALLY BASED SAMPLING, MEANINGFUL TEST METHODS, AND ACCURATE TESTING, IT IS THE TEST RESULTS WHICH ARE THE PRIMARY INDICATION OF THE QUALITY OF MATERIAL PRODUCED OR OF THE COMPLETE ITEM OF CONSTRUCTION. SUFFICIENT MAJOR RESEARCH WORK HAS BEEN COMPLETED TO INDICATE BOTH THE PRACTICABILITY AND THE ECONOMIC NECESSITY OF STATISTICAL TOOLS IN MANY MAJOR ITEMS IN HIGHWAY SPECIFICATIONS. IT WILL STILL BE NECESSARY TO FOLLOW GOOD CONSTRUCTION PRACTICE, TO HAVE INSPECTORS AT ALL CRITICAL POINTS, AND TO EXERCISE GOOD INSPECTION
CONSTRUCTION EQUIPMENT AND METHODS

3A 214814 ECONOMIC CONSTRUCTION PRACTICES INSEPARABLE FROM STRUCTURE DESIGN

MODERN TECHNOLOGY HAS MADE AVAILABLE NEW AND IMPROVED MATERIALS, EQUIPMENT, AND TECHNIQUES THAT CONTRIBUTE SUBSTANTIALLY TO MORE ECONOMICAL CONSTRUCTION OF BRIDGES. OUTSTANDING ADVANCES HAVE BEEN MADE IN SEVERAL CATEGORIES. THE FULLEST ADVANTAGE OF ECONOMICS INHERENT TO THESE TECHNOLOGICAL ADVANCES CANNOT BE REALIZED UNLESS THE DESIGNER IS FULLY AWARE OF THEM AND CREATES THE STRUCTURE DESIGN WHICH PERMITS THEIR INCORPORATION. EMPHASIS IN THIS REPORT IS PLACED UPON THE FIELDS AND CATEGORIES IN WHICH ADVANCES HAVE BEEN MADE. DISCUSSION IS CONDUCTED OF THE ECONOMIES THAT CAN BE ACHIEVED BY A DESIGNER WITH A COMPLETE AWARENESS OF SHOP PRACTICES IN FABRICATING PLANTS, FORM BUILDING PROCESSES AND DEVICES, FALSEWORK TYPES AVAILABLE, WELDING EQUIPMENT, AND NEW MATERIALS. ANY OF THESE TECHNOLOGICAL ADVANCES MAY BE NULLIFIED BY A DESIGNER WHO CREATES PLANS AND WRITES SPECIFICATIONS THAT HINDER THEIR USE. /AUTHOR/


3A 214821 FUNDAMENTAL INVESTIGATION ON THE COMPACTION OF CONCRETE ROAD SLABS BY SURFACE VIBRATION

A SYSTEMATIC ROAD INVESTIGATION WAS CONDUCTED ON THE COMPACTION CHARACTERISTICS OF VIBRATING BEAMS, SUCH AS AMPLITUDE, FREQUENCY, ACCELERATION AND RUNNING SPEED OF CONCRETE FINISHERS TO DETERMINE THE FACTORS FOR A SATISFACTORY COMPACTION OF CONCRETE ROAD SLABS BY SURFACE VIBRATION. THE COMPACTION CHARACTERISTICS OF CONCRETE ROAD FINISHERS ARE DISCUSSED FROM A STANDPOINT OF COMPACTING EFFECT. THE PROPAGATING CHARACTERISTICS OF ACCELERATION, FROM A VIBRATING BEAM TO FRESH CONCRETE PARTICLES WERE STUDIED TOGETHER WITH THE RELATION BETWEEN THE PROPAGATED ACCELERATION AND PROPERTIES OF HARDENING CONCRETE. SOME USEFUL INDICES ARE GIVEN FOR EVALUATING COMPACTION EFFECT. OUTSTANDING AND THEIR REASONABLE CRITERIA. IT IS DETERMINED THAT AS LONG AS THE MAGNITUDE OF ACCELERATION OF THE VIBRATING BEAM REMAINS REASONABLE FOR A PERIOD OF PARTICULAR CONSISTENCY OF CONCRETE, THE RUNNING SPEED OF THE FINISHER CAN BE RAISED UP TO 100 CM/MIN, WITHOUT ANY DISADVANTAGES TO COMPACTION OF CONCRETE ROAD SLABS. REASONABLE MAGNITUDES WILL DETERMINE THE PROPAGATION EFFICIENCY OF ACCELERATION FROM THE BEAM TO FRESH CONCRETE PARTICLES, TOGETHER WITH RELATIONSHIPS BETWEEN PROPAGATED ACCELERATION OF CONCRETE PARTICLES AND PROPERTIES OF HARDENED CONCRETE. PHYSICAL PROPERTIES ARE EVALUATED OF HARDENED CONCRETE ROAD SLABS, COMPACTED BY SURFACE VIBRATIONS. RATIOS ARE GIVEN FOR PROPERTIES OF CONCRETE LAYER RATIOS. THE RATIOS OF THE LOWER TO THE UPPER LAYER GIVEN ARE NOT LESS THAN 0.98 FOR WET DENSITIES AND NOT LESS THAN 0.92 FOR SPLIT (INDIRECT) TENSILE STRENGTHS, WITH CORES OF 15 CM IN DIAMETER, BEING SLICED INTO TWO LAYERS, THE UPPER AND LOWER.

Nagamori, M
Public Works Res Inst, Cm /Japan/ 1966

3A 214830 BOOKS ON ESTIMATING AND COSTS

THIS ARTICLE CONTAINS A COMPILATION OF REFERENCE BOOKS AND COMPREHENSIVE PAMPHLETS ON ESTIMATING AND COST. SUBJECTS COVERED RANGE FROM APPRAISALS TO TUNNELS, GOOD INFORMATION IS AVAILABLE ON ENGINEERED CONSTRUCTION BUILDINGS AND INDUSTRIAL PLANTS. /ASCE/ 3A 214832 P.C. CANTILEVER ERECTION METHOD USING PRECAST UNITS

THE P. C. CANTILEVER ERECTION METHOD USING PRECAST BOX-TYPE GIRDERS AND EPOXY RESINO INTO JOINTS IS CONSIDERED FOR THE ENGINEERING OF PRESTRESSED CONCRETE. THIS METHOD WAS USED IN JAPAN FOR THE CONTINUOUS EXPRESSWAY VIADUCT WORK WHERE THE TOKYO METROPOLITAN EXPRESSWAY VIADUCT WORK WHERE THE TOKYO METROPOLITAN EXPRESSWAY SAFETY CROSS OVERS RADIAL ROUTE 3. RESULTS ARE DESCRIBED OF TESTS CARRIED OUT ON SPECIMEN, PREDICTION, INTERMEDIATE, AND TOP, AND THE RESULTS OF EXPERIMENTS EXECUTED ON ACTUAL BRIDGE.

Breed, JW Civil Engineering Asce June 1967

3A 214833 TRENCH COMPACTION-PRACTICES AND PROBLEMS

RESEARCH IS REPORTED ON TRENCH COMPACTION AND TRENCH BACKFILL. A SURVEY OF SPECIFICATIONS CURRENTLY EMPLOYED BY 45 AGENCIES YIELD THE FOLLOWING STATISTICS: (1) 89% HAD A BACKFILL SPECIFICATION, (2) 60% HAD A SPECIFICATION, THE REQUIREMENTS OF WHICH VARIED WITH LOCATION AND DEPTH, (3) 70% HAD A MATERIAL QUALITY REQUIREMENT IN THE BACKFILL SPECIFICATION, (4) 95% HAD A COMPACTION REQUIREMENT, (5) 93% REFERRED TO JETTING FOR DENSIFYING TRENCH BACKFILL, (6) 91% HAD A MINIMUM COMPACTION REQUIREMENT WITH JETTING, (7) 55% GAVE GENERAL INSTRUCTIONS FOR JETTING AND 12% GAVE PRECISE REQUIREMENTS FOR JETTING. COST STUDIES SHOW THAT COMPACTION BY JETTING WAS ABOUT THE SAME WHETHER THE NATIVE MATERIAL WAS REUSED OR REPLACED BY A FREE-DRAINING GRANULAR MATERIAL. A TRENCH BACKFILL SHOULD BE DESIGNED FOR THE PARTICULAR SITUATION UNDER THREE DIFFERENT LAYERS; BEDDING INTERMEDIATE, AND TOP LAYER. THE TOP LAYER IS THE MOST IMPORTANT TO BE CONSIDERED IN TRENCH BACKFILL. JETTING IS EFFECTIVE ONLY IN FREE-DRAINING GRANULAR MATERIAL OR WHERE COMPACTION IS NOT CRITICAL. SAND IS A POOR BACKFILL MATERIAL IN CONGESTED TRENCH AREAS SINCE FUTURE TRENCHING WILL REMOVE THE SUPPORT AND CAUSE CAVING. THE BOUNDARY BETWEEN THE FREE-DRAINING AND THE DEVELOPMENT OF BETTER TRENCHING AND BACKFILL EQUIPMENT IS RECOMMENDED AS WELL AS CUTTING THE COSTS FOR LIME TREATMENT OF NATIVE BACKFILL.

Lundgren, R
Uite, California University, Berkeley pp 37-38, Feb. 1967

3A 214843 BACKFILL GUIDE

FIELD INVESTIGATIONS HAVE SHOWN THAT IMPROPERLY PLACED AND COMPACTED BACKFILL IS COMMONLY ASSO-
CONSTRUCTION EQUIPMENT AND METHODS

CITATED WITH PAVEMENT SETTLEMENT AND THE MOVEMENT OF RETAINING STRUCTURES. THIS GUIDE IS PRESENTED TO DEMONSTRATE THE IMPORTANCE OF THE BACKFILL, TO POINT OUT THE REASONS FOR SPECIFIED BACKFILLING PROCEDURES, AND TO SHOW SOME CONSTRUCTION PRACTICES THAT SHOULD BE AVOIDED. THE NECESSITY OF COMPILING WITH BACKFILL SPECIFICATIONS IS EMPHASIZED. BACKFILL MATERIALS AND CONSTRUCTION PRACTICES ARE DISCUSSED.

Peck, RB Ireland, HO Am Soc Civil Engr J Structural Div July 1937

3A 214844

A PRACTICAL APPLICATION OF THE IMPERFECT DITCH METHOD OF CONSTRUCTION

A BRIEF DISCUSSION IS PRESENTED OF THE PRINCIPLES ON WHICH MARSTON'S IMPERFECT DITCH METHOD IS BASED AND A DESCRIPTION OF THE CONSTRUCTION PLAN CARRIED OUT IN A SUCCESSFUL ATTEMPT TO MINIMIZE THE LOAD PRODUCED BY A HIGH ADDITIONAL FILL PLACED ABOVE A SEWER IN A REGRADING OF A LARGE RAILROAD FREIGHT YARD AT ATLANTA, GEORGIA. THE CONCRETE PIPE SEWER IS NOW CARRYING THE ADDITIONAL HEIGHT OF FILL WITH NO SIGNS OF DISTRESS OR OTHER EVIDENCE OF LOAD DAMAGE.

/Author/

Spangler, MG Highway Research Board Proceedings 1958

3A 214848

NEW CONCEPTS IN BASE COURSE CONSTRUCTION WITH ASPHALTS

THE DEVELOPMENT OF ASPHALT BASES IN TODAY'S MODERN HIGHWAY SYSTEM HAS FOLLOWED A PATTERN SIMILAR TO MOST OTHER ENGINEERING ADVANCES. AS HIGHWAY PERFORMANCE DEMANDS INCREASED, THE COMBINED RESOURCES OF THE VARIOUS HIGHWAY DEPARTMENTS AND INDUSTRY DEVELOPED IMPROVED DESIGN METHODS, CONSTRUCTION PROCEDURES, AND PRODUCTS. THE DEVELOPMENT OF ASPHALT BASES IS REVIEWED FROM THEIR ORIGIN TO THEIR USE IN HEAVY-DUTY HIGHWAY SYSTEMS. THE DEVELOPMENT IS PRESENTED IN LIGHT OF CURRENT EMPIRICAL AND THEORETICAL DESIGN METHODS AS WELL AS NEW CONSTRUCTION PROCEDURES AND ASPHALT PRODUCTS, INCLUDED ARE A CLASSIFICATION SYSTEM FOR ASPHALT BASES, A REVIEW OF FACTORS IMPORTANT TO THE DESIGN OF ASPHALT BASES, THE CONCEPT OF HIGHER ASPHALT CONTENT BASES TO MINIMIZE FLEXURAL FATIGUE FAILURES, THE USE OF 'LAYER EQUIVALENCIES' AS A CONVENIENT BASIS FOR ECONOMIC DESIGN, AND FACTORS IMPORTANT TO THE QUALITY OF ASPHALT BASES IN ASPHALT MACADAM, ASPHALT CONCRETE, ASPHALT TREATED, AND ASPHALT SOIL BASES.

Neunaber, AH Kari, WJ Canadian Tech Asphalt Assoc Proc 1961

ACKNOWLEDGMENT: Highway Research Board Bibliography

3A 214850

CONSTRUCTION PRACTICES-RIGID PAVEMENT

REFERENCE ARE LISTED ON RIGID PAVEMENT CONSTRUCTION PRACTICES INCLUDE MIXING, PLACING, CURING, MATERIALS CONTROL AND BATCHING OPERATIONS, SLIPFORM PAVING, CRITICAL PATH METHOD AS APPLIED TO PAVEMENT CONSTRUCTION, FACTORS INFLUENCING CONCRETE PAVEMENT COST, ADJUSTMENT OF PAVING EQUIPMENT, DUAL DRUM PAVERS, RIDING QUALITY OF CONCRETE HIGHWAYS, PLACING DISTRIBUTED STEEL, AND DOWELS IN PAVEMENT, COMPACTION OF CONCRETE SLABS, DEVELOPMENTS IN PORTLAND CEMENT PAVEMENT DESIGN AND CONSTRUCTION, A CONCRETE PAVEMENT INSPECTOR'S MANUAL, AND COORDINATION OF PAVING OPERATIONS BY A TRIAL AREA SPECIFICATION.

Highway Research Information Service

3A 214855

CONSIDERATIONS AFFECTING THE DESIGN AND CONSTRUCTION OF STABILIZED-SOIL ROAD BASES

THEORIES OF THICKNESS DESIGN ARE PRESENTED, AS WELL AS EXPERIMENTAL PROJECTS, LABORATORY TESTS SUCH AS COMPRESSIVE STRENGTH, CYLINDER PENETRATION TESTS AND DURABILITY TESTS AS DEVELOPED AND USED IN BRITAIN ARE DESCRIBED. METHODS OF CONSTRUCTION AND PROJECT COST DATA ARE ALSO INCLUDED.


ACKNOWLEDGMENT: Highway Research Board Bibliography

3A 214864

SOME WARTIME SOIL-CEMENT CONSTRUCTION EXPERIENCES

DETAILS ARE GIVEN OF CONSTRUCTION PROCEDURES, EQUIPMENT AND ACCOMPLISHMENTS ON SOME OF THE MORE IMPORTANT SOIL-CEMENT ROADS, STREET AND AIRPORT PROJECTS CONSTRUCTED BY THE ARMY AND NAVY IN THE UNITED STATES AND CANADA. ALSO, SOME OF THE UNUSUAL WEATHER AND SUBGRADE CONDITIONS ENCOUNTERED ON SOME JOBS ARE DESCRIBED.

Catton, MD Highway Research Board Proceedings 1944

3A 214866

PORTLAND CEMENT-TREATED BASE AND BITUMINOUS SURFACE CONSTRUCTION IN CALIFORNIA

EXPERIENCE WITH CEMENT STABILIZATION IN CALIFORNIA IS DESCRIBED. CONSTRUCTION METHODS FOR NUMEROUS PROJECTS ARE PRESENTED.

Stanton, TE Road Abstracts /UK/ 1947

ACKNOWLEDGMENT: Highway Research Board Bibliography

3A 214868

HIGHWAYS ARE TAILOR-MADE IN KANSAS

THE DESIGN OF BASE COURSES IS BASED ON TRIAXIAL TESTS MADE WITH CYLINDRICAL SOIL SAMPLES 2-1/2 IN. BY 8 IN. OBTAINED FROM READINGS OF APPLIED PRESSURE AND MEASURED DEFORMATION WITH THE THICKNESS COMPUTED. DATA ARE PRESENTED ON BASE COURSE, SURFACE TYPES, AND CONSTRUCTION PROCEDURES CONSIDERING GRANULAR BASE COURSES, STABILIZED OR MODIFIED SUBGRADES AND SOIL-CEMENT.

Arndt, WJ Roads and Streets, Engineering Index July 1948

ACKNOWLEDGMENT: Highway Research Board Bibliography

3A 214872

SUPERVISION OF CONTROL TESTS AT FERRY FRYSTON ESTATE, CASTLEFORD, U.D.C.

THIS REPORT GIVES AN ACCOUNT OF THE WORK UNDERTAKEN BY THE ASSOCIATION TO ASSIST WITH THE CONSTRUCTION OF SOIL-CEMENT BASES FOR HOUSING ESTATE ROADS AT FERRY FRYSTON, CASTLEFORD. DETAILS ARE GIVEN OF THE METHOD OF CONSTRUCTION EMPLOYED, TOGETHER WITH THE RESULTS OF FIELD TESTS ON A PRELIMINARY AREA OF APPROXIMATELY 1,350 SQ. YARDS. EXTRACTS FROM THE SPECIFICATION ARE INCLUDED.

Lilley, AA Cement & Concrete Association Res Reps Oct. 1954

ACKNOWLEDGMENT: Highway Research Board Bibliography

3A 214874

A SPECIFICATION FOR THE CONSTRUCTION OF SOIL-CEMENT BASES BY MIX-IN-PLACE AND STATIONARY PLANT METHODS

THIS REPORT GIVES A SPECIFICATION FOR THE CONSTRUCTION OF SOIL-CEMENT BASES ON ROADS AND AIRFIELD RUNWAYS. PART OF IT IS BASED ON A SPECIFICATION PREPARED BY THE ARMY.
CONSTRUCTION EQUIPMENT AND METHODS


Blake, LS Cement & Concrete Association Res Repts Feb. 1958

ACKNOWLEDGMENT: Highway Research Board Bibliography

3A 214877 CONSTRUCTION PRACTICES-EARTHWORK
THESE REFERENCES ON EARTHWORK CONSTRUCTION PRACTICES INCLUDE CONSOLIDATION OF FINE-GRAINED SOIL BY DRAIN WELLS, BOMBING FOR ROAD CONSTRUCTION, THEORIES FOR SAND DRAINS, VERTICAL SAND DRAIN INSTALLATIONS, SOIL MECHANICS IN THE DESIGN AND CONSTRUCTION OF AN AIRPORT, SETTLEMENT CORRECTION AT AIRPORTS, TUNNEL ENGINEERING, AND PRE-WETTING EMBANKMENT SOILS.

Highway Research Information Service Feb. 1970

3A 214889 UNIQUE SUBMARINE ASSEMBLY TECHNIQUES USED FOR LAYING GIANT MARSEILLES HARBOUR TUNNEL
THE DESIGN AND CONSTRUCTION OF THE MARSEILLES HARBOUR TUNNEL, THE THREE MAIN CONSTITUENTS OF WHICH ARE TWO SUBMARINE TUBES, TWO ACCESS-GRADIENTS, AND LINK-ROADS TO THE CITY NETWORK ARE DISCUSSED. THE PREFABRICATED TUNNEL-SECTIONS ARE DESCRIBED IN DETAIL AND DIAGRAMS ARE USED TO ILLUSTRATE THE LAYING PROCEDURES ADOPTED. REFERENCE IS ALSO MADE TO VENTILATION, LIGHTING, SOUND PROOFING AND DRAINAGE.

Doyen, P World Road News /Switz/ Jan. 1967

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 214891 COMPARATIVE METHODS OF SUSPENSION BRIDGE CONSTRUCTION

Maxwell, HM Suspension Bridges Symposium /Portugal/ 1966

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 214909 BRITISH STANDARD CODE OF PRACTICE: COMPOSITE CONSTRUCTION IN STRUCTURAL STEEL AND CONCRETE. PART 2: BEAMS FOR BRIDGES
THIS PART DEALS WITH SIMPLY-SUPPORTED AND CONTINUOUS BEAMS OTHER THAN FILLER BEAMS, COMPOSED OF EITHER ROLLED OR BUILT-UP STRUCTURAL STEEL SECTIONS, WITH OR WITHOUT CONCRETE ENCASEMENT, ACTING IN CONJUNCTION WITH AN IN-SITU REINFORCED CONCRETE SLAB. THE TWO ELEMENTS BEING INTERCONNECTED SO AS TO FORM A COMPOSITE SECTION ACTING AS A WHOLE.

Schenck, W Bautechnik, Berlin /Germany/ 1968

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 214921 INSTRUCTIONS FOR THE CONSTRUCTION OF BITUMINOUS SURFACINGS USING THE HOT-LAID METHOD OF CONSTRUCTION
INFORMATION IS PRESENTED ON THE BUILDING OF THE ROAD STRUCTURE. DEFINITIONS, CONSTRUCTION PRINCIPLES, DIMENSIONING, BUILDING MATERIALS, COMPOSITION AND PRODUCTION OF THE MIX, AND PLACING AND COMPACTION. THE DIMENSIONING IS BASED ON FOUR TYPES OF TRAFFIC.

Road Research Society /Austria/ 1966

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 214922 THE DESIGN OF SUBMERGED TUNNELS
A HISTORICAL AND TECHNICAL SURVEY OF THE DIFFERENT FORMS AND METHODS OF CONSTRUCTING UNDERWATER
CONSTRUCTION EQUIPMENT AND METHODS

TUNNELS IS PRESENTED. THE CONSTRUCTION OF THESE SUBMERGED TUNNELS-CIRCULAR SECTIONS WITH STEEL SEALED, AND TUNNELS WITH RECTANGULAR CROSS-SECTIONS IS DISCUSSED AND ILLUSTRATED BY EXAMPLES OF DESIGNS. SPECIAL ATTENTION IS PAIRED TO THE SHAPING OF THE UNDERWATER SECTIONS, SEALING, LOWERING AND BONDING, JOINT DESIGN, VENTILATION AND THE COSTS AND PARTS TO BE HANDLED. SPECIAL TYPES OF SUBMERGED TUNNELS, INCLUDING TUNNELS FOR RAPID-TRANSIT RAILWAYS, AND PEDESTRIAN TUNNELS ARE CONSIDERED. IN CONCLUSION, THE INCREASING IMPORTANCE OF SUBMERGED TUNNELS IS DISCUSSED. A SUMMARY OF EXISTING SUBMERGED TUNNELS WITH THEIR MOST IMPORTANT DESIGN FEATURES IS APPENDED. /RRL/A/

Simons, H Baumachine Und Bautechnik /Germany/ 1966

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 214927
PREFABRICATION IN CARRIAGEWAY CONSTRUCTION /IN GERMAN/
FOR TEN YEARS PREFABRICATED SLABS HAVE BEEN USED FOR THE REPAIR OF MOTORWAYS; THEY SHORTEN THE ROAD CLOSURE TIMES. ARE ECONOMIC AND CAN BE USED PRACTICALLY WITHOUT LIMITATION. AT PRESENT SLABS OF 9.9 M X 3.74 M IN SIZE AND 18 CM. THICK WITH PRESTRESSED LONGITUDINAL AND TRANSVERSE REINFORCEMENT ARE MOSTLY USED; THEY ARE PLACED ON A BITUMINOUS SUB-STRUCTURE, PRESSED DOWN WITH CEMENT MORTAR TO THE DESIRED HEIGHT AND CONNECTED WITH SCREW DWELLS. ON THE BASIS OF RECENT TESTS LONGITUDINAL AND TRANSVERSE PRESTRESSES LABS JOINED WITH CEMENT OR PLASTIC MORTARS AND Laid ON A REINFORCED BASE ARE NOW PROPOSED. /FG/RRL/

Eisenmann, J Strausse Und Tiefbou /Germany/ 1967

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 214929
CONSTRUCTIONAL METHODS AND EQUIPMENT FOR MANUFACTURING ASPHALT ROADS WITH AN EVEN SURFACE /IN GERMAN/.
AN IMPORTANT PREREQUISITE FOR THE EVENNESS OF THE SURFACING IS A HIGH PRELIMINARY COMPACTION BY THE FINISHER. TODAY THIS IS MORE THAN 90% AND SHOULD BE INCREASED TO 100% IF POSSIBLE. UNIFORM THICKNESS OF THE MIXTURE IS ALSO A PREREQUISITE FOR SMOOTH SURFACES; IRREGULAR THICKNESS OF THE LAYER MAY BE DUE TO THE FINISHING DEVICE. VARYING RATE OF PLACE-MENT OR STOPPING OF THE FINISHER AND NON-UNIFORM TEMPERATURE OF THE MIXTURE. IRREGULARITIES IN THE LOWER LAYER MAY ALSO BE TRANSMITTED TO THE SURFACE. THESE ARE AVOIDED BY THE USE OF FINISHERS WHICH EXERT A HIGH PRELIMINARY COMPACTION; MIXTURES WITH A FLOATING PLANT AND, IN THE CASE OF GREAT IRREGULARITIES, ELECTRONICALLY-CONTROLLED LEVELLING EQUIPMENT, ARE ADVANTAGEOUS. IRREGULARITIES ALSO OCCUR DURING COMPACATION OF THE SURFACING AND THESE ARE CAUSED BY THE VERTICAL AND HORIZONTAL FORCES ACTING DURING THE ROLLING PROCESS. MEASURES FOR SUITABLE ROLLING OPERATIONS ARE DESCRIBED. SINCE MOST UNDULATIONS, AND THE LARGER UNDULATIONS ARE FORMED DURING THE LAYING AND COMPAC-TION OF TRANSVERSE, LONGITUDINAL AND WORKING SEAMS, SPECIAL MEASURES ARE AGAIN NECESSARY IN THESE CASES. IN THE CASE OF INSUFFICIENT COMPACTION BY ROLLING, IRREGULARITIES OCCUR DURING COMPACTION BY TRAFFIC, PARTICULARLY IN THE TRAFFIC LANE IN THE FORM OF GROOVED TRACKS. IF THE STRUCTURE IS INSUFFICIENTLY FIRM, SUBSEQUENT COMPACTION MAY REDUCE THE RIGIDITY. /FG/RRL/

Volk, L Bitumen /Germany/ 1967

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 214930
PREFABRICATED PRESTRESSED AND REINFORCED CONCRETE DECKS FOR HIGHWAY BRIDGES

Beck, J Strasse Und Autobahn /Germany/ Jan. 1967

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 214933
MACHINE FOR THE TRANSVERSE ROUGHENING TREATMENT AND PULVERIZING A CURING COMPOUND ON FRESH CONCRETE /IN FRENCH/.
DETAILS ARE GIVEN OF A PROTOTYPE MACHINE, DEVELOPED BY THE CENTRE DE RECHERCHES ROUTIÈRES. FOR TRANSVERSE ROUGHENING OF CONCRETE ROADS AND FOR PULVERIZING CURING COMPOUND ON FRESH CONCRETE. THE MACHINE IS FULLY AUTOMATIC, AND THE ROUGHENING DEVICE CAN HAVE METAL BLADES OR TUFFS OF METAL. COCONUT FIBRE OR P.V.C. SPECIAL DEVICES CONTROL THE QUANTITY OF CURING COMPOUND APPLIED. PREVENT THE CLOGGING OF THE JETS, ENSURE A CONSTANT HOMOGENEITY OF THE CURING COMPOUND AND PREVENT IT FROM BEING BLOWN AWAY BY THE WIND. THIS ROUGHENING FACILITATES THE RAPID DRAINAGE OF SURFACE WATER, AND GIVES A HIGH DEGREE OF ROUGHNESS IN WET WEATHER ENABLING VEHICLES TO TRAVEL AT HIGH SPEED. IT DOES NOT IMPAIR THE RIDING QUALITY OF THE PAVEMENT AND HAS THE ADVANTAGE OF REDUCING GLARE.

/CRIC/FESR/LCPC/A/RRL/

Leyder, JP Technique Routiere, Brussels /Belgium/ Mar. 1968

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 214947
SYNTHESIS ON CONCRETE ROUGHNESS /IN FRENCH/.

Leyder, JP Technique Routiere, Brussels /Belgium/ Sept. 1968
CONSTRUCTION EQUIPMENT AND METHODS

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 214954
THE CONSTRUCTION OF EARTH SUBGRADES UNDER DIFFICULT NATURAL CONDITIONS, WORK CARRIED OUT BY THE SOYZUDORNII (FEDERAL STUDY AND RESEARCH INSTITUTE IN THE USSR) /IN RUSSIAN/
THE CONSTRUCTION IS STUDIES OF EARTH ROADS ON COMPRESSIBLE SOIL, PEAT, MUD, WET BRACKIST SOIL, ETC. THE HIGH COST OF THE CONVENTIONAL CONSTRUCTION METHOD, WHICH EXISTS IN REMOVING THE EXISTING SOIL AND REPLACING IT WITH BORROW, LED TO RESEARCH INTO THE IMPROVEMENT OF CONSTRUCTION METHODS WHICH USE COMPRESSIBLE SOIL UNDER EMBANKMENTS. FINDINGS ARE PRESENTED AND RECOMMENDATIONS ARE OUTLINED FOR THE ESTABLISHMENT OF PROJECTS FOR BUILDING EARTH SUBGRADES ON COMPRESSIBLE SOIL. THE TITLES OF THE ARTICLES ARE AS FOLLOWS: (1) PROBLEMS CONCERNING PLANNING THE CONSTRUCTION OF EARTH SUBGRADES ON COMPRESSIBLE SOIL, (2) SPECIAL FEATURES OF PROJECTS AND CONSTRUCTION OF EARTH SUBGRADES IN THE MARSHES OF WESTERN SERBIA, (3) THE USE OF RIGID SLABS IN THE CONSTRUCTION OF ROAD EMBANKMENTS ON MARSH-LAND, (4) STABILITY OF SUBGRADES BUILT ON WET BRACKIST SOIL, (5) INFLUENCE OF HIGHLY SOLUBLE SALTS ON THE PHYSICAL AND MECHANICAL PROPERTIES OF SOIL WITH A HIGH SALT CONTENT, (6) STRUCTURAL AND MECHANICAL PROPERTIES OF SOIL WITH A HIGH SALT CONTENT, (7) PRINCIPLE FOR DRAWING UP SPECIFICATIONS RELATING TO THE COMPLEMENTARY WEITTING OF THE SOIL DURING THE CONSTRUCTION OF EARTH IN KAZAHSTAN, AND (8) WINTER CONSTRUCTION OF EMBANKMENTS USING POWDER AND COHESIVE SOIL. /LCPC/RRL/

Trudy Soyuzdornii /Ussr/ 1967

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 214955
USE OF PREFABRICATION IN ROAD CONSTRUCTION SHORTENS MOTORWAY REPAIR TIMES /IN GERMAN/

Zeitschrift Ver Deutscher Ingen /Ger/ 1968

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 214967
URBAN UNDERGROUND TRAFFIC STRUCTURES, PART 1 CONSTRUCTION PITS /IN GERMAN/
BUILDING PITS CONSTRUCTED BY MEANS OF THE OPEN CONSTRUCTION METHOD ARE DESCRIBED. THIS METHOD IS PREFERRED FOR UNDERGROUND TRAFFIC STRUCTURES, ESPECIALLY UNDERGROUND RAILWAYS AND STATIONS, BECAUSE OF ITS SAFETY. OTHER STRUCTURES FOR WHICH IT IS USED INCLUDE PEDESTRIAN TUNNELS AND VARIOUS KINDS OF VEHICLE TUNNELS. /FG/RRL/

Winter, K
Bauingenieur - Praxis /Ger/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 214972
VIEWS ON AND METHODS OF PRESSURE TUNNEL CONSTRUCTION /IN GERMAN/

Innerhofer, G
Osterreichische Ingzeitschrift /Aust/ 1966

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 214979
METHODS USED IN THE CONSTRUCTION OF THE UNDERGROUND RAILWAY STATIONS IN BUDAPEST /IN GERMAN/
A REPORT IS MADE ON THE CONSTRUCTION OF FOUR UNDERGROUND RAILWAY STATIONS AT IMPORTANT TRAFFIC JUNCTIONS IN BUDAPEST. BECAUSE OF THE GEOLOGICAL CONDITIONS THE OPEN-CUT CONSTRUCTION METHOD WAS USED WHICH INVOLVED LOWERING OF THE GROUND WATER LEVEL AND THE SINKING OF PNEUMATIC CAISSONS. THE EXECUTION OF THE WORK IS DESCRIBED IN DETAIL. /FG/RRL/

Vajda, Z Kelemen, J Baumaschine Und Bautechnik /Germany/ 1969

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 214980
TUNNEL AND GALLERY CONSTRUCTION /IN GERMAN/
AN ANNUAL SURVEY OF RECENT DEVELOPMENTS IN TUNNEL AND GALLERY CONSTRUCTION IS PRESENTED. HEADING BY MEANS OF BLASTING IS DISCUSSED, TOGETHER WITH THE CHOICE OF EXPLOSIVES AND THEIR EFFICIENCY, AND HEADING BY MEANS OF DRIVING MACHINERY AND ITS EFFECTIVENESS IN DIFFERENT TYPES OF ROCK. VARIOUS METHODS OF LINING AND INSULATING TUNNELS ARE CRITICALLY EVALUATED AND COMPARED. /FG/RRL/

Markl, W Zeitschrift Ver Deutscher Ingen /Ger/ 1968

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 214985
VEHICLE TUNNEL CONSTRUCTION, VOLUME 2: NETWORK FORMATION, OPERATIONAL FEATURES AND CONSTRUCTION METHODS /IN GERMAN/
A REFERENCE MANUAL FOR PLANNERS AND CONSTRUCTION ENGINEERS IS PRESENTED CONTAINING EXAMPLES OF ALL THE UNDERGROUND RAILWAYS IN THE WORLD, BOTH IN OPERATION AND UNDER CONSTRUCTION, AND ALSO EXAMPLES OF RAPID TRAMWAY SYSTEMS LINKING FEDERAL RAILWAYS. UNDERWATER TUNNELS ARE ALSO INCLUDED. /FG/RRL/

Mandel, G
Ernst Und John, Berlin /Germany/ 1969

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 214996
PROBLEMS IN THE DEVELOPMENT OF PRECAST SUBSTRUCTURE ELEMENTS FOR ROAD BRIDGES OF UP TO 6.0M HEADROOM /IN GERMAN/
THE USE OF PRECAST ELEMENTS FOR THE CONSTRUCTION OF ABUTMENTS, WINGS AND SUPPORTS FOR HIGHWAY BRIDGES IS DESCRIBED TOGETHER WITH THE PROBLEMS INVOLVED. /FG/RRL/

Ernst Und John, Berlin /Germany/ 1969

ACKNOWLEDGMENT: Road Research Laboratory /UK/

435
3A 214987

THE SLURRY TRENCH WALL CONSTRUCTION METHOD /IN GERMAN/


Muller, H Bauwirtschaft, Wesbaden /Germany/ 1969

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 214991

PRECAST CONCRETE SUBWAY CONSTRUCTION

TWO SUBWAYS, CONSTRUCTED BY THE BASILDON DEVELOPMENT CORPORATION IN ESSEX USING THE POST-TENSIONED TECHNIQUE, ARE DISCUSSED, ALSO DETAILS OF FIVE PRECAST SUBWAYS NOW UNDER CONSTRUCTION IN READING ON THE DEEP ROAD DEVELOPMENT. /RRL/

Davis, PJ Chartered Municipal Engineer /UK/ Aug. 1968

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 214993

RIGID PAVEMENTS AND THE ADVENT OF THE SLIP FORM PAVER

THE BASIS OF DESIGN OF CONCRETE ROADS IS BRIEFLY OUTLINED, FOLLOWED BY A DISCUSSION OF THE PRESENT TECHNICAL AND ECONOMIC SITUATION, WITH PARTICULAR REFERENCE TO ITS COMPETITIVE VALUE. SOME OF THE CHARACTERISTICS AND ADVANTAGES OF USING THE SLIP-FORM PAVER ON MAJOR ROADS ARE DISCUSSED AND ALSO ITS EFFECTS ON METHODS OF CONSTRUCTION OF MINOR ROADS AND ESTATE ROADS. THE FACTORS AFFECTING THE CHOICE OF REINFORCED OR UNREINFORCED CONCRETE ROADS ARE CONSIDERED. THERE IS A BRIEF DISCUSSION WITH RECOMMENDATIONS ON THE SPECIFICATION OF JOINT ASSEMBLIES AND JOINT GROOVE FORMING METHODS AND A DESCRIPTION OF THE ADVANTAGES OFFERED BY SLIP-FORMED, WEET LEAN CONCRETE AS A BASE FOR CONCRETE PAVEMENTS. /RRL/A/

Burks, AE Maggs, MF J Inst Munic Engrs /UK/ Aug. 1968

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 214994

STAGE CONSTRUCTION OF ROAD PAVEMENTS /IN PORTUGUESE/

THE USE OF SURFACE TREATMENT OVER GRANULAR BASE COURSES AND THE PROBLEM OF THE STAGE CONSTRUCTION OF ROAD PAVEMENTS ARE DISCUSSED, SHOWING THAT, SAVE IN SPECIAL CASES, THICKNESS DIFFERENCES IN ROAD PAVEMENTS IN THE DIFFERENT STAGES ARE NOT VERY WELL MARKED. /RRL/

Souza, ML Bol Tech Dept Estrados Rodagem /Braz/ July 1966

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 215015

COMPOSITE CONSTRUCTION IN STEEL AND CONCRETE

A SUMMARY IS PRESENTED OF THE TECHNIQUES OF COMPOSITE CONSTRUCTION IN STEEL AND CONCRETE AS THEY ARE APPLIED IN GERMANY, RUSSIA AND THE U.S.A., AND THESE TECHNIQUES ARE EVALUATED IN THE LIGHT OF THEIR APPLICATION UNDER INDIAN CONDITIONS. THE ADVANTAGES OF SUCH CONSTRUCTION AND DESIGN METHODS ARE DESCRIBED WITH EXAMPLES OF CALCULATIONS, AND PROBLEMS INVOLVED IN USING STEEL AND CONCRETE. THE TOPICS DEALT WITH IN DETAIL INCLUDE CREEP AND SHRINKAGE, TEMPERATURE DIFFERENCES BETWEEN STEEL AND CONCRETE, SHEAR CONNECTIONS (RIGID, FLEXIBLE, ELASTIC, AND BOND TYPES), SHEAR STRESSES, CASTING OF CONCRETE, LOAD FACTORS, PRESTRESSING, AND REINFORCEMENT OF STRUCTURES. /RRL/

Yan, HT Orient Longmans Ltd /India/ 1965

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 215016

THE EFFECT OF CONSTRUCTION TECHNIQUES ON THE DESIGN OF ROADS

THE DEVELOPMENT IS OUTLINED OF CONSTRUCTION TECHNIQUES WITH REFERENCE TO EXCAVATION AND EARTHWORKS, DRAINAGE, AND SUB-BASE, BASE AND SURFACING CONSTRUCTION. EXAMPLES ARE QUOTED FROM CONSTRUCTION WORK ON THE A1 MOTORWAY. DEVELOPMENTS IN CONCRETE ROAD CONSTRUCTION, PARTICULARLY THE SLIP FORM PAVER, AND ITS STEEL AND CONCRETE BRIDGES ARE DESCRIBED. A DISCUSSION IS APPENDED. /RRL/

Oliver, FR Inst Hwy Engineers Journal, London /UK/ Mar. 1969

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 215020

PRINCIPLES OF MECHANIZATION AND AUTOMATION APPLIED TO ROAD CONSTRUCTION /IN RUSSIAN/

THE CHARACTERISTICS OF MODERN ROAD CONSTRUCTION, AND BASIC TECHNICAL CONSTRUCTION METHODS AND THEIR REQUIREMENTS DURING THE INTRODUCTION OF AUTOMATION IN THE TREATMENT OF SUBGRADES, AND LAYING OF SUBBASES AND SURFACINGS ARE CONSIDERED. THE AUTOMATION OF BITUMINOUS MIXING PLANTS AND CEMENT PLANTS IS ALSO DISCUSSED. DATA ARE PRESENTED ON AUTOMATIC CONTROL SYSTEMS, AND THE THEORY OF AUTOMATIC CONTROL IS OUTLINED. /LCP/A/RRL/

Kaluzhskii, YA Derevyankos, N Kaminskaya, DA Kireev, VN Izdatelstvo Transporti, Moscow /User/ 1967

ACKNOWLEDGMENT: Road Research Laboratory /UK/
CONSTRUCTION EQUIPMENT AND METHODS

3A 215033
FIRST APPLICATION OF PRECAST CONSTRUCTION
WITHOUT FALSEWORK IN GERMANY. IN GERMAN,
THE DESIGN AND CONSTRUCTION BY HOCHTIEF AG OF THE
NEW BRIDGE OVER THE LECH AT EPFACH ARE DESCRIBED.
BUILDING OF THE SUPERSTRUCTURE, INCLUDING MANUFACTURE
OF THE PRECAST SECTIONS AND THEIR ASSEMBLY,
IS OUTLINED. THIS WAS THE FIRST BRIDGE TO BE BUILT IN
GERMANY USING THE METHOD OF CONSTRUCTION WITH­
OUT FALSEWORK. /RRL/

Hager, G Bautechnik, Berlin /Germany/ Oct. 1968

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 215042
STAGE CONSTRUCTION OF TWO-LANE ROADS: ITS
ECONOMY AND CONSTRUCTION TECHNIQUE (IN FINNISH)
THE ECONOMIC JUSTIFICATION IS INVESTIGATED OF STAGE
CONSTRUCTION. THE FACTORS CONSIDERED ARE ROAD
CROSS-SECTION, ORGANIZATION OF CONSTRUCTION WORK,
TRAFFIC MEASURES DURING THE SECOND STAGE OF CON­
STRUCTION, INITIAL TRAFFIC VOLUME, AND RATE OF TRAFFIC
GROWTH DURING THE PERIOD STUDIED. FINDINGS SHOW
THAT STAGE CONSTRUCTION IS AN ECONOMICAL
PROPOSITION WHEN THE INITIAL TRAFFIC VOLUME IS LOW,
AND WHEN THE CROSS-SECTION IS WIDENED TO A CONSIDER­
ABLE EXTENT. /RRL/

Sauna-aho, Koskinen, O Tietehti, Helsinki /Finland/ Oct. 1969

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 215053
FREE-CANTILEVER CONSTRUCTION OF PRESTRESSED
CONCRETE BRIDGES AND MUSHROOM-SHAPED BRIDGES
NEW CONSTRUCTION TECHNIQUES BASED ON RESEARCH, IN
BOTH MATERIALS AND METHODS, ARE IMPROVING QUALITY
AND SAVING COST IN THE CONSTRUCTION OF PRESTRESSED
CONCRETE BRIDGES. FREE-CANTILEVER AND MOVABLE
SCAFFOLD SYSTEMS SAVE TIME AND IMPROVE SAFETY BY
REPLACING CONVENTIONAL SCAFFOLDS AND FALSEWORK.
THE FREE-CANTILEVER METHOD PERMITS SAFE AND EFFICI­
ENT CONSTRUCTION OF LONG SPANS WITHOUT HIGH
FORMWORK COSTS. MATERIALS AND METHODS DEVELOP­
MENT INCLUDE THREADED PRESTRESSING BARS FOR IM-
PROVED ANCHORAGE, STUDIES IN STRESS-CRACK
CORROSION, DIAGONAL PRESTRESSING TO SAVE DEAD
WEIGHT IN LONG SPANS, AND A MOVEABLE-JOINT DESIGN
THAT PERMITS USE OF CONTINUOUS ASPHALT PAVEMENT
WITHOUT RUPTURE. BRIDGE TYPES DESCRIBED INCLUDE
MUSHROOM, STRESS-RIBBON, AND SUSPENSION, IN ADDITION
TO MANY EXAMPLES OF FREE-CANTILEVER CONSTRUCTION.
/RRL/A/

Fiisterwalder, U
Int'l Symp Concer Bridge Des Proc /Can/ 1969

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 215056
PRESTRESSED CONCRETE BRIDGE CONSTRUCTION WITH
STEPPING FORMWORK EQUIPMENT
THE PROCEDURE OF SPANWISE CONSTRUCTION IN
CAST-IN-SITU CONCRETE, USING SOME MOVEABLE FORM­
WORK TECHNIQUE, HAS PROVED MOST SUITABLE FOR LARGER-SIZE
PRESTRESSED CONCRETE BRIDGES. THE CON­
STANT REPEITION OF THE WORKING RHYTHM RESULTS IN
A VERY ECONOMICAL CONSTRUCTION PROGRESS. DEPENDING
ON THE CIRCUMSTANCES, ANY OF THE FOLLOWING
MEANS MAY BE ADOPTED: SCAFFOLDING THAT HAS TO BE
PARTLY DISMANTLED, MOVED INTO NEW POSITION
AND REERECTED; SLIDING SCAFFOLDING; STEPPING DORMWORK
EQUIPMENT, SLIDING ON THE GROUND; CANTILEVERED
STEPPING FORMWORK EQUIPMENT. THE DEVELOPMENT OF THE
PROCESS-FROM USING MOVEABLE SCAFFOLDING TO EM-
PLOYING CANTILEVERED STEPPING FORMWORK EQUIPMENT
HAS BEEN ILLUSTRATED BY EXAMPLES OF THE DIFFERENT
METHODS. DISTINCTION IS MADE BETWEEN
STEPPING FORMWORK EQUIPMENT FOR SPANS UP TO 50 M
AND FOR THOSE FROM 50 TO 150 M (160 TO 500 FT) OR FOR
EVEN LARGER SPANS. THE CONSEQUENCES AND THE SCOPE
OF PRESTRESSED CONCRETE BRIDGE CONSTRUCTION WITH
STEPPING FORMWORK EQUIPMENT ARE BEST ILLUSTRATED
IN THE FINAL EXAMPLE: THE PRIZE-WINNING DESIGN OF
THE BRIDGE ACROSS THE GREAT BELT IN DENMARK. THIS
BRIDGE HAS VARYING SPANS UP TO 325 M (1100 FT). /RRL/A/

Witfoht, H
Intl Symp Concer Bridge Des Proc /Can/ 1969

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 215057
THREE-SPAN CONTINUOUS PRESTRESSED CONCRETE
BRIDGE CONSTRUCTED OF PRECAST UNITS IN CANTILEVER
CONSTRUCTION
DETAILS ARE GIVEN OF THE BRIDGE ACROSS THE TAF FAWR
VALLEY IN WALES. THE BRIDGE IS A BOX GIRDERS WITH THREE
COMPARTMENTS, THE DEPTH VARYING PARABOLICALLY FROM 15 FT AT THE PIERS TO 5 FT AT MIDSPAN AND
ABUTMENTS. THE WEBS WERE PRECAST AS I-SECTIONS, AND
THE BRIDGE WAS CONSTRUCTED BY CANTILEVERING FROM
THE TWO PIERS TOWARD THE ABUTMENTS AND THE CENTER
OF THE MAIN SPAN. DURING CONSTRUCTION, THE BRIDGE
PASSED THROUGH THREE DIFFERENT STATIC PHASES: (1)
SIMPLY SUPPORTED UNTIL THE CANTILEVERING REACHES
THE ABUTMENTS, (2) TWO-PIN PORTAL WHEN RESTING ON
ABUTMENTS BUT STILL FREE AT MID-SPAN, AND (3)
THREE-SPAN CONTINUOUS WHEN JOINED IN THE MIDDLE.
TWO ELECTRONIC COMPUTER PROGRAMS WERE DEvised.
THE FIRST DEALT WITH THE SIMPLY SUPPORTED CONDITION
AND GAVE STEP-BY-STEP STRESSES AND DEFORMATIONS AT
ALL CONSTRUCTION JOINTS AS THE BRIDGE WAS BEING
CONSTRUCTED AND THE PRESTRESSING FORCES WERE
INTRODUCED. THE SECOND PROGRAM DEALT WITH THE INDE­
TERMINATE STAGES AND, TO MAKE IT AS GENERAL AS
POSSIBLE, WAS DESIGNED ONLY TO GIVE THE CONTRIBUTIONS
to THE COEFFICIENT MATRIX FROM BEAMS WITH
VARIEBLE CROSS-SECTION, THE VARIATION BEING COM­
PLETELY ARBITRARY AND THE BEAMS WITH OR WITHOUT
END-FIXITY. /RRL/

Lundgren, A Hansen, F
Intl Symp Concer Bridge Des Proc /Can/ 1969

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 215058
DESIGN OF LONG-SPAN CONCRETE BRIDGES WITH SPECIAL
REFERENCE TO PRESTRESSING, PRECASTING, ERECTION,
STRUCTURAL BEHAVIOR, AND ECONOMICS
THE DESIGN OF LONG-SPAN CONCRETE BRIDGES, CONSIDER­
ING CONDITIONS IN THE U.S.A., IS DISCUSSED WITH REFER­
ENCE TO RECENT ADVANCES IN MATERIALS AND
CONSTRUCTION TECHNIQUES. THE USE OF PRESTRESSING,
PRECASTING, AND ERECTION METHODS ARE PRESENTED AS
APPLIED TO DIFFERENT TYPES OF BRIDGES SUCH AS CANTI­
LEVER, CONTINUOUS, RIGID-FRAME, TRUSS, ARC, AND SUS­
PENSION STRUCTURES. DESIGN APPROACHES HIGHLIGHTING
STRENGTH AND BEHAVIOR REQUIREMENTS ARE MEN­
TIONED, TOGETHER WITH THE USE OF COMPUTER
PROGRAMS FOR OPTIMIZATION. MATERIAL, LABOR, AND
ERECTION COSTS ARE COMPARED AS INDICES OF TOTAL
ECONOMY IN BRIDGE DESIGN. /RRL/A/

Lin, TY Gerwick, BC
Intl Symp Concer Bridge Des Proc /Can/ 1969

ACKNOWLEDGMENT: Road Research Laboratory /UK/
3A 215059
LONG-SPAN PRECAST Prestressed CONCRETE BRIDGES BUILT IN CANTILEVER
THE EVOLUTION OF CANTILEVER SEGMENTAL CONSTRUCTION, ITS FIRST APPLICATIONS AND SUCCESSIVE IMPROVEMENTS ARE SURVEYED. DETAILS ARE GIVEN OF THE CONSTRUCTION METHOD. PRESTRESSING IS APPLIED AFTER EACH SYMMETRICAL PAIR OF SEGMENTS IS PLACED IN POSITION. AS THE SEMISPANS FROM ADJACENT PIERS COME TOGETHER, THE CENTER OF THE SPAN IS CLOSED BY INSERTING A DROP-IN GIRDER SEGMENT, AND CONTINUITY IS PROVIDED BY EPOXY CEMENT, MORTAR AND STRESSED TENDONS. CONTINUOUS SPANS MINIMIZE THE DEFLECTIONS AND ANGULAR BREAK THAT WOULD BE CAUSED IN A HINGED DECK BY CREEP RELAXATION, SHRINKAGE, LIVE LOAD, AND DEVIATIONS IN MATERIAL PROPERTIES. CAREFUL APPLICATION OF PRESTRESSING STEEL IS NECESSARY IN CONTINUOUS BRIDGES, HOWEVER, TO TAKE CARE OF MOMENT REVERSALS AND TO ACHIEVE OPTIMUM STRESS DISTRIBUTION. IN LONG DECKS, EXPANSION JOINTS ARE PROVIDED PREFERABLY AT POINTS OF CONTRAFLEXURE TO MINIMIZE DEFLECTION. SEVERAL BRIDGE PROJECTS UTILIZING DIFFERENT PRECASTING AND ERECTION TECHNIQUES ARE DESCRIBED, AND TYPICAL COSTS ARE TABULATED.

/RRL/

Muller, J
Int'l Symp Concr Bridge Des Proc /Can/ 1969

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 215079
THE SIXTH INTERNATIONAL CONFERENCE ON PREFABRICATED CONCRETE (BIBM/969) IN FRENCH/
THE FIRST 4 SESSIONS OF THIS CONFERENCE ARE CONCERNED WITH QUALITY CONTROL, STANDARDIZATION, MECHANIZATION, AUTOMATION, LIGHTWEIGHT STRUCTURAL CONCRETE, AND NEW PRODUCTS AND TECHNIQUES WITH EXAMPLES OF APPLICATION. THE FIFTH SESSION IS DEVOTED TO THE CONSTRUCTION OF BRIDGES BUILT WITH PRECAST CONCRETE UNITS. IN THIS SESSION, THE REPORTS PRESENTED WERE AS FOLLOWS: ATTEMPT AT STANDARDIZING HORIZONTAL CONSTRUCTION ELEMENTS FOR BRIDGES (UNDERPASSES AND OVERPASSES), PARKING STRUCTURES AND OTHERS, BRIDGE CONSTRUCTION WITH PRECAST CONCRETE UNITS. SOME PRECAST CONCRETE BRIDGES IN SPAIN; CONSTRUCTION OF PRECAST CONCRETE BRIDGES IN SPAIN. DETAILS ARE GIVEN OF BRIDGE CONSTRUCTION METHODS USING PRECAST REINFORCED OR PRESTRESSED CONCRETE ELEMENTS. /LCPC/RRL/

Venuat, M
Rev Mails Constr & Trav Publics /Fri/ Aug. 1969

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 215081
STATE OF THE ART OF THE USE OF SLIDING FORMS
A REVIEW IS PRESENTED OF THE USES OF SLIDING FORMS. THE BASIC TECHNICAL ASPECTS OF THIS CONSTRUCTION METHOD ARE OUTLINED, AND MENTION IS MADE OF THE PRECAUTIONS TO TAKE TO OBTAIN A CONCRETE OF PLEASED APPEARANCE. /TRRL/

Adam, M
La Construction Moderne /France/ No. 2, Mar. 1970, pp 22-5, 1 Fig, 9 Phot

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 215102
REPORT OF THE TECHNICAL COMMITTEE ON LOW COST ROADS
CONTENTS: GENERAL ACTIVITY REPORT MANUAL AND MECHANICAL METHODS FOR HIGHWAY CONSTRUCTION AND MAINTENANCE REGIONAL AND NATIONAL SURVEYS OF ROADMAKING MATERIALS INFLUENCE OF ENVIRONMENT ON THE DESIGN OF ROADS VARIOUS QUESTIONS AND INFORMATION UNESCO MANUAL ON THE CONSTRUCTION AND MAINTENANCE OF ROADS IN DEVELOPING COUNTRIES CONCLUSIONS
Perm Int'l Assoc Road Congresses Proc 1967

3A 215106
TWO WAYS TO BUILD SUBWAY STATIONS

Pacific Road Builder & Engineering Rev June 1968

3A 215109
CONCRETE DOWN THE SPOUT
EQUIPMENT, CONSTRUCTION TECHNIQUES AND PRIMARY REQUIREMENTS FOR THE SUCCESSFUL PLACEMENT OF TREMIE CONCRETE ARE DESCRIBED. TREMIE CONCRETE IS A NAME GIVEN TO THE METHOD OF PLACING CONCRETE UNDER WATER BY MEANS OF A PIPE CALLED A TREMIE PIPE. CONCRETE OF HIGH SLUMP IS NECESSARY IN ORDER TO ACHIEVE HIGH-QUALITY CONCRETE WITH THIS METHOD. CONCRETE MUST BE POURED BELOW THE SURFACE OF THE WATER AND THEN INTRODUCED BELOW THE PREVIOUSLY PLACED FRESH CONCRETE IN A CONTINUOUS OPERATION, CARRYING ON OUTWARD AND UPWARD FLOW. ADVANTAGES OF TREMIE CONCRETE ARE: (1) IT IS UNNECESSARY TO DE-WATER THE CAISSON OR COFFERDAM, (2) IT IS POSSIBLE TO PLACE LARGE VOLUMES OF CONCRETE VERY QUICKLY AT GREAT DEPTHS, (3) THE CURING CONDITIONS ARE PERFECT, AND (4) VOIDS AND HONEYCOMBS ARE ELIMINATED PROVIDED THE TREMIE SEAL IS NOT BROKEN.

Concrete Construction July 1968

3A 215111
INVESTIGATION OF STRENGTH, FROST-RESISTANCE AND IMPERMEABILITY OF CONCRETE CONSTRUCTION JOINTS
THE LIFE SPAN AND RELIABILITY OF MONOLITHIC CONCRETE STRUCTURES DEPENDS TO A GREAT DEGREE ON CORRECT METHODS OF PLACING CONCRETE DURING CONSTRUCTION. THE STRENGTH OF CONNECTION OF CONCRETE WITH CONSTRUCTION JOINTS AND INTERVAL BETWEEN CONCRETING UP TO 8 HOURS DECREASES UP TO 12%, IN THE CASE WITH NO SPECIAL TREATMENT OF THE JOINT SURFACE. THE STRENGTH OF CONNECTION OF CONCRETE WITH CONSTRUCTION JOINTS AND INTERVAL BETWEEN CONCRETING UP TO 13 DAYS DECREASES BY 18 TO 29% BY COMPARISON WITH STRENGTH OF TEST PIECES WITHOUT JOINTS. IN THE CASE WITH CORRECT AND CAREFUL TREATMENT OF JOINT SURFACES. FOR EACH TYPE OF CEMENT ONE SHOULD CAREFULLY ASCERTAIN MAXIMUM ALLOWABLE TIME BETWEEN STAGES OF CONCRETING WITHOUT FORMATION OF CONSTRUCTION JOINTS, THAT IS, WITHOUT TREATMENT OF THE JOINT SURFACE THE FROST-RESISTANCE OF CONCRETE WITH CONSTRUCTION JOINTS, IF PREPARED BY AN ACCEPTED METHOD ENSURES ADEQUATE LIFE-SPAN FOR MONOLITHIC REINFORCED-CONCRETE STRUCTURES THE COMPOSITION OF THE CLinker HAS NO REAL EFFECT ON STRENGTH OF CONNECTION OF CONCRETE JOINTS, NOR ON FROST-RESISTANCE (WHEN TESTED UP TO 300 CYCLES), NOR ON IMPERMEABILITY. HOWEVER, THE PERSENC IN THE
Cement of a large amount of gypsum (in the form of a semi-hydrate) causes rapid stiffening and less of workability of concrete mixes, and this makes for difficult concrete placing and may harm the structure of the concrete. /Author/

Trinker, BD Hydrotechnical Construction Sept. 1967

3A 215121

NEW DEVELOPMENTS IN PAVEMENT JOINTING

History is briefly reviewed on concrete pavement construction in Michigan. Changes in pavement joint construction incorporated in the 1940 Standard Specifications reflect conclusions reached from studies on the previous behavior under load and also the structural effectiveness of typical longitudinal and transverse joint designs. A study of failed joints disclosed that the main responsibility for failure rested on two or three of the following factors: (1) misalignment of the dowel bars vertically or horizontally due to basket weakness, (2) locking of joints because of improper coating of bars prior to placement, (3) locking of joints caused by contamination of water, (4) carelessness in placement of the dowel assembly during construction, and (5) infiltration of soil into the joint opening at the sides and bottom of the slab due to the rupturing of the substitute base plate material. In 1952, a dowel basket assembly was fabricated in accordance with a modification of an assembly supplied by the Bethlehem Steel Company. This basket design made provision for the center wires of the basket to straddle the base plate parting strip and hold it in proper position during concrete placement. Dowel alignment has been greatly improved and delays in paving operations to permit correction of improperly placed basket assemblies are negligible. Another design change substituted saw longitudinal joint construction in place of the pre-molded type long used. Tests are reported on sealing compounds. Styrofoam and corrugated paperboard were tested to form contraction joint grooves. The styrofoam method appeared to be a substitute for sawed transfer joints at reasonable cost and without the risk of random cracking. Problems now under study are: freezing of joints due to voids between the concrete and low transfer bars, and erosion of concrete around the low transfer bar.

Laird, CB Highway Research Board Bulletin 57

3A 215122

INSULATED FORMS FOR WINTER CONSTRUCTION OF BRIDGES

The thesis is developed that bridge construction in the north temperate zone states of the United States has been traditionally subject to the disadvantage of a short construction season, due to the cold weather conditions existing during five months of the year. The only alternative to the short construction season has been the expensive alternate of using external heat and housings over the mass of concrete to be poured. Furthermore, recent improvement in types of insulating materials has operated to reduce the additional cost of winter construction with no adverse effects on the concrete structures produced and with an attendant elimination of hazard by fire. The greatly expanded highway construction program emphasizing the interstate system, with a disproportionately large number of structures, creates such a demand on the existing construction plant that the program cannot be accomplished in a short construction season and the available plant must be economically used for a full twelve months if interests of the states and of the contractors themselves are to be properly served. The illustrations used are from projects initiated in South Dakota in 1952 and 1953 and are intended to show that proper use of modern insulation in connection with forms of bridge structures offers a solution which is sufficiently economical to justify year-round construction. The experience of this state, South Dakota, indicates that low temperatures alone are not sufficient justification to suspend construction operations in the case of the majority of concrete structures of the girder or slab type and in the case of foundations for structures of any type. /Author/


3A 215123

NUCLEAR EXCAVATION RESEARCH

Research to date has confirmed the basic theories of cratering applicable to nuclear excavation. Continuing advances and improved techniques are expected, as well as numerous new applications. Studies so far indicate a variety of realistic uses for nuclear explosives in construction. Some offer economies and others show possibilities for the construction of projects considered impractical by other means. Interest shown by the engineering profession will be a major factor in the development and application of nuclear explosives as a new and powerful construction tool. /Author/

Kurtz, MK Military Engineer Sept. 1968

3A 215128

A BIBLIOGRAPHY ON WINTER CONSTRUCTION-1940-1967

References contained in this bibliography were derived primarily from a search of the U.S. Army cold regions research and engineering laboratory, the Arctic bibliography, the bibliography on snow, ice and permafrost, the polar bibliography, the industrial arts index and the applied science and technology index. An author index is presented of the 751 references contained.

Fulwider, CW Starrman, JH Crel Special Reports. Army Dept /US/ Apr. 1968

3A 215125

TRIGONOMETRIC CONSTRUCTION STAKING (TRIGSTAK)

TRIGSTAK (ACRONYM FOR TRIGONOMETRIC STAKING) IS A METHOD OF CONSTRUCTION STAKING BY HORIZONTAL AND VERTICAL INTERSECTION LINES OF SIGHT FROM TWO OR MORE THEODOLITES STRATEGICALLY LOCATED AT THE CONSTRUCTION SITE OR ROAD ALIGNMENT. IT IS ACTUALLY AN EXTENSION OF THE AUTOMATION ALREADY ACHIEVED IN THE MAPPING AND DESIGN OF MOUNTAIN HIGHWAYS. PHOTOGRAMMETRIC DIGITIZING IS USED TO OBTAIN A MATHEMATICAL MODEL OF THE EARTH'S SURFACE OVER THE ENTIRE AREA OF THE PROPOSED CONSTRUCTION. THIS DIGITAL TERRAIN MODEL IS STORED IN A COMPUTER ALONG WITH THE HORIZONTAL AND VERTICAL GEOMETRY AND ROADBED TEMPLET OF THE PROPOSED HIGHWAY TO-obtain a mass diagram and an earthwork summary. Instead of the trigstak program itself, includes coordinates of the triangulation stations, the station (pluses) of slope stakes to be set from each triangulation station, and vertical control data. Trigstak is also used to check photogrammetric maps and digitizing using the terrain data only. /Author/

Stipp, DW Surveying and Mapping Sept. 1968
3A 215142
FEASIBILITY OF COLD-WEATHER EARTHWORK

Lovel, CW Osborne, AM Highway Research Record, Hwy Res Board 1968

3A 215144
CONSTRUCTION TECHNIQUES AS RELATED TO BRIDGE DECK ROUGHNESS
TECHNIQUES AND PROCEDURES USED DURING THE CONSTRUCTION OF BRIDGE DECKS WERE SURVEYED AND RECORDED TO IDENTIFY THOSE FACTORS MOST CLOSELY RELATED TO THEIR ROUGHNESS. DATA FROM ROUGHNESS TESTS PERFORMED AFTER COMPLETION OF THE DECKS WERE RELATED TO THE CONSTRUCTION VARIABLES AS WELL AS TO OTHER DESIGN AND GEOMETRIC FACTORS. THE SCREEDING TECHNIQUE USED DURING CONSTRUCTION PROVED TO BE THE MOST SIGNIFICANT FACTOR RELATED TO THE ROUGHNESS OF THE COMPLETED BRIDGE DECKS. IT WAS FOUND THAT LONGITUDINAL MECHANICAL OSCILLATING TYPE SCREEDING FOLLOWED BY LONGITUDINAL BELTING AND/OR BURLAP DRAG CONSISTENTLY PRODUCED THE SMOOTHER DECKS ON SIMPLE SPAN TYPE BRIDGES. longitudinal floating operations following TRANSVERSE type SCREEDING REDUCED DECK ROUGHNESS BY AS MUCH AS 25 PERCENT. ISSUE IN 1964 OF SPECIAL PROVISIONS FOR THE CONSTRUCTION OF BRIDGE DECKS BY THE VIRGINIA DEPARTMENT OF HIGHWAYS ENCOURAGED MORE UNIFORM CONSTRUCTION PROCEDURES, REQUIRED MECHANICAL SCREEDING MACHINES, AND STATED A PREFERENCE FOR THE USE OF LONGITUDINAL TYPE SCREEDING. STUDIES SHOW THAT RECENTLY CONSTRUCTED BRIDGES HAVE BETTER RIDING QUALITIES THAN THOSE CONSTRUCTED PRIOR TO 1964. THE CONSIDERABLE VARIATION IN RESULTS OBTAINED, HOWEVER, SUGGESTS THAT A HIGH STANDARD OF WORKMANSHIP AND EQUIPMENT MUST BE MAINTAINED TO OBTAIN OPTIMUM RESULTS. /AUTHOR/

Hilton, MH Highway Research Record, Hwy Res Board 1968

THE CONTRACTOR KEEPS THESE DOCUMENTS UPDATED AND SENDS THE CARBON COPIES TO ADS FOR PREPARATION OF THE COMPUTERIZED REPORTS. THE CONTRACTOR RECEIVES THE FOLLOWING OUTPUT FORMS: BALANCE SHEET, INCOME STATEMENT, ACCOUNTS RECEIVABLE AND PAYABLE, JOB COSTS RECORDS FOR EACH CONSTRUCTION PROJECT, & A TRIAL BALANCE AND GENERAL LEDGER. IN ADDITION TO THESE BASIC REPORTS, THE CUSTOMER-CONTRACTOR CAN CONTRACT FOR THE FOLLOWING OPTIONAL REPORTS: (1) A JOB ACTIVITY REPORT, (2) AN EQUIPMENT REPORT, AND (3) AN ACCOUNT ANALYSIS REPORT. THIS SERVICE PROVIDES A SAVING IN TIME AS WELL AS MONEY.

Davis, J Constructor pp 34-36, Jan. 1969

3A 215173
PLASTIC TENT HAS INTERESTING POSSIBILITIES IN CANADIAN INDUSTRY
A PLASTIC, INFLATABLE BUBBLE, OR AIR SHELTER IS BEING TESTED IN TORONTO. THE SHELTER is AIR SUPPORTED, MADE OF HEAVY-GAUGE PLASTIC, AND DESIGNED TO COMBAT WINTER WEATHER. IT WAS DEVELOPED AND TESTED IN SWEDEN WHERE IT IS USED WIDELY BY INDUSTRY, SPORTS AND THE MILITARY. FOR A WAREHOUSE OR A GARAGE, THE BUILDING INDUSTRY USES IT EXTENSIVELY TO PROTECT BOTH WORKERS AND BUILDINGS FROM WINTER WEATHER. MADE OF STRONG SYNTHETIC PLASTIC FIBRES, THE BUBBLE, OR ENVELOPE, IS PREFABRICATED BY MEANS OF HIGH-FREQUENCY WELDING. IT IS ABSOLUTELY FIREPROOF. ENTERED THROUGH TWO DOORS, WHICH SERVE AS AN AIR-LOCK, THE SHELTER HAS HOT AIR UNITS (INFLATION FANS), WHICH NOT ONLY PROVIDE THE REQUIRED VOLUME OF AIR TO KEEP THE DOME STANDING, BUT ALSO SUPPLY THE NECESSARY HEATING. PRODUCED IN SECTIONS, WHICH MAKES EXTENSIONS TO THE SHELTER RELATIVELY SIMPLE, THE NORDIC AIR SHELTER MAY BE ERECTED IN ONLY A FEW DAYS TIME, OFTEN FORTY-EIGHT HOURS OR LESS. IT TAKES LESS THAN A DAY TO DEFUSE THE SHELTER AND PREPARE IT FOR STORAGE. IT IS ANTICIPATED THAT THE SHELTER WILL BE USED FOR WINTER CONSTRUCTION SITES. IT WILL CERTAINLY PERMIT THE POURING OF CONCRETE IN COLD WINTER MONTHS.

Canadian Pit and Quarry Jan. 1969, 18

3A 215175
ILLINOIS DEPARTMENT TO TEST NEW BRIDGE BUILDING TECHNIQUES
NEW TECHNIQUES IN BRIDGE CONSTRUCTION WILL BE TESTED IN SIDE-BY-SIDE COMPARISONS WITH CONVENTIONAL METHODS IN TWO RESEARCH PROJECTS PROPOSED BY THE ILLINOIS DIVISION OF HIGHWAYS. THE PROPOSAL CALLS FOR CONSTRUCTION OF BRIDGE STRUCTURES AT TWO DIFFERENT SITES. A FOUR-SPAN, DUAL-STRUCTURE CONCRETE BRIDGE WITH GALVANIZED REINFORCEMENT IN THE CONCRETE DECKING IS PROPOSED FOR ONE THE PROJECTS WHICH WILL TEST THE EFFECTIVENESS OF GALVANIZED REINFORCING STEEL AS A DETERRENT TO SPALUNG IN CONCRETE BRIDGE DECKS. IN THE DUAL STRUCTURES, ONLY THE TOP REINFORCING STEEL WILL BE GALVANIZED; IN THE OTHER, BOTH TOP AND BOTTOM STEEL WILL BE GALVANIZED. THE OTHER PROJECT WILL COMPARE MAINTENANCE COSTS FOR GALVANIZED AND UNGALVANIZED STEEL IN A STRUCTURAL STEEL BRIDGE. IT ALSO WILL BE A DUAL STRUCTURE BRIDGE, WITH STEEL IN ONE STRUCTURE TO BE GALVANIZED. THE COMPANION STRUCTURE BUILT ALONGSIDE WILL RECEIVE THE STATE'S STANDARD SYSTEM. /AUTHOR/

Hwy Bldr, Associated Penn Constructors Feb. 1969

3A 215183
HIGHWAY SHOULDER CONSTRUCTION PRACTICES
A BRIEF REVIEW IS PRESENTED OF SHOULDER PRACTICES DURING THE LAST TWENTY YEARS IN OHIO. THE POLICY FOR NEW CONSTRUCTION PROVIDES STABILIZED SHOULDERS...
CONSTRUCTION EQUIPMENT AND METHODS

ALONG THE OUTSIDE PAVEMENT EDGE OF ALL DIVIDED PAVEMENT HIGHWAYS, AND ALONG EACH EDGE OF ALL TWO-LANE PAVEMENTS WITH MORE THAN 200 HEAVY COMMERCIAL VEHICLES PER DAY. SEATED EARTH SHOULDERS ARE STILL GENERALLY USED ON LOW TRAFFIC ROADS. THE PRESENT STANDARD FOR STABILIZED SHOULDERS CONSISTS OF A FOUR-FOOT WIDTH OF STABILIZED CRUSHED AGGREGATE, SIX-INCH COMPACTED DEPTH, FINISHED FLUSH WITH THE PAVEMENT SURFACE, WITH A SLOPE OF 3/4 INCH PER FOOT. MATERIALS FOR THIS COURSE ARE CRUSHED LIME-STONE, CRUSHED SLAG OR CRUSHED GRAVEL. SHAPING THE SUBGRADE FOR THE STANDARD STABILIZED SHOULDERS COURSE IS USUALLY DONE WITH A MOTOR GRADER, OFTEN WITH A SPECIAL PLATE OF PROPER DIMENSIONS FOR THE PURPOSE. AFTER THE SUBGRADE IS SHAPED AND COMPACTED, THE CRUSHED AGGREGATE IS SPREAD UPON THE SUBGRADE IN LAYERS NOT TO EXCEED SIX INCH COMPACTED THICKNESS. FOR INITIAL COMPACTION OF THE STABILIZED SHOULDER MATERIAL, SPECIFICATIONS PERMIT THE USE OF ANY SUITABLE EQUIPMENT APPROVED BY THE ENGINEER. EFFECTIVE COMPACTION CONTROL PROCEDURES AND CONTINUOUS INSPECTION DURING CONSTRUCTION ARE NECESSARY TO INSURE ADEQUATE COMPACTION OF STABILIZED SHOULDERS AND THE SUBGRADES. TO IMPROVE PRACTICES FOR THE CONSTRUCTION OF FLEXIBLE PAVEMENTS, IT HAS BEEN PROPOSED TO KEEP ALL HEAVY CONSTRUCTION EQUIPMENT OFF THE PAVEMENT AND TO USE THE SHOULDERS. IT IS ANTICIPATED THAT SUCH REQUIREMENTS WILL RESULT IN LESS SHEETING AND DELAYS DURING CONSTRUCTION. ON HEAVILY TRAVELLED PRIMARY ROADS, THERE IS AN UNQUESTIONABLE NEED FOR STABLE SHOULDERS, PROVIDED DURING CONSTRUCTION WITH SOME TYPE OF PAVED SURFACE TO PROVIDE SURFACE DRAINAGE. TO MEET FUTURE NEEDS ON PRIMARY ROADS, IT IS INDICATED THAT STABILIZED SHOULDERS, WITH THEIR EFFECTIVENESS, PLANNED FUTURE WORK INCLUDES A CONTINUATION OF TEXTURING STUDIES, A SEARCH FOR EFFECTIVE SURFACE TREATMENTS, A STUDY OF FIELD PRACTICES THAT AFFECT SURFACE MORTAR QUALITY AND TEXTURE, AND ADDITIONAL WORK ON GROOVING OF OLDER PAVEMENTS TO OBTAIN OR RESTORE ADEQUATE SKID RESISTANCE. SPECIFICATIONS WILL BE DEVELOPED AS WORK PROGRESSES TO IMPROVE CHARACTER AND DURABILITY OF THE SURFACE TEXTURE.

Spelman, DI. Highway Research Board Special Reports 1969

Shepard, CH. Highway Research Board Bulletin 1957

NEW TECHNIQUE 'EXTRUDES' FOAM BUILDINGS

AN IDEA IS PRESENTED FOR EXTRUDING FOAMED-IN-PLACE INTEGRAL SKIN SANDWICH STRUCTURES. THE MIDWEST APPLIED SCIENCE CORPORATION (MASC) HAS CHOSEN A TWO-COMPONENT, FILLED EPOXY AS MOST SUITABLE FOR BUILDING CONSTRUCTION. THE ERECTOR CONSISTS OF AN ARTICULATED BOOM CONSTRUCTION MOLD IS MOUNTED AND THROUGH WHICH MATERIAL COMPONENTS ARE FED TO THE HEAD AT THE MOLD. IT CARRIES COLDING LINES TO THE MOLD. FOAMING EQUIPMENT AND SUPPLY TANKS MOUNTED ON THE TRUCK COMPLETE THE SELF-CONTAINED SYSTEM. THE MOST UNIQUE COMPONENT IS THE TRAVELING MOLD WHICH BASICALLY WILL CONSIST OF TWO 36 IN. LONG STEEL PLATES AND TWO ENDLESS, EMBOSSED, MYLAR RELEASE BELTS, WITH SUCCESSIVE PASSES, ANY DESIRED HEIGHT CAN BE ACHIEVED FROM FOAMED IN PLACE SEGMENTS 9-12 IN. HIGH. NO TRIMMING WILL BE NECESSARY BETWEEN PASSES.

Plastics Technology July 1968

TEXTURING OF CONCRETE PAVEMENT

PRESENT WORK BY CALIFORNIA ON TEXTURING OF CONCRETE PAVEMENTS IS DESCRIBED. THE PROBLEM HAS RESOLVED INTO TWO GENERAL AREAS: SECURING ADEQUATE TEXTURE DURING CONSTRUCTION, AND MAINTAINING TEXTURE, AS BUILT, BY USING MATERIALS AND CONSTRUCTION PRACTICES THAT INSURE DURABLE SURFACE MORTAR. VARIOUS TEXTURE PATTERNS WERE FORMED INTO THE SURFACE OF LABORATORY-CAST SLABS USING A VARIETY OF PROTOTYPE DEVICES. SKID TESTS WERE PERFORMED ON THESE SLABS. A PROMISING PATTERN WAS SELECTED AND USED ON SHORT SECTIONS OF THREE FREEWAYS. SOME OF THE RESULTS WERE DISAPPOINTING. A UNIFORM TEXTURE OVER A LARGE AREA COULD NOT BE ACHIEVED BECAUSE OF VARYING MORTAR PROPERTIES. IT WAS ALSO DISCOVERED THAT THE PATTERN SELECTED, WHEN FORMED TOO DEEPLY, CAUSED A DIVERSE REACTION BETWEEN THE DIFFERENT MATERIALS. ADDITIONAL WORK IS PLANNED USING OTHER TEXTURE PATTERNS. OTHER SURFACE TREATMENTS INCLUDED BROADCASTING OF SLAG AND SELECTED COARSE SAND PARTICLES ON THE SURFACE WHILE DRAGGING WITH BURLAPS, AND BROOMING. SKID TESTS ARE BEING PERFORMED ON A PERIODIC BASIS, BUT IT IS TOO SOON TO DRAW CONCLUSIONS REGARDING THE LONG-TERM SKID RESISTANCE AS AFFECTED BY TRAFFIC AND WEATHER. NEW CURING COMPOUNDS AND SO-CALLED SURFACE HARDENERS WERE APPLIED TO SHORT TEST SECTIONS OF FREEWAYS IN AN ATTEMPT TO IMPROVE MORTAR DURABILITY. LABORATORY TESTS PREVIOUSLY PERFORMED INDICATED THAT SOME IMPROVEMENT COULD BE EXPECTED FROM THE USE OF BETTER CURING COMPOUNDS AND HARDENERS. AGAIN, THESE TEST SECTIONS HAVE NOT BEEN IN SERVICE LONG ENOUGH TO FORM ANY CONCLUSIONS REGARDING THEIR EFFECTIVENESS. PLANNED FUTURE WORK INCLUDES A CONTINUATION OF TEXTURING STUDIES, A SEARCH FOR EFFECTIVE SURFACE TREATMENTS, A STUDY OF FIELD PRACTICES THAT AFFECT SURFACE MORTAR QUALITY AND TEXTURE, AND ADDITIONAL WORK ON GROOVING OF OLDER PAVEMENTS TO OBTAIN OR RESTORE ADEQUATE SKID RESISTANCE. SPECIFICATIONS WILL BE DEVELOPED AS WORK PROGRESSES TO IMPROVE CHARACTER AND DURABILITY OF THE SURFACE TEXTURE. /AUTHOR/
CONSTRUCTION EQUIPMENT AND METHODS

3A 215202
SLURRY-TRENCH CONSTRUCTION FOR BASEMENT WALL OF
WORLD TRADE CENTER
New York City's World Trade Center project in
Manhattan has a huge basement 70ft. deep and 11
acres in area. In building the exterior wall for this
hole, the slurry-trench method was employed. This
method was chosen because conventional con-
struction methods would have been difficult.
Among the problems were (1) subsurface obstructions
such as old buried wharves, (2) deep lowering of the
water table outside of the site had to be avoided, (3)
It was desirable to leave gaps in the wall during
utility relocation, and (4) a waterproof wall ex-
tending down into bedrock (as provided by the
slurry-trench method) would mean a nonbuoyant
basement. The slurry-trench method as applied to
this project is described and the advantages of the
method are presented. Building demolition oc-
curred simultaneously with the wall construc-
tion. Completion of the wall in effect sealed off
the basement from the outside excavation contin-
ued inside. With only pumping required to remove
the existing entrapped water.

Kapp, MS  Civil Engineering Ace  Apr. 1969

3A 215207
LOW COST, LOW TYPE ASPHALT SURFACED ROADS IN
THE WESTERN REGIONS OF THE U.S.
Major highways built in the U.S.A. are surfaced with
a high type asphaltic concrete pavement or a
portland cement concrete pavement when high
traffic volumes are expected. However, when new
highway routes are constructed, high traffic vol-
umes may not develop for a number of years. In such
cases, stage construction starting with low type
asphalt surfaces may serve traffic effectively and
at lower costs. Additional thicknesses of pavement
can be added when high traffic volumes develop.
It is essential that all roads of any importance have
all weather, dustless surfaces. In most areas, local
aggregates suitable for base courses and low type,
low cost asphalt surfaces can be found and used.
These low cost surfaces on adequate base courses
will give good service to low or medium traffic
volumes ranging from 50 to 250 vehicles per day.
Intermediate classes of asphalt pavements such as
bituminous penetration macadam mats or plant mix
surfaces can carry traffic volumes up to 500 or 600
vehicles per day. The benefits are reviewed of as-
phalt surface roads.

Schwegler, RM
Pavement Association /Brazil, Inst Pesquisas Rodoviarias Symp /Braz./
July 1969

3A 215208
SELECTED BIBLIOGRAPHY ON IMMERSED TUBES
THE MOST IMPORTANT FEATURE OF THE DEVELOPMENT OF
THE TECHNIQUE OF IMMERSED TUBE TUNNELING IS THE
CHANCE IT OFFERS OF PROVIDING A DRY WATER CROSSING
WHERE, FORMERLY, EITHER A BRIDGE OR TUNNEL HAS
BEEN MADE PROHIBITIVELY COSTLY BY GROUND CONDI-
TIONS. ALTHOUGH NOT ALWAYS COMPETITIVE WITH BORED
TUNNEL OR BRIDGE, WHERE BOTH ARE POSSIBLE, THE PRE-
FABRICATED TUNNEL SHOULD ALWAYS BE GIVEN AT LEAST
CURSORY CONSIDERATION BY ENGINEERS INVESTIGATING THE
VIABILITY OF A WATER CROSSING. SURPRISINGLY FEW OF
THOSE WHO HAVE NOT BEEN DIRECTLY CONCERNED WITH
THE DESIGN AND CONSTRUCTION OF A SUNKEN TUBE
KNOW THE EXTENT TO WHICH THIS TECHNIQUE HAS BEEN
USED. THIS BIBLIOGRAPHY IS THE RESULT OF REFERENCES
SELECTED FROM THE LITERATURE OVER A TEN YEAR PER-
IOD. IT IS REPRESENTATIVE OF EVERY KIND OF IMMERSED
TUBE TUNNEL SO FAR STARTED OR COMPLETED, AND OF
EVERY TECHNIQUE EMPLOYED. FOREIGN LANGUAGE REF-
ERENCES HAVE BEEN OMITTED EXCEPT WHERE THEY GIVE
DETAILS NOT AVAILABLE IN ENGLISH.

Pequignot, CA  Tunnels and Tunneling /UK/ July 1969

3A 215212
CONSTRUCTION PRACTICES FOR PLACING 48-INCH
PRECAST, PRESTRESSED CONCRETE PILING IN DEEP
WATER
THE PROPOSAL TO CONSTRUCT A STRUCTURE ACROSS MORE
THAN A MILE OF OPEN WATER UP-TO 80 FT DEEP WAS THE
BEGINNING OF AN EXTENSIVE ENGINEERING ECONOMIC
ANALYSIS TO DETERMINE THE TYPE AND LENGTH OF STRUCTURE TO FIT THE SITE, A COMPOSITE I-BEAM STRUCTURE
6555.5 FT. LONG SUPPORTED ON A DRIVEN PILE BENT WAS
CHOOSEN. THE PILE BENTS CONSISTED OF EITHER 8 OR 12
PILES, WITH EACH PILE 48 IN. IN DIAMETER. EACH OF THE 276
PILES WOULD BE A PRESTRESSED, PRECAST CONCRETE CYL-
INDER PILES. SOIL BORINGS INDICATED THE LENGTH WOULD
VARY FROM 25 TO 176 FT. TO WITHSTAND HANDLING AND
DRIVING, THE WALL THICKNESS WOULD BE 5 IN. WITH SPIRAL
REINFORCEMENT OF .043 IN. BARS AND 8 NO. 4 BARS. EACH OF THE SIXTEEN 7/16-IN. DIAMETER PRESTRESS-
ING CABLES WAS TENSIONED TO STRESS THE 7000-PSI CON-
CRETE TO 1100 PSI. DRIVING SPECIFICATIONS REQUIRED THE
PILING TO BE SEATED WITH 50 BLOWS PER INCH BY A 60,000
FT-LB HAMMER IN NIORRA KAL HAMMER. THE CONTRACTOR
ELECTED TO CAST THE PILING AT THE SITE. THE FIRST
METHOD OF PILE PLACEMENT USED A THREE-FINGER JET TO
PLACE THE PILING NEAR CHALK AND A HAMMER TO DRIVE
THE PILE INTO CHALK. THIS METHOD PROVED INEFFECTIVE,
AND SUBSEQUENTLY A SINGLE JET WAS ATTACHED TO THE
PILE AND THE PILE JETTED AND DRIVEN SIMULTANEOUSLY
WITH THE FINAL SEATING FOR BEARINGS AFTER REMOVAL
OF THE JETS. AFTER EACH BENT WAS DRIVEN THE FILES
WERE BACK-FILLED WITH DRY-PACK CONCRETE, AND A STEEL
SOUND PILE. /AUTHOR/

Grimes, WW  Highway Research Record, Hwy Res Board 1969

3A 215214
FABRICATION AND ERECTION OF POPULAR STREET
ORTHOTROPIC-PLATE DECK GIRDER BRIDGE
THIS PAPER DESCRIBES DESIGN CONCEPTS CONCERNING
CONSTRUCTION, AND THE FABRICATION AND ERECTION
TECHNIQUES EMPLOYED ON THE FIRST MAJOR ORTHOTROP-
IC-PLATE DECK GIRDER BRIDGE UNDERTAKEN IN THE
UNITED STATES. THE BRIDGE WAS COMPLETED IN NOVEM
BER 1967. EXCEPT FOR A SMALL AMOUNT OF STRUCTURAL
SHAPES, THE BRIDGE IS COMPOSED OF PLASTS OF VARIOUS
TYPES OF STEEL. THE ARTICLE DESCRIBES THE JIGS AND
SPECIAL HANDLING EQUIPMENT USED TO FABRIVATE AND
ASSEMBLE LARGE ORTHOTROPIC-PLATE DECK SECTIONS
AND LARGE WELDED BOX GIRDER. IT ILLUSTRATES THE
SPECIAL MOUNTING OF WELDING EQUIPMENT USED TO
PERFORM THE MILES OF AUTOMATIC SUBMERGED-ARC
WELDING, AND IT DESCRIBES THE SHOP-ASSEMBLY PROCE-
DURES, ERECTION SEQUENCES, ERECTION EQUIPMENT AND
SUSPENDED TROLLEY PLATFORMS ARE DESCRIBED AND
ILLUSTRATED. IT WAS LEARNED THAT PRECISE AND ACCU-
CONSTRUCTION EQUIPMENT AND METHODS

RATE FABRICATION METHODS, COUPLED WITH GOOD SUPPORTING EQUIPMENT, PERMITTED EXTENSIVE USE OF AUTOMATIC WELDING EQUIPMENT FOR THE MILES OF WELDING REQUIRED ON THE BRIDGE. ANOTHER CONCLUSION WAS THAT LARGE UNITS OF DECK SECTIONS AND GIRDER SECTIONS COULD BE ECONOMICALLY FABRICATED AND ERECTED. //AUTHOR//


3A 215217
AGC SEASONALITY IN CONSTRUCTION CONFERENCE-1968

Associated General Contractors America //Nov. 1968//

3A 215226
AMPHIBIOUS MOTOR TAKES ON REPAIR, SALVAGING UNDERWATER
AN ELECTRIC-POWER UNDERWATER TOOL HAS BEEN DEVELOPED WHICH IS INTENDED TO SERVE AS A UNIVERSAL POWER SOURCE FOR THE SEAPLIER UNIT, AS THE TOOL IS CALLED, DEVELOPS 3/8 HP, WORKS IMMERSED, CONVERTS EASILY FOR USE AS A DRILL, SAW, TAP, NUT TIGHTENER, ETC. SEAPLIER WAS TESTED UNDER WATER FOR 70 DAYS IN OPERATION TEKTITE, AN UNDERSEA RESEARCH PROJECT CONDUCTED IN THE VIRGIN ISLANDS. TOOLS CAN BE ATTACHED TO THE ELECTRIC-POWER UNIT WITH A SIMPLE ADAPTOR, EITHER IN OR OUT OF THE WATER. THE LINEAR IMPACTOR CONVERTS ROTARY MOTION INTO LINEAR MOTION FOR SAWING, CHIPPING, FILLING, SCRAPING, AND OTHER LINEAR MOTIONS. THIS SEAPLIER UNIT PROMISES TO REVOLUTIONIZE METHODS FOR UNDERSEA SALVAGING, CONSTRUCTION, AND REPAIR.

Product Engineering //July 1969//

3A 215230
(A) TECHNICAL COMMITTEE ON LOW COST ROADS, (B) TECHNICAL COMMITTEE ON WINTER MAINTENANCE CONSIDERING THE GREATEST NEED FOR LOW COST ROADS EXIST IN DEVELOPING COUNTRIES, THE COMMITTEE SELECTED 3 OF THE MORE PERTINENT SUBJECTS FOR STUDY: (1) COMPARISON OF MATERIAL AND MECHANICAL METHODS FOR HIGHWAY CONSTRUCTION, WITH SPECIFICATIONS, CARRY OUT THE PAVING PROCESS, STAY ON SCHEDULE. THE IDEA IS TO ENCOURAGE A HASTY RETURN. (2) TIMING OR ORDER OF MAJOR AND SECONDARY ROAD CLEARANCE; (3) MATERIALS USED (SALTS VS. GRITTY MATERIALS); (4) EXPENDITURES; AND (5) MEASUREMENTS OF PAVEMENT SLIPPERINESS. MR. ONO OF JAPAN, MR. FARRAR OF GREAT BRITAIN, MR. BLEMENFELD OF ROMA, AND DR. FAGGIA OF ITALY EACH DESCRIBED WINTER MAINTENANCE PRACTICES AND SERVICES IN HIS COUNTRY. A SUMMARY OF THE CONTRIBUTIONS OF EACH SPEAKER WAS PRESENTED BY M. JOUVENT.

Perm Intl Assoc Road Congresses Proc //1967//

3A 215233
CERAMICS MINIMIZE WEAR
A METHOD IS REPORTED OF BONDING ALUMINUM OXIDE CERAMIC, ONE OF THE TOUGHEST WEAR RESISTANT MATERIALS KNOWN, TO AND INTO ORGANIC MATERIALS SUCH AS RUBBER, URETHANES, AND PLASTICS. THE RESULT IS A MATERIAL THAT COULD REDUCE MANY WEAR PROBLEMS IN CONSTRUCTION EQUIPMENT AND DRASTICALLY CUT MAINTENANCE COSTS.

Mann, WP //Construction Methods & Equipment// //Nov. 1969//

3A 215235
APPLICATION OF CONSTRUCTION MANAGEMENT TO THE PAVING PROCESS
THE APPLICATION OF CONSTRUCTION MANAGEMENT TO THE PAVING PROCESS BY THE CONTRACTOR CONSISTS OF THE FOLLOWING OPERATIONS: INTERPRETING THE SPECIFICATIONS, OBTAINING, ORGANIZING AND CONTROLLING MAN, EQUIPMENT, AND MATERIALS TO CONSTRUCT A PAVEMENT AT THE RIGHT COST. EVERY STEP OF THE PAVING PROCESS MUST BE PLANNED FROM THE MOMENT OF AWARD UNTIL ACCEPTANCE BY THE AWARDING AGENCY. A PAVING OPERATION SCHEDULE SHOULD BE DETAILED AND EXACT TO THE LAST MINUTE DETAIL. A SAFETY PROGRAM MUST BE DESIGNED TO PREVENT ACCIDENTS AND AVOID INJURIES. AND MUST BE CONSISTENTLY EMPLOYED AND ENFORCED IN EVERY PHASE OF THE PAVING PROCESS. SUPERVISION MUST BE PROVIDED THAT HAS EXPERIENCE, DRIVE, DETERMINATION, & THE ABILITY TO COMMUNICATE, TO INTERPRET SPECIFICATIONS, CARRY OUT THE PAVING PROCESS, STAY ON SCHEDULE, AND MAINTAIN A SAFE OPERATION.


3A 215237
SOMETHING NEW ON THE E4 HIGHWAY

World Construction //Nov. 1969//

413
CONSTRUCTION EQUIPMENT AND METHODS

3A 215239
HEAVY ROAD GRADING JOB PIONEERED FROM ONE END A 6-1/2-MILE HIGHWAY GRADING JOB THROUGH TIMBERED MOUNTAIN TERRAIN WAS STARTED BY PIONEERING EQUIPMENT TRAILS ALL THE WAY THROUGH FROM A SINGLE END. THE ACCESS ROADS FOR CONSTRUCTION OF THE SEGMENT OF THE HIGHWAY CUT ACROSS THE BACKBONE OF ENGLAND AT AN AVERAGE ELEVATION OF 1000 FEET ABOVE SEA LEVEL. THE ROUTE CHOSEN CLIMBS THROUGH A SERIES OF EMBANKMENTS AND CUTTINGS AND HAS BEEN DESIGNED TO BE PASSABLE IN MID-WINTER. FROM TRIALS IT WAS FOUND THAT WHERE THE HIGHWAY EMBANKMENT SIDE SLOPES WERE 1:5, MINIMUM SNOW WAS DEPOSITED ON THE HIGHWAY. MOST OF IT BEING BLOWN CLEAR. SIDE SLOPES OF THIS RATIO WERE ADOPTED TO A WIDTH OF 25 FT. ON BOTH SIDES OF THE HIGHWAY, AND FROM THIS POINT THE NORMAL EMBANKMENT SIDE SLOPES OF 1:2 WERE USED. THE MAIN CUTTINGS WERE WINDY HILL (120 FT DEEP X 2,500 FT LONG), DEANHEAD (180 FT DEEP X 2,600 FT LONG), CROFT HOUSE (90 FT DEEP X 1,700 FT LONG), AND WHOLESTONE (50 FT DEEP X 5,000 FT LONG). SOME OF THE MATERIAL EXCAVATED WILL BE USED IN THE CONSTRUCTION OF SCAMMONDEN DAM. ON COMPLETION, SCAMMONDEN DAM WILL BE 240 FT HIGH AND 1,220 FT WIDE AT THE BASE. THE ARTICLE DESCRIBES THE CONSTRUCTION EQUIPMENT BEING USED AND THE METHODS FOR DEALING WITH UNDERGROUND WATER.

Mead, HT World Construction Oct. 1969

3A 215242
CONQUERING CONNEAUT MARSH
THE PITTSBURGH-TO-ERIE SECTION OF INTERSTATE 79 HAD TO GO OVER CONNEAUT MARSH WHICH IS ABOUT A MILE WIDE IN SOME PLACES AND ABOUT 12 MILES LONG FROM EAST TO WEST. PIPE BENTS OR PIERS WERE DESIGNED TO SUPPORT THE TWO-LANE BRIDGES CROSSING THE MARSH. A CHANNEL WAS DREDGED ACROSS THE SWAMP TO ACCOMMODATE FLOATING EQUIPMENT. PILES WERE HELD IN POSITION FOR DRIVING BY TWO FLOATING TEMPLATES WHICH WERE THE ONLY PIECES OF EQUIPMENT THAT HAD TO BE BUILT ESPECIALLY FOR THE PROJECT. WHEN THE PILE DRIVING WAS COMPLETED AT A BENT, THE BEAM ATTACHED TO THE PREVIOUSLY DRIVEN BENT WAS REMOVED. ANGLES THAT HAD BEEN PLACED ACROSS THE SLOTS TO LOCATE INDIVIDUAL PILES WERE RELEASED, AND THE TEMPLATE WAS FLOATED AHEAD TO THE SITE FOR THE NEXT BENT. THE DRIVEN PILES WERE FILLED WITH READY MIXED CONCRETE AND BENT CAPS FILLED THE CONCRETE BRIDGE DECKS WERE CAST-IN-PLACE ON FIVE CONCRETE GIRDERS WHICH WERE PRESTRESSED OF HOLLOW BOX CONSTRUCTION COMPLETION OF THE BRIDGES IS SCHEDULED BY MID-1970.

Goff, JS Civil Engineering Asce May 1969

3A 215244
LARGE AGGREGATE SHOTCRETE CHALLENGES STEEL RIBS AS A TUNNEL SUPPORT
LARGE AGGREGATE SHOTCRETE IS THOUGHT TO BE AN ECONOMICAL, RAPID AND EFFECTIVE MEANS OF TUNNEL LINING. SPRAYED ON THE TUNNEL SURFACE CLOSE BEHIND THE EXCAVATION, IT PREVENTS AIR SLAKING OF ROCK. YIELDING ELASTICALLY AT A DECREASING RATE AS IT GAINS STRENGTH, IT PERMITS FORMATION OF A SELF-SUPPORTING ARCH ABOVE THE TUNNEL. A DEVELOPED GROUND ARCH CAN SUBSTANTIALLY REDUCE THE LOAD FOR WHICH A LINING NEED BE DESIGNED. SHOTCRETE EXHIBITS A HIGH ADHESION OR BOND TO THE ROCK. WITH SHOTCRETE A NUMBER OF FEATURES COMBINE TO GIVE THE BEST PRACTICAL GROUND SUPPORT CONDITIONS. EARLY SUPPORT BY THIN, STRONG FLEXIBLE LINER UNDER CONTINUOUS BLOCKING CONDITIONS, GENERATING AN EFFECTIVE GROUND ARCH AROUND THE OPENING AND AUGMENTING THE SELF-SUPPORTING PROPERTIES OF THE NATIVE GROUND MATERIAL. CONSTRUCTION PROCESSES IN USE ARE THE WET PROCESS AND THE DRY PROCESS. THE TERM WET PROCESS IS USED WHEN ALL MATERIALS ARE MIXED WITH THE REQUIRED WATER OF HYDRATION BEFORE AIR OR PUMP TRANSPORTATION TO THE POINT OF APPLICATION. THIS MIX IS BLOWN INTO PLACE BY AIR PRESSURE AT THE NOZZLE. THE DRY PROCESS CONSISTS OF MIXING ALL MATERIALS, INCLUDING ACCELERATORS, IN A DAMP STATE BEFORE AIR TRANSPORTATION TO THE POINT OF APPLICATION. THE ADDITIONAL WATER IS ADDED AT THE GUN. THE SUCCESSFUL APPLICATION OF SHOTCRETE DEPENDS ON RIGID OBSERVANCE OF THE FOLLOWING RULES: (1) THE DISTANCE BETWEEN THE NOZZLE AND THE POINT OF APPLICATION IS CRITICAL, GENERALLY A DISTANCE OF 3 TO 4 FT, (2) WATER SEEPAGE AREAS AND CONSIDERABLE FLOWS OF WATER CAN BE HANDLED SUCCESSFULLY BY THE PLACING OF A DRAIN PIPE AND PLACEMENT OF SHOTCRETE AROUND IT, (3) SHOTCRETE IMPACTS AT BETWEEN 300 AND 500 FPS WHICH VELOCITIES TEND TO PRODUCE A DENSE, HIGH QUALITY SHOTCRETE, (4) IN ORDER TO KEEP REBOUND IT IS NECESSARY TO KEEP THE ANGLE OF IMPACT NORMAL TO THE SURFACE, AND (5) NORMAL CONTROL PRACTICE IS TO SPECIFY FABRICATION OF TEST PANELS USING SEVERAL MIXES. GOOD DESIGN USES THE ADVANTAGES OF A NEW MATERIAL COMpletely. WITH SHOTCRETE THIS MEANS A TUNNEL SECTION WHICH PRODUCES A MINIMUM OF BENDING MOMENT IN THE SUPPORT. THE SPEED OF APPLICATION OF SHOTCRETE MAY WELL BE THE GREATEST ADVANTAGE.

Sutcliffe, H Moclure, CR Civil Engineering Asce Nov. 1969

3A 215253
UNDERWATER JOINING AND CUTTING
IN MOST CASE, LAND TECHNIQUES HAVE BEEN AND ARE BEING APPLIED TO PIPELINE AND OTHER UNDERWATER WORK EVEN THOUGH ENVIRONMENTAL CONDITIONS ARE SIGNIFICANTLY DIFFERENT, AND RESULTS HAVE NOT BEEN COMPLETELY SATISFACTORY BECAUSE OF RELATIVELY SLOW SPEED, HIGH COSTS, AND OTHER FACTORS. THIS ARTICLE DESCRIBES THE CURRENTLY USED METHODS FOR BOTH WET AND DRY WELDING UNDERWATER, AND DISCUSSES THE PROBLEMS INVOLVED IN OBTAINING HIGHQUALITY JOINTS. MOST WELDING IN UNDERWATER SALVAGE AND EMERGENCY REPAIR IS DONE WET WITH THE CONVENTIONAL
CONSTRUCTION EQUIPMENT AND METHODS

MANUAL SHIELDED METAL-ARC PROCESS, COMMONLY KNOWN AS STICK ELECTRODE WELDING, UNDERWATER DRY WELDING CAN BE DONE WITH EITHER OF TWO CONVENTIONAL LAND TECHNIQUES: THE GAS-METAL-ARC (GMA) AND GAS-TUNGSTEN-ARC (GTA) PROCESSES. SEVERAL OTHER PROCESSES COULD BE OR ARE BEING USED FOR MAKING JOINTS UNDERWATER: PLASMA-ARC WELDING, BRAZING, ADHESIVE BONDING, EXPLOSIVE WELDING, AND MECHANICAL JOINING. TWO BURNING PROCESSES—FLAME AND ARC CUTTING—are applied commercially to cut metals underwater.

Mehler, HW Randall, MD Battelle Research Outlook 1969

3A 215257
CONSTRUCTION OF A FILL BY A MUD DISPLACEMENT METHOD
A HIGHWAY FILL WAS CONSTRUCTED ACROSS AN OPEN WATER COVE ON THE WEST SIDE OF SAN FRANCISCO BAY BY DISPLACING THE UNDERLYING SOFT MUD TO DEPTHS OF AS MUCH AS 60 FT. BY THE WEIGHT OF THE PLACED FILL. VARIOUS CONSTRUCTION METHODS WERE ATTEMPTED AND A METHOD OF OBTAINING REASONABLY UNIFORM MUD DISPLACEMENT DEVELOPED. THE FILL FAILURES WERE ANALYZED AND THE FACTORS AFFECTING THESE FAILURES EVALUATED. THE MEASURED SETTLEMENTS AND PORE PRESSURES ARE PRESENTED AND EVALUATED. THE PERFORMANCE OF THE HIGHWAY AFTER THREE YEARS OF USE IS GIVEN. /AUTHOR/


3A 215261
THE INFLUENCE OF INVESTMENT CREDIT ON THE ECONOMIC LIFE OF CONSTRUCTION EQUIPMENT
A STUDY WAS CONDUCTED TO DETERMINE THE INFLUENCE OF THE INVESTMENT TAX CREDIT ON THE ECONOMIC LIFE OF CONSTRUCTION EQUIPMENT. ANALYSIS OF EQUIPMENT LIFE FALLS INTO THREE CATEGORIES: (1) ECONOMIC LIFE TOO SHORT TO BE INFLUENCED BY INVESTMENT CREDIT, (2) ECONOMIC LIFE OF FOUR TO EIGHT YEARS, WHERE THE INVESTMENT CREDIT INFLUENCES THE OPTIMUM LIFE OF THE EQUIPMENT, AND (3) THE EQUIPMENT LIFE IS SO LONG THAT INVESTMENT CREDIT HAS NO APPRECIABLE EFFECT ON THE OPTIMUM LIFE. BUT MAY AFFECT THE PROFITS SOME ANALYTICAL EXPRESSIONS WERE DEVELOPED BY WHICH TO COMPUTE INVESTMENT CREDIT AND INCLUDE THEM IN THE MATHEMATICAL MODEL THAT DETERMINES THE ECONOMIC LIFE OF THE EQUIPMENT. THE EQUATIONS DEVELOPED IN THIS REPORT, THE ANALYST STIPULATED THAT A PIECE OF EQUIPMENT SHOULD NOT BE DEPRECIATED BELOW A REASONABLE SALVAGE VALUE. EQUATIONS HAVE BEEN DEVELOPED TO SUBSTITUTE STRAIGHT LINE DEPRECIATION FOR LIVES OF LESS THAN THREE YEARS, AND THE STIPULATION THAT A PIECE OF EQUIPMENT SHOULD NOT BE DEPRECIATED BELOW A REASONABLE ALLOWANCE. THE CONCLUSION OF THE REPORT IS THAT INCOME TAX PROBLEMS CAN BE TREATED IN THE COMPUTATION OF ECONOMIC LIFE BY DIGITAL COMPUTER. BY MODIFYING THE ALGORITHM IN TECHNICAL REPORT NO. 61 WITH THE EQUATIONS DEVELOPED IN THIS REPORT, THE ANALYST IS PROVIDED WITH AN ADDED TOOL FOR DETERMINING THE ECONOMIC LIFE OF VARIOUS TYPES OF CONSTRUCTION EQUIPMENT. /AUTHOR/

Douglas, J Stanford University

3A 215266
OBSOLESCENCE AS A FACTOR IN THE DEPRECIATION OF CONSTRUCTION EQUIPMENT
THE EFFECTS OF EQUIPMENT OBSOLESCENCE WERE STUDIED ON OWNERSHIP POLICY, PARTICULARLY AS IT AFFECTS THE CONSTRUCTION INDUSTRY. AN INDUSTRY SURVEY WAS CONDUCTED WHICH CONSISTED OF A QUESTIONNAIRE AND PERSONAL INTERVIEWS. A THEORETICAL ANALYSIS WAS CONDUCTED TO SIFT OUT THE VARIOUS ECONOMIC EFFECTS OF TECHNOLOGICAL IMPROVEMENT. THESE WERE TRANSLATED INTO A MATHEMATICAL THEORY TO EXPRESS THE INTER-RELATION OF OBSOLESCENCE, INFLATION, AND OTHER ECONOMIC FACTORS AND TO APPRAISE THEIR INFLUENCE ON THE ECONOMIC LIFE OF CONSTRUCTION EQUIPMENT. A MATHEMATICAL MODEL WAS USED WITH A DIGITAL COMPUTER ANALYSIS TO DEMONSTRATE THE THEORETICAL APPROACH TO OBSOLESCENCE. THE COSTS OF OWNING AND OPERATING A CRAWLER TRACTOR IN THE 200 HORSEPOWER CLASS WERE FED INTO THE COMPUTER PROGRAM. RESULTS SHOWED THAT THE ECONOMIC LIFE OF THE CRAWLER TRACTOR WAS SHORTENED BY THE PRESSURE OF TECHNOLOGICAL IMPROVEMENTS IN REPLACEMENT MACHINES.

Douglass, J Stanford University Feb. 1968

3A 215265
CONSTRUCTION-EQUIPMENT POLICY: INFLUENCE OF INCOME TAX LAW ON ECONOMIC LIFE
STUDY WAS TO CONDUCT TO EXAMINE THE INFLUENCE OF THE TAX LAWS ON THE MATHEMATICAL MODEL PREVIOUSLY DEVELOPED BY THE AUTHOR IN HIS TECHNICAL REPORT NO. 61. THE TWO PRINCIPAL INFLUENCES OF THE TAX LAWS ON THE ECONOMIC LIFE OF CONSTRUCTION EQUIPMENT ARE (1) THE PROHIBITION AGAINST USING DOUBLE DECLINING BALANCE DEPRECIATION FOR AN EQUIPMENT LIFE OF LESS THAN THREE YEARS, AND (2) THE STIPULATION THAT A PIECE OF EQUIPMENT SHOULD NOT BE DEPRECIATED BELOW A REASONABLE SALVAGE VALUE. EQUATIONS HAVE BEEN DEVELOPED TO SUBSTITUTE STRAIGHT LINE DEPRECIATION FOR LIVES OF LESS THAN THREE YEARS, AND TO RECAPTURE INCOME WHEN THE ASSET HAS BEEN DEPRECIATED MORE THAN A REASONABLE ALLOWANCE. THE CONCLUSION OF THE REPORT IS THAT INCOME TAX PROBLEMS CAN BE TREATED IN THE COMPUTATION OF ECONOMIC LIFE BY DIGITAL COMPUTER. BY MODIFYING THE ALGORITHM IN TECHNICAL REPORT NO. 61 WITH THE EQUATIONS DEVELOPED IN THIS REPORT, THE ANALYST IS PROVIDED WITH AN ADDED TOOL FOR DETERMINING THE ECONOMIC LIFE OF VARIOUS TYPES OF CONSTRUCTION EQUIPMENT. /AUTHOR/

Deswolinski, LW Stanford University May 1969

3A 215262
OCCUPATIONAL HEALTH IN THE CONSTRUCTION INDUSTRY

Herrero-a, C Stanford University Nov. 1967

3A 215262
OCCUPATIONAL HEALTH IN THE CONSTRUCTION INDUSTRY

Herrero-a, C Stanford University Nov. 1967

3A 215262
OCCUPATIONAL HEALTH IN THE CONSTRUCTION INDUSTRY
3A 215267
AN ANALYSIS OF TWO-LINK MATERIAL HANDLING SYSTEMS WITH ONE CARRIER IN ONE OF THE LINKS

Teicholz, P
Stanford University Aug. 1963

3A 215269
HUMAN FACTORS AS THEY AFFECT METHODS IMPROVEMENT IN CONSTRUCTION
SOME OF THE HUMAN PROBLEMS THAT THE CONTRACTOR AND HIS MANAGEMENT MUST SOLVE IN THE FIELD ARE DISCUSSED. INFORMATION IS PRESENTED ON TWO TOPICS THAT ARE PERTINENT TO THE HUMAN PROBLEMS BEING FACED: (1) THE EXPERIENCE OF MANUFACTURING INDUSTRY WHEN SCIENTIFIC MANAGEMENT WAS INTRODUCED, AND (2) THE KNOWLEDGE OF HUMAN BEHAVIOR THAT HAS BEEN DISCOVERED BY SYSTEMATIC SCIENTIFIC STUDY. THESE TWO TOPICS ARE RELATED TO THE SPECIFIC PROBLEMS OF CONSTRUCTION. THE DEGREE TO WHICH AN OPERATIONAL ACTION CAN BE IMPROVED BY SYSTEMATIC METHODS IMPROVEMENT WILL DEPEND ON: (1) THE METHOD IMPROVEMENT TECHNIQUE USED, (2) THE TIME AND EFFORT DEVOTED TO IT, AND (3) THE SKILL, CREATIVITY AND EXPERIENCE OF THE PEOPLE DEVELOPING THE NEW METHODS. THE PROBLEMS OF IMPLEMENTATION AND THE ACCEPTANCE OF NEW METHODS WERE INVESTIGATED. THE FINDINGS OF THE BEHAVIORAL SCIENCES OF CHANGING A MAN'S ESTABLISHED WORK HABITS ARE REPORTED. THESE FINDINGS, BY SHOWING HOW A WORKMAN USES SATISFACTION FROM HIS JOB, ILLUSTRATE HOW CHANGES WHICH INCREASE A WORKMAN'S JOB SATISFACTION CAN BE ACCEPTABLE TO HIM. IT IS CLAIMED THAT AN EVER-EXPANDING KNOWLEDGE OF HUMAN BEHAVIOR IS A VALUABLE ASSET FOR ANY CONSTRUCTION SUPERVISOR, AND THAT THE BEHAVIORAL SCIENCES NOW PROVIDE AN ALTERNATIVE TO SITE EXPERIENCE AS A SOURCE OF LEARNING ABOUT HUMAN BEHAVIOR.

Jones, WL
Stanford University Sept. 1964

3A 215271
CONSTRUCTION-EQUIPMENT POLICY: THE ECONOMIC LIFE OF EQUIPMENT
THE PURPOSE WAS TO DEVELOP AND APPLY A MATHEMATICAL MODEL FOR THE ANALYSIS OF THE ECONOMIC LIFE OF CONSTRUCTION EQUIPMENT. THE MATHEMATICAL MODEL USED IN THE AUTHOR'S PREVIOUS STUDIES OF OBsolescence WAS REOrientED AND AUGMENTED IN ORDER TO STUDY ECONOMIC LIFE. NEW VARIABLES WERE INTRODUCED TO ACCOUNT FOR MONOTONICALLY DECREASING DISCRETE COSTS OF MAINTENANCE AND OPERATION--IT WAS BELIEVED THAT THESE COSTS MIGHT HAVE A SIGNIFICANT EFFECT IN TRIGGERING MAJOR OVERHAULS AND THE REPLACEMENT OF EQUIPMENT. IN ADDITION TO THE NEW EQUATIONS, EQUATIONS ALREADY DEVELOPED WERE REWRITTEN WITH NEW VARIABLE NAMES TO SIMPLIFY THE NUMBERING SYSTEM AND TO MAKE THE VARIABLES MORE COMPATIBLE WITH THE COMPUTER PROGRAM VARIABLES. AFTER DEVELOPMENT OF THE MODEL, PROGRAMS WERE WRITTEN IN FORTRAN IV TO SOLVE THE ALGORITHMS AND TO PLOT THE RESULTS ON THE CALCOP COMPUTER. IT WAS BELIEVED THAT THESE GRAPHIC RESULTS WOULD BE MORE IMPRESSIVE AND EASIER TO ANALYZE. LIAISON WAS ESTABLISHED WITH A LARGE READY-MIX OPERATOR IN THE SAN FRANCISCO BAY AREA. WITH HIS COOPERATION, COSTS WERE DEVELOPED AND STUDIED THAT COULD BE USED IN COMPUTER ANALYSIS TO DETERMINE THE ECONOMIC LIFE OF THE TRANSMIXERS IN HIS OPERATION. THE FOLLOWING CONCLUSIONS WERE DRAWN ON THE FEASIBILITY OF UTILIZING THE COMPUTER-RUN MODEL TO AID THE OPERATOR IN MAKING POLICY DECISIONS ABOUT THE ECONOMIC LIFE OF HIS EQUIPMENT: (1) COMPUTER ANALYSIS OF EQUIPMENT ECONOMIC PROBLEMS IS FEASIBLE AND RELATIVELY INEXPENSIVE, (2) THE MATHEMATICAL MODEL IS FLEXIBLE AND ADAPTABLE TO REAL-LIFE SITUATIONS, (3) THE ECONOMIC LIFE OF TRANSMIXERS IN THE USE OF THE COMPANY STUDIED IS SOMEWHERE BETWEEN THREE AND FIVE YEARS. (4) FURTHER RESEARCH IS NEEDED TO DEVELOP THE PARAMETERS FOR APPLICATION OF THE MATHEMATICAL MODEL FOR ESTABLISHMENT OF EQUIPMENT POLICY. (5) GOOD COST KEEPING IS NECESSARY FOR A THOROUGH AND ACCURATE ANALYSIS OF EQUIPMENT. GOOD COST KEEPING APPEARS TO BE THE EXCEPTION, RATHER THAN THE RULE.

Author

3A 215273
FORMWORK FOR CONCRETE SHELL STRUCTURES
ALTHOUGH THIN CONCRETE SHELL CONSTRUCTION IS GAINING SOMEWHAT WIDER ACCEPTANCE IN THIS COUNTRY, IT IS STILL NOT BEING USED IN ALL SITUATIONS WHERE IT WOULD BE THE BEST ARCHITECTURAL AND STRUCTURAL SOLUTION. REASONS COMBINED WITH ITS LIMITED ACCEPTANCE OF THIS STRUCTURAL FORM INCLUDE: (1) THE RELUCTANCE OF THE BUILDING INDUSTRY TO CHANGE FROM CONVENTIONAL PRACTICES; (2) THE BUILDING INDUSTRY'S LACK OF FAMILIARITY WITH THE INHERENT ADVANTAGES; AND (3) THE HIGH COST AND COMPLEXITY OF FORMWORK. THIS REPORT IS PRIMARILY AN INVESTIGATION OF THE LAST TWO PROBLEMS. CHAPTER ONE IS CONCERNED WITH THE STRUCTURAL, ARCHITECTURAL, AND ECONOMIC ADVANTAGES (AND DISADVANTAGES) COMMON TO ALL TYPES OF THIN CONCRETE SHELLS. CHAPTER TWO IS A BRIEF OUTLINE OF THE CONSTRUCTION PROCESSES EMPLOYED IN CAST-IN-PLACE AND PRECAST THIN CONCRETE SHELL CONSTRUCTION. CHAPTER THREE IS AN EXAMINATION OF ELEMENTS IN THE STRUCTURAL DESIGN OF CENTERING. CHAPTER FOUR IS A DISCUSSION OF VARIOUS TYPES OF SHELLS USED IN ARCHITECTURAL PRACTICE AND OF SPECIFIC FORMWORK SOLUTIONS USED IN THEIR CONSTRUCTION. THE INTENTION OF THIS REPORT IS TO PRESENT AN IMPARTIAL EXPOSITION OF THE ADVANTAGES AND DISADVANTAGES OF THIN CONCRETE SHELLS AND TO ASSIST IN OVERCOMING THE RELUCTANCE OF THE BUILDING INDUSTRY TO CHANGE. A FURTHER PURPOSE IS TO DIRECT ATTENTION TO THE PROBLEMS OF FORMING SUCH STRUCTURES BY PROVIDING GENERAL INFORMATION IN THE PAPER AND BY LISTING A LARGE NUMBER OF BIBLIOGRAPHICAL REFERENCES. BECAUSE THE SUBJECT DISCUSSED HERE IS SO BROAD, THE COVERAGE OF A PARTICULAR TOPIC IS NECESSARILY SOMEWHAT BRIEF. FOR THIS REASON, THE BIBLIOGRAPHY IS SO ORGANIZED THAT THE INTERESTED READER CAN EASILY INVESTIGATE THE DE-
CONSTRUCTION EQUIPMENT AND METHODS

TAILED REFERENCES. WITH THE ADDITION OF THE THIN CONCRETE SHELL TO THE ARCHITECT'S VOCABULARY, A STRUCTURAL ELEMENT APPEARS WHICH IS AT ONCE FUNCTIONAL AND EXPRESSIVE, ECONOMIC, AND BEAUTIFUL. HOWEVER, DESPITE ITS GREAT POSSIBILITIES, THE THIN CONCRETE SHELL IS NOT A UNIVERSAL SOLUTION TO ALL ARCHITECTURAL PROBLEMS. ITS APPLICATION SHOULD BE JUSTIFIED, IN EACH SPECIFIC INSTANCE, ON THE BASIS OF THE RELATIVE STRUCTURAL, ARCHITECTURAL, AND ECONOMIC FACTORS INVOLVED. /AUTHOR/

Merchant, DH Stanford University May 1963

3A 215283

URBAN PAVING IN STATE ROADS COMMISSION, DISTRICT 3 (MONTGOMERY AND PRINCE GEORGE'S COUNTIES) EXAMPLES ARE GIVEN OF HIGH TYPE URBAN HIGHWAYS CONSTRUCTED OF FLEXIBLE PAVEMENTS IN THE PAST FEW YEARS. ACTIVITIES DISCUSSED ARE: (1) UTILITY PREPARATION AND REQUIREMENTS, (2) MAINTENANCE AND CONTROL OF TRAFFIC DURING CONSTRUCTION, (3) VARIOUS PAVEMENT DESIGNS AND THEIR PLACE IN URBAN PAVING, (4) CONSTRUCTION TECHNIQUES AND REQUIREMENTS FOR SUCCESSFUL PAVING EFFORT, AND (5) ACTIVITIES SUBSEQUENT TO PLACING THE URBAN PAVING AND TRAFFIC ON THE FINISHED ROADWAY. THOSE PAVEMENTS DESIGNED AND CONSTRUCTED USING MAINLY BITUMINOUS CONCRETE HAVE PROVIDED THE QUICKEST, MOST STRUCTURALLY CAPABLE, EFFICIENT, ECONOMICAL, AND SATISFYING CONSTRUCTION EFFORTS. ADVANTAGES OF USING THESE PAVEMENTS ARE: (1) LESS EXCAVATION, (2) LESS CONSTRUCTION TIME, (3) SAME EQUIPMENT AND MEN CAN BE USED ON THE BULK OF THE WORK, (4) INSPECTION FORCES HAVE LESS DIFFERENT TYPE OF MATERIALS TO INSPECT, (5) MAINTENANCE OF TRAFFIC IS SIMPLIFIED AND LESS COSTLY, (6) ONCE BITUMINOUS CONCRETE BASE COURSE IS PLACED THERE ARE NO DELAYS AFTER INCLEMENT WEATHER, (7) NO WAITING FOR A SECOND, THIRD, OR FOURTH TYPE OF MATERIAL, AND (8) NO EXTENDED CURING PERIOD. IT IS SHOWN THAT THE USE OF OLD PAVEMENT AS A PART OF THE PAVEMENT SECTION WAS BENEFICIAL IN THE URBAN PROJECTS, TWO RECOMMENDATIONS ARE MADE TO EXPEDITE COMPLETION OF TRAFFIC LANES, SHYING AWAY FROM THE PAVEMENT LANE PROJECTS: (1) SIMPLIFY PAVEMENT DESIGNS BY ELIMINATING THE MULTITUDE OF THE VARIOUS GRADED AGGREGATE COURSE, AND (2) ELIMINATE THE CALENDAR DATES FOR BITUMINOUS CONCRETE PAVING, EXCEPT FOR SURFACE COURSES.

Caltrider, MS Maryland Asphalt Paver Apt. 1970

3A 215287

ROTATING LASER GUIDES TRENCHERS

Dickey, GL Western Construction May 1970

3A 215293

CONSTRUCTION EXPEDITING

EXPEDITING CONSTRUCTION PROJECTS IS MORE THAN PREPARING BAR CHARTS OR NETWORKS. IT REQUIRES PERSONNEL THAT POSSESS CERTAIN INTELLIGENCE, SPECIAL EXPERIENCE, AND UNIQUE PERSONALITY TRAITS. IN ADDITION, WHO DOES THE PLANNING? WHAT ARE THE PROBLEMS? THESE ARE EXAMINED. THE EXPediting PROCEDURE IS PERHAPS THE MOST IMPORTANT SINGLE PHASE OF THE CONSTRUCTION PROGRAM. CONSTRUCTION PERSONNEL WERE SURVEYED FOR THEIR VIEWS OF EXISTING PRACTICES. THE RESULTS SUGGESTED TWO AREAS OF FURTHER STUDY IN ADDITION TO POINTING OUT SOME EXISTING PROBLEMS. /AUTHOR/

Monsey, A Am Soc Civil Engr J Construction Div June 1970

3A 215299

CONSTRUCTION PLANNING, EQUIPMENT, AND METHODS

MANY OF THE ASPECTS OF CONSTRUCTION MANAGEMENT AND PLANNING ARE COVERED AS WELL AS MOST OF THE MAJOR TYPES OF CONSTRUCTION ACTIVITY USUALLY CLASSIFIED IN THE ENGINEERING FIELD. THIS EDITION INCLUDES NEW CHAPTERS ON OPERATIONAL ANALYSIS, SOIL STABILIZATION, AND COMPACTING. THE IMPORTANCE OF VALUE ENGINEERING, CRITICAL PATH METHOD, AND THE TIME VALUE OF MONEY IS COVERED IN DETAIL. NEW METHODS AND MATERIALS USED IN BLOWING ROCK AND DRIVING PILES ARE DEALT WITH. THERE IS A TREATMENT OF THE DESIGN, SELECTION OF EQUIPMENT, AND APPENDIX DIX GIVES FIGURES ON THE COST OF OWNING AND OPERATING MANY TYPES OF CONSTRUCTION EQUIPMENT. /AUTHOR/


3A 215301

COLORADO STRAIGHT CREEK TUNNEL-1-70

THE COLORADO DIVISION OF HIGHWAYS IS BUILDING A 1.7 MILE VEHICULAR TUNNEL UNDER THE CONTINENTAL DIVIDE AT AN ELEVATION OF SLIGHTLY OVER 11,000 FEET. IT IS THE WORLD'S HIGHEST VEHICULAR TUNNEL, THE LONGEST VEHICULAR ROCK BORE IN NORTH AMERICA, AND THE WORLD'S HIGHEST MECHANICALLY VENTILATED TUNNEL. THE PROJECT INCLUDES DRIVING THE FIRST OF WHAT WILL EVENTUALLY BE TWO BORES, CONSTRUCTING COMPACTING VENTILATION AND PORTAL STRUCTURES FOR BOTH TUNNELS, SUB SECTIONS OF WHAT WILL BE THE SECOND TUNNEL, THREE CROSS PASSAGEWAYS BETWEEN THE VEHICULAR AND PIONEER TUNNEL AND OTHER ITEMS NECESSARY TO PRODUCE AN OPERATIONAL TUNNEL BY 1971. THE WEST BOUND TUNNEL WILL BE USED FOR TWO-WAY TRAFFIC UNTIL THE PIONEER APPEARS, THEN IT WILL BE CLOSED TO TRAFFIC. THE EASTBOUND TUNNEL WILL BE USED FOR TWO-WAY TRAFFIC. THE PIONEER TUNNEL IS TO BE OPENED IN TWO PHASES. THE EASTBOUND TUNNEL WILL BE USED FOR TWO-WAY TRAFFIC UNTIL THE PILOT BORE IS ENLARGED LATER TO BECOME A FULL FACE. THE PILOT TUNNEL HAS OFFERED A BONUS FULLY IN THE DESIGN TO THE PROJECT'S OPERATING GEOLoGY: DRAINAGE, COMPUTATION AND TESTS WERE MADE OF CARBON MONOXIDE POUNDS Emitted PER MINUTE BY AN IDLING MOTOR AND CARBON MONOXIDE POUNDS PER MILE BY THE POWER PLANTS OF MOVING VEHICLES. THE APPROXIMATE AVERAGE CARBON MONOXIDE EMISSION WAS COMPUTED. VENTILATION SYSTEMS WERE DESIGNED AND CONSTRUCTED TO REMOVE ALL THE EXHAUST DUCT THROUGH CEILING OPENINGS. TRAFFIC CONTROL DEVICES WILL OPERATE TELEVISION SURVEY LANCE WHEREBY THE TRAFFIC MOVEMENT CAN BE MONITORED AT ALL TIMES. A WALKWAY CAR FOR RAPID TRANSIT OF PERSONNEL TO THE SCENE OF AN ACCIDENT OR STOPPAGE, ONE OF THE PARTS OF THE LIMITING COMPACTING AND CONSTRUCTION METHODS ARE BEING USED TO ACCOMPLISH THE TOP HEADING AND BENCH PORTIONS OF THE EXCAVATION THROUGH APPROXIMATELY 7,100 FEET OF COMPETENT ROCK. LESS TRADITIONAL METHODS ARE USED IN THE 1,083 FEET OF EXTREMELY BAD GROUND IN THE CENTER OF THE MOUNTAIN. THEY ENTAIL THE USE OF A HUGE SHIELD THAT ALLOWS THE DRIVING TO CONTINUE FULL FACE.

Shumate, CE American Highways Oct. 1969

447
TOGETHER AT REGULAR INTERVALS TO FORM FILTER

448

THE "TECHNICAL CONTROL" BY

POINTS PORVIDINGS RELIEF FROM HYDROSTATIC UPLIFT. A

STANTIAL INCREASE IN STRENGTH AND VERY RAPID STIFF-

TER-PERMEABLE SYNTHETIC FABRIC AS A CONCRETE FORM-

ATION OR RAMMING TO FORCE THE INDIVIDUAL PIECES OF

INTERNAL FIBER REINFORCING. /ASCE/

Lamberton, BA Am Soc Civil Engr J Construction Div July 1969

3A 215305 CONSTRUCTION EQUIPMENT AND METHODS

THOMPSON-ARTHUR EXPERIMENTS WITH LINKED PAVERS

AN EXPERIMENT WITH TWO PAVERS LINKED TOGETHER AS

ONE MACHINE WITH ONE OPERATOR IS PROVING SUCCESS-

FUL ON VIRGINIA'S INTERSTATE HIGHWAY 85 CONSTRU-

CTION. LINKED PAVERS ARE PERFORMING WELL AND CUT-

TING COSTS ON THE JOB. AN ATTACHED Z BAR HELDS

THE PAVERS IN ACCURATE ALIGNMENT AND IS ADJUSTABLE

FOR EITHER 4-FOOT OR 6-FOOT SPACING. THE LINKED PAV-

ERS SAVE PERSONNEL BY USING ONLY ONE OPERATOR AND

TWO LESS RAKERS, AND IT ELIMINATES THE CENTER JOINT.

THE SUBGRADE IS PREPARED MICACIOUS CLAY, WITH A

SUBGRADE COURSE OF SIX INCHES OF CRUSHED STONE. FULL

DEPTH ASPHALT BASE OF SEVEN AND A HALF INCHES WITH

A ONE AND A HALF-INCH SURFACE COURSE WILL SUPPORT

THIS ROADWAY.

Paving Forum /Napa/ July 1970

3A 215312 INSTRUCTIONS FOR THE EXECUTION OF CONCRETE PAVEMENTS BY MECHANICAL METHODS

THE CONTRACT INSTRUCTIONS ARE EXAMINED BY STUDYING

THE "TECHNICAL CONTROL," BY MEANS OF STATISTICAL

ANALYSIS AND THE "RECEIVING CONDITIONS" WITH APPLI-

CATION OF REDUCTION OF THE PRICES IN THE STRETCHES

WHERE THE CONTRACTS CONDITIONS WERE NOT MET. THE

WORK INCLUDES THE USUAL ITEMS OF INSTRUCTIONS FOR

PAVING. /RRI/

Crawdell, JS Highway Research Board Proceedings 1937

3A 215317 TIMBER-ARCH FALSEWORK FOR CONCRETE ARCH BRIDGES

SIX RECENTLY BUILT 201-FT. TO 546-FT. SPAN AUSTRIAN

HIGHWAY BRIDGES ARE MULTI-BOX CONCRETE ARCH

STRUCTURES. THE FALSEWORK FOR ALL THESE BRIDGES

CONSISTED OF PARTIALLY PREASSEMBLED TWO-TIER AND

THREE-TIER TIMBER ARCHED BRIDGE. THEY WERE BUILT

SUFFICIENTLY STRONG TO CARRY THE WEIGHT OF THE

ARCHED BOTTOM PANEL OF THE MULTI-BOX CONCRETE

ARCH. AFTER THIS CONCRETE PANEL HAD CURVED, IT CARR

IED THE WEIGHT OF THE WOBS AND TOP PLATE OF THE

BOXED CONCRETE ARCH. WITHIN EACH TRUSSED TIMBER

ARCH, NO CARPENTER JOINTS, MECHANICAL FASTENERS OR

ADHESIVES WERE USED. PROCEDURE BETWEEN ASSEMBLIES OF

8-3/16 IN. TIMBER PLANKS RESISTED THE INTERNAL

FORCES. THUS THE FALSEWORK COULD BE DISMANTLED

INTACT FOR REUSE. /AUTHOR/

3A 215330 TIMBER-ARCH FALSEWORK FOR CONCRETE Arch BRIDGES

DATA PRESENTED WERE DERIVED FROM THE RESULTS OF THE

QUESTIONNAIRE TO THE OECD COUNTRIES. ATTENTION

IS FOCUSED ON THE INADEQUACIES OF ROCK TUNNELING AND

IMPROVEMENTS NEEDED ARE OF THE UNANIMOUS OPINION THAT IMPROVEMENTS ARE

NEEDED IN EVERY PHASE OF THE TUNNEL CONSTRUCTION

PROCESS. IT IS FELT THAT RESEARCH AND DEVELOPMENT

EFFORTS SHOULD BE DIRECTED TOWARD FINDING WAYS TO

INCREASE THE RATE OF TUNNEL CONSTRUCTION WHILE AT

ALL TIMES, BEING AWARE OF THE NEED TO REDUCE COSTS,

MAINTAIN SAFE AND HEALTHY WORKING CONDITIONS,

AND PRESERVE THE QUALITY OF THE ENVIRONMENT. IT IS

FELT THAT THE BASIC CONSTRAINT TO THE ADVANCEMENT

OF ROCK TUNNELLING TECHNOLOGY IS DIRECTLY RELATED TO

THE STATUS OF ROCK DISINTEGRATION METHODS. MORE

SOPHISTICATED ROCK DISINTEGRATION TECHNIQUES ARE

NEEDED WHICH ELIMINATE OR MINIMIZE THE EFFECT OF

TIME-WASTING CYCLIC PATTERNS AND ARE READILY

ADAPTABLE TO AUTOMATION. EXCAVATION AND CON-

STRUCTION METHODS ARE HIGHLY DEPENDENT UPON GEO-

LOGICAL AND HYDROLOGICAL CONDITIONS. AN EFFORT

 SHOULD BE MADE TO: (1) DEVELOP METHODS TO ACCU-

RATELY PREDICT ROCK CONDITIONS AND PROPERTIES AND

TO EVALUATE THEIR ENGINEERING SIGNIFICANCE, (2) STAND-

ARDS AND WAYS TO PERFORM THE TESTS SO THAT THE

RESULTS WILL BE UNDERSTANDABLE AND USEFUL, AND (3)

ENCOURAGE GREATER USE OF PRE-CONSTRUCTION EXPLO-

RATION TECHNIQUES BY REDUCING THEIR COST AND

EMPHASIZING POTENTIAL SAVINGS IN CONSTRUCTION COSTS.

THE POTENTIAL FOR GREATLY REDUCING THE TIME AND

MONEY REQUIRED FOR UNDERGROUND EXCAVATION

SEEMS TO LIE IN THE DEVELOPMENT OF TECHNIQUES TO

RAPIDLY ADVANCE THE EXCAVATION, SUPPORT THE OPEN-

ING, AND REMOVE THE WASTE IN A SINGLE HIGHLY AUTO-

MATED CONTINUOUS OPERATION. THE DRILL AND BLAST

METHOD OF TUNNEL EXCAVATION IS THE MOST FRE-

QUENTLY USED. WIDESPREAD USE OF THE TUNNELLING

MACHINE METHOD IS DESIRABLE IF THE MACHINES CAN BE

INCREASED IN VERSATILITY PARTICULARLY WITH RESPECT

TO THE ABILITY TO OPERATE EFFICIENTLY IN VARIOUS

GROUND CONDITIONS AND TO BORE DIFFERENT SIZES AND

SHAPES OF OPENINGS. IMPROVEMENTS IN DESIGN AND FAB-

RICATION OF CUTTERS AND OTHER MACHINE PARTS TO

PROVIDE GREATER RELIABILITY AND TO REDUCE THE

MAINTENANCE COSTS ARE ALSO NEEDED.

Howard, TE Oecd, Paris /France/ June 1970

CPSTI PB 193286, HRIS 33 213476, HRIS 33 213475, IP33213477, HRIS

33 213479, HRIS 33 213478, HRIS 33 213480
CONSTRUCTION EQUIPMENT AND METHODS

3A 215341
INADEQUACIES AND NEEDED IMPROVEMENTS IN THE TECHNOLOGY OF IMMERSED TUNNELS

The term "IMMERSED TUNNELS" means TUNNELS COMPOSED OF ELEMENTS CONSTRUCTED IN A DRY-Dock OR ON A SLIPWAY AND SUBSEQUENTLY TRANSPORTED TO THE CONSTRUCTION SITE, WHERE THEY ARE SUNK, PLACED ON A FOUNDATION AND CONNECTED TOGETHER UNDER WATER. THIS METHOD OF CONSTRUCTION OFFERS ADVANTAGES ONLY IN A RELATIVELY LIMITED FIELD. VIRTUALLY NO COUNTRY HAS BUILT A LARGE NUMBER OF IMMERSED TUNNELS STANDARDIZED CONSTRUCTION METHODS, AND THE APPLICATION OF SPECIAL EQUIPMENT THAT HAS BEEN ALMOST NON-EXISTENT. DURING THE LAST TEN YEARS EXPERIENCE HAS BEEN MAINLY CONCENTRATED IN THE UNITED STATES, BELGIUM, DENMARK AND THE NETHERLANDS. UNITED STATES TECHNOLOGY IS MOSTLY BASED ON CIRCULAR STEEL TUNNEL HULLS CONSTRUCTED ON SLIPWAYS. THE CONCRETE IS PLACED WHILE THE HULLS ARE IN A FLOATING POSITION AND THEY ARE SUBSEQUENTLY LOWERED ONTO AN ACCURATELY-FINISHED FOUNDATION BED. IN THE LOW-LYING COUNTRIES OF EUROPE REINFORCED-CONCRETE TUNNEL ELEMENTS, MOSTLY OF A RECTANGULAR CROSS-SECTION, ARE CONSTRUCTED IN A DRY-Dock. THEY ARE FOUND ON PILES OR PLACED ON TEMPORARY FOUNDATIONS AND SAND-JETTED IN BOTH THESE PARTS OF THE WORLD, THERE IS RELATIVE SATISFACTION WITH THE PRESENT-DAY STATE OF TECHNOLOGY. THE MOST IMPORTANT NEED FOR IMPROVEMENTS APPEARS TO LIE IN THE FIELD OF BASIC KNOWLEDGE OF GEOLOGY, HYDROLOGY AND SOIL MECHANICS AND DREDGING AND MEASURING TECHNIQUES. IN THE CASE OF BASIC KNOWLEDGE, THE FUNDAMENTAL RESEARCH IN MOST CASES IS BEING DONE BY UNIVERSITIES, WHEREAS RESEARCH INSTITUTES ARE MORE CONCERNED WITH APPLICATIONS. THERE IS NO CO-ORDINATION OF THESE ACTIVITIES AND INTERNATIONAL EXCHANGES ARE INSUFFICIENT. THE MOST IMPORTANT NEEDS ARE FOR: (1) A STANDARD CLASSIFICATION OF ROCKS AND SOILS TO ACHIEVE A COMMON UNDERSTANDING OF GEOLOGICAL CONDITIONS, (2) IMPROVED TECHNIQUES FOR DETERMINING BED-LOAD TRANSPORT AND FOR PREDICTING THE RATE AND EXTENT OF SITING OF TRENCHES, (3) IMPROVED TECHNIQUES FOR DETERMINING THE EFFECT OF WAVES AND CURRENTS, (4) IMPROVED LABORATORY TESTS FOR DETERMINING PERMEABILITY, COMPRESSION AND SWELLING CHARACTERISTICS, EARTH PRESSURE AT REST, AND SOIL BEHAVIOR DURING EARTHQUAKES, (5) IMPROVED METHODS OF CORRELATING LABORATORY AND FIELD TESTS TO PREDICT THE BEHAVIOR OF TRENCH SLOPES, AND (6) IMPROVED METHODS FOR PREDICTING THE STABILITY OF TRENCH SLOPES. THE DREDGING OF TUNNEL TRENCHES INVOLVED SPECIAL PROBLEMS FOR WHICH THE EQUIPMENT AT PRESENT AVAILABLE IS INADEQUATE AND OFTEN RESULTS IN HIGH COSTS. SUITABLE EQUIPMENT FOR DIGGING TRENCHES AT DEPTH EXCEEDING 40 METERS IS NOT YET AVAILABLE. THE METHODS COMMONLY USED FOR MEASURING DEPTH RELY ON THE ECHO SOUNDER AND THE MARINER'S SOUNDING LEAD.

3A 215352
THE APPLICATION OF TIME-LAPSE PHOTOGRAPHY IN WORK SIMPLIFICATION STUDIES OF CONSTRUCTION OPERATIONS

THE REPORT DESCRIBES THE USE OF TIME-LAPSE PHOTOGRAPHY IN WORK SIMPLIFICATION STUDIES OF CONCRETE BRIDGE DECK CONSTRUCTION. THE INVESTIGATION WAS FUNDED BY THE INDIANA STATE HIGHWAY COMMISSION THROUGH THE PURDUE JOINT HIGHWAY RESEARCH CENTER AND WAS PERFORMED WITH THE COOPERATION OF SEVERAL BRIDGE CONSTRUCTION CONTRACTORS. THE FINDINGS INDICATED THAT COMMONLY USED METHODS FOR BRIDGE DECK CONSTRUCTION CONTAINED INEFFICIENCIES THAT WARRANTED FORMAL WORK SIMPLIFICATION STUDIES AND COULD BENEFIT THEREFROM. ANALYSES IN SUPPORT OF THIS CONCLUSION ARE INCLUDED IN THE REPORT. THE INVESTIGATOR RECOMMENDS THAT CONSTRUCTION MANAGERS BE ENCOURAGED TO MAKE USE OF TIME-LAPSE PHOTOGRAPHY AS A BASIS FOR WORK SIMPLIFICATION STUDIES OF SELECTED CONSTRUCTION OPERATIONS. GENERALIZED WORK SIMPLIFICATION FINDINGS ARE OF QUESTIONABLE VALUE TO CONSTRUCTION MANAGERS BECAUSE OF THE CHANGING NATURE OF THEIR WORK. HOWEVER, SPECIFIC APPLICATIONS OF WORK SIMPLIFICATION TECHNIQUES CAN BE OF SUBSTANTIAL BENEFIT TO EACH CONSTRUCTION ORGANIZATION. THE REPORT INCLUDES AN APPENDIX ON GUIDE LINES FOR THE APPLICATION OF TIME-LAPSE PHOTOGRAPHY TO WORK SIMPLIFICATION STUDIES OF CONSTRUCTION OPERATIONS.

Jacobsen, JA
Highway Research Record, Hwy Res Board 1970

3A 215361
ECONOMICS OF THE CONSTRUCTION INDUSTRY

3A CONSTRUCTION EQUIPMENT AND METHODS

Cassimatis, PJ
National Industrial Conference Board

3A 215371
STATISTICAL QUALITY CONTROL OF HIGHWAY CONSTRUCTION AND MATERIALS
EXISTING LOCAL PRACTICES USED IN ESTABLISHING AND ENFORCING HIGHWAY SPECIFICATIONS AND CONSTRUCTION PROCESSES ARE REVIEWED AND COMPARED WITH PROCEDURES BASED ON STATISTICAL QUALITY CONTROL CONCEPTS. IN ORDER THAT STATISTICAL QUALITY CONTROL CONCEPTS MAY BE PROPERLY USED WHERE APPLICABLE, THE FIRST PART OF THIS REPORT CONSIDERS THE GENERAL THEORY UNDERLYING THE USE OF STATISTICAL CONTROL METHODS AND THE DEVELOPMENT OF DIFFERENT TYPES OF ACCEPTANCE PLANS WHICH MAY BE USED IN THE HIGHWAY CONSTRUCTION INDUSTRY. THE SECOND PORTION OF THE REPORT IS CONCERNED WITH ANALYZING AND COMPARING KENTUCKY'S CURRENT SPECIFICATION REQUIREMENTS WITH TYPICAL QUALITY CONTROL REQUIREMENTS ESTABLISHED USING BASIC STATISTICAL THEORY. SPECIFICATIONS USED BY SOME OTHER AGENCIES WHICH ARE BASED ON STATISTICAL PRINCIPLES ARE PRESENTED TO ILLUSTRATE THE USE BEING MADE OF THIS TYPE OF ACCEPTANCE PLAN. /AUTHOR/

Venable, JB
Kentucky Department Highways Dec. 1970

3A 215373
HIGH RISE "SYSTEMS BUILDING" IN THE HUDSON VALLEY
THE USE OF "SYSTEMS BUILDING" TECHNIQUES IS DISCUSSED FOR AN URBAN RENEWAL PROJECT IN POUGHKEEPSIE, N. Y. THE PROJECT CONSISTS OF A CENTRAL 18-STORY BUILDING SURROUNDED BY SMALLER BUILDINGS PROVIDING ABOUT 1000 DWELLING UNITS. ALSO CONSTRUCTION IS DESCRIBED OF THE CENTRAL BUILDING WHICH COMBINES CAST-IN-PLACE ELEVATOR AND STAIRWELL CORES AND SHEAR WALLS WITH PRECAST CONCRETE ELEMENTS, SOME OF WHICH WERE CAST ON-SITE. PRECASTING OPERATIONS DESCRIBED AND ERECTION PROCEDURES DISCUSSED. IN THE LATTER, CAST-IN-PLACE WORK AND PRECAST FLOOR ERECTION PROCEEDED TOGETHER FLOOR BY FLOOR FOLLOWED SHORTLY BY ERECTION OF PRECAST EXTERIOR PANELS. SHEAR WALLS AND FLOOR PANELS WERE ERECTED AT A RATE OF ONE FLOOR PER WEEK. /ACIP/

Corbetta, RH Wilson, RE Am Concrete Inst Journal & Proceedings Jan. 1971

3A 215380
CURRENT CONSTRUCTION PRACTICES IN THE INSTALLATION OF HIGH-CAPACITY PILING
STRUCTURAL AND ECONOMIC CONSIDERATIONS ARE CAUSING A TREND TOWARD THE USE OF HIGH-CAPACITY PILING FOR HIGHWAY BRIDGES. THEY ARE BEING EMPLOYED IN COMBINED LOADING TO RESIST BEARING UPLIFT, AND LATERAL FORCES WITH DESIGN LOADS FROM 200 TO 1,500 TONS. THESE PILES MUST BE INSTALLED TO PENETRATIONS IN SOIL-SUPPORTING CAPACITY. AFTER INSTALLATION, POLE-SOIL CAPACITIES MAY BE IMPROVED BY CONSOLIDATION OF SURROUNDING SOILS, CONCRETE PLUGS, GROUT INJECTION, AND EXPANSION OF THE PILE TIP. A REVIEW OF IMPORTANT RECENT INSTALLATIONS OF HIGH-CAPACITY PILES OF VARIOUS TYPES IS INSTRUCTIVE IN ILLUSTRATING THE VARIOUS COMBINATIONS OF TECHNIQUES THAT HAVE BEEN SUCCESSFULLY EMPLOYED. A REVIEW AND ANALYSIS OF PROBLEMS ALSO DIRECTS ATTENTION TO THOSE AREAS REQUIRING FURTHER DEVELOPMENT. THE VARIABLES FACING BOTH THE DESIGNER AND THE CONTRACTOR INCLUDE CHARACTER OF THE SOILS, DEPTH OF WATER OR SOFT MATERIAL, LOADS TO BE CARRIED, ACCESS FOR EQUIPMENT, MAGNITUDE OF THE JOB, AVAILABLE EQUIPMENT FOR TRANSPORTING, LIFTING, AND INSTALLING, AND AVAILABLE FACILITIES FOR FABRICATIONS OR MANUFACTURE. IT IS ESSENTIAL THAT THE DESIGN AND INSTALLATION BE INTEGRATED IF SUCCESS IS TO BE OBTAINED WITH THESE HIGH-CAPACITY PILES. THUS, THE MAXIMUM BENEFITS OF HIGH-CAPACITY PILES CAN BE MADE MORE WIDELY AVAILABLE TO THE BRIDGE ENGINEERING PROFESSION. /AUTHOR/

Gerwick, BC Highway Research Record, Hwy Res Board 1970

3A 215393
A STUDY OF THE EFFECTS OF CONSTRUCTION PRACTICES ON BRIDGE DECK CONSTRUCTION
DURING THE PERIOD OF 1964 THROUGH 1966 SEVEN CONCRETE BRIDGE DECKS WERE OBSERVED UNDER CONSTRUCTION IN PENNSYLVANIA. SPECIMENS AND AIR CONTENTS WERE RECORDED FOR EVERY TRUCKLOAD OF CONCRETE THAT WENT INTO THE DECKS. ALSO, THE Precise LOCATION OF PLACEMENT OF EVERY TRUCKLOAD OF CONCRETE WAS RECORDED, AND NOTE WAS TAKEN OF CONSTRUCTION PRACTICES THAT MIGHT ADVERSELY AFFECT THE PERFORMANCE OF CONCRETE. THE 7 BRIDGE DECKS WERE SUBSEQUENTLY INSPECTED DURING THE PERIOD OF 1967 THROUGH 1969, AND THE VARIOUS FORMS OF DETERIORATION WERE OBSERVED AND RECORDED. IN THIS WAY IT HAS BEEN POSSIBLE TO DETERMINE RATES OF DETERIORATION AND TO RELATE CONCRETE PROPERTIES AND CONSTRUCTION PRACTICES TO OBSERVED DETERIORATION. DETAILS OF BRIDGE CONSTRUCTION PERTINENT TO DURABILITY AND OBSERVATIONS MADE DURING SUBSEQUENT INSPECTIONS ARE COVERED FOR EACH DECK. THE CONSTRUCTION DIFFICULTIES THAT LEAD TO DURABILITY PROBLEMS, BASED ON THE OBSERVATIONS MADE IN THIS STUDY, ARE SUMMARIZED. /AUTHOR/

Cady, PD Theisen, JC Highway Research Board Special Reports 1970

3A 215399
CONSTRUCTION PRACTICES
DURING THE 1920'S THE DEFENSE DEPARTMENT PIONEERED THE GENERAL DEVELOPMENT AND APPLICATION OF STATISTICAL-BASED PROCESS CONTROL AND ACCEPTANCE CONCEPTS TO INDUSTRIAL PRODUCTS. THE FIRST USE OF THE METHODOLOGY BY HIGHWAY ENGINEERS WAS A RECORD SAMPLING PROGRAM. A LONG SLOW PERIOD OF ADOPTION FOLLOWED. ONLY IN RECENT YEARS HAS REALISTIC PROGRESS BEEN MADE IN THE USE OF STATISTICAL METHODS. NOW, A TOTAL OF 36 STATES HAVE ACTIVELY BEEN ENGAGED IN SOME FORM OF STUDY OR APPLICATION OF STATISTICALLY ORIENTED SPECIFICATION, FOR CONTROL AND ACCEPTANCE OF CONSTRUCTION, AND MORE THAN 1/3 OF THESE STATES ARE USING A STATISTICALLY DESIGNED SPECIFICATION, AS THEIR STANDARD OR PROVISIONAL SPECIFICATION THAT NUMEROUS OPINIONS HAVE PROVED SOUND. YET THE GENERAL CONSENSUS SEEMS TO BE THAT THE APPLICATION OF STATISTICAL CONCEPTS TO HIGHWAY USE IS NOT FEASIBLE AT THIS TIME.

Deyoung, CE Highway Research Board Special Reports 1971

3A 215417
COORDINATION OF CONCRETE PAVING OPERATIONS BY A TRIAL AREA SPECIFICATION
THE START OF LAYING CONCRETE PAVEMENT ON A NEW CONTRACT IS REGARDED AS A TRIAL DURING WHICH THE CONTRACTOR'S ORGANIZATION, CREW AND EQUIPMENT MUST BE BROUGHT INTO WORKING COORDINATION WITH THE DESIGN CONCRETE MIX SO AS TO ACHIEVE THE SPECI-
CONSTRUCTION EQUIPMENT AND METHODS

3A 216441

APPROACH ROADS, GREENLAND 1958-60

PROJECT 1. APPROACH ROADS, GREENLAND ROAD PROGRAM,
was organized in 1954 to develop methods, techniques
and criteria for constructing roads on both
glacial ice surfaces and adjacent ice-free terrain.
activities for the years 1955 and 1959 consisted of
construction of additional roads and culverts
and an annual assessment of the performance
of the various roads and other structures on the
ice cap. Special measurements were made of ice surface
movement, subsurface temperature and melt-water
runoff. /Author/

Davis, RM

Cun Technical Reports, Army Dept /US/ June 1971

3A 215451

A COMPUTER PROGRAM FOR ESTIMATING COSTS OF HARD
ROCK TUNNELLING (COHORT)

A computer performs all logic and computations
customarily done by hand in preparation of engi-
neer's estimates or contractor's bids on tun-
nel-shaft systems. The program described is based
on construction methods, work forces and equip-
ment selections corresponding to the current
state of the art of tunnelling. The program con-
tains logic to permit the estimate, the program will
accommodate a large number of values or changes
in values of the factors that affect costs, such as
as tunnel shape and size, shaft depth, rock charac-
teristics, and construction method, to provide
great flexibility, the user of the program is pro-
vided with the option of selecting lining type and
thickness, profit and overhead margins, and other
input data. Suggestions for selecting an appropri-
ate value for these inputs are contained. Complete
operating instructions and an illustrative exam-
ple are presented. /Author/

Wherry, FT

Cikanek, EM

Harza Engineering Company

May 1970

NTIS PB 193 272. 3P33220660

3A 215497

EARTH MOVING AND COMPACTION EQUIPMENT: A PANEL

DISCUSSION

In view of the proposed acceleration of the na-
tional road building program, it is imperative that
the contractor, the roadway equipment manufac-
turer, and the highway engineer pool their talents
in working out a solution to mutual problems if the
work ahead is to be accomplished, to meet the chal-
lege that lies ahead, improved highway design
and construction specifications, the development
of new and better construction equipment, and a
more effective use of existing equipment, must be
met. Design standards have of necessity, been
changed to require better alignment, better hori-
zontal and vertical, a more level grade, flatter
cross slopes, wider ditches, better sight


distances, etc. These improvements in design have
permitted a more economical use of larger and
more varied pieces of grading and earth moving
equipment. However, to permit the most efficient
use of new and existing equipment, it is necessary to
continue to keep construction specifications abreast of equipment development and to
improve design within the limits of good construction prac-
tices. A perfect design and a perfect set of con-
struction specifications, although ideal for an
objective, are not enough to assure the success-
ful completion of the highway construction program
that lies ahead. The equipment designer and manu-
pacturer, the contractor, and the engineer must

3A 215434

LONG-SPAN PRECAST Prestressed Girder Bridges

Fabrication, handling, and temporary construct-
ion loads, as well as the structural requirements
for shear and flexure, influence long-span precast
prestressed girder dimensions and details. An anal-
ysis of permanent distribution of wheel loads for
construction as presented. Various types of erection procedures are
described. /IPCJ/

Libby, JR

Prestressed Concrete Institute Journal July 1971

3A 216421

SOME CONSIDERATIONS OF SUBMERGED TUNNELLING

THE TRENCH AND PRECAST TUNNEL IS THE USUAL CON-
STRUCTION METHOD OF UNDERWATER TUNNELLING. THE
LENGTH OF THE ELEMENTS HAS INCREASED TO MORE THAN
100 M, THE WIDTH TO MORE THAN 40 M, AND THE WEIGHT TO
ABOUT 50,000 TONS. THERE IS A MORE OR LESS HISTORICAL
DIFFERENCE IN SUBMERGED TUNNELING METHODS IN THE
US AND THE REST OF THE WORLD. ALTHOUGH THERE IS A
TENDENCY FOR BOTH METHODS TO GROW TOWARDS ONE
OTHER, PARTICULARLY WITH REGARD TO EXECUTION. THE
AMERICAN TUNNEL IS BASED ON THE CYLINDRICAL CROSS
SECTION WITH TWO TRAFFIC LANES; THE EUROPEAN
TUNNEL HAS A RECTANGULAR CROSS SECTION WHICH CAN
EASILY BE ADAPTED TO THE REQUIRED NUMBER OF TRAFFIC
LANES (2X3 OR 3X2 FOR INSTANCE). BECAUSE OF THE FINANC-
IOUS, THE FOUNDATION OF THE TUNNEL ELEMENTS IS
GENERALLY DIRECTLY ONTO THE SUBSOIL. BUT SOMETIMES
THE SOIL CONDITIONS ARE SO BAD THAT A PILE FOUND-
ATION HAS TO BE USED. SOME IDEAS ARE GIVEN ABOUT
POSSIBLE DEVELOPMENTS OF LONG TUNNEL CROSSINGS AND
BRIDGE-TUNNEL COMBINATIONS. /Author/

Braakel, J

Instit Civil Engineers Proc. London /UK/ Apr. 1971

3A 215434

LONG-SPAN PRECAST Prestressed Girder Bridges

Fabrication, handling, and temporary construc-

1000 FT LONG TO BE LAID AHEAD OF THE MAIN PAVING. THIS
TRIAL AREA AFFORDS AN OPPORTUNITY FOR ANY NECESSARY
CHANGES IN THE ORGANIZATION OF THE JOB, FOR
ANY ADJUSTMENTS TO THE EQUIPMENT OR ALTERATIONS IN
THE DESIGN MIX PROPORTIONS TO SUIT WORKING CONDI-
TIONS, AND FOR THE TRAINING OF INEXPERIENCED MEN.
TO CHECK THE QUALITY OF THE PAVEMENT AS QUICKLY AS
POSSIBLE, ACCELERATED TESTS ARE UNDER DEVELOPMENT
TO ESTABLISH THE STRENGTH AND COMPACTION OF THE
CONCRETE WITHIN A FEW HOURS. IN ADDITION, THE RIDING
QUALITY OF THE PAVEMENT IS MEASURED. IF THE RESULT
OF THESE TESTS ARE SATISFACTORY AND THE TRIAL AREA
WAS SUCCESSFUL, THE CONTRACTOR IS ALLOWED TO PRO-
CEED AND THE TRIAL AREA BECOMES PART OF THE PAVE-
MENT IF NOT, THE CONTRACTOR IS HELD UNTIL NECESSARY
CORRECTIONS ARE MADE; ANY SLABS IN THE TRIAL AREA
NOT MEETING THE SPECIFICATION ARE REMOVED AND
REPLACED AT THE CONTRACTOR'S EXPENSE. THE BACK-
ground, contractual and practical advantages, together
with the results achieved by such a trial
area specification, are discussed. /Author/

Smith, P

Highway Research Board Proceedings 1961

...
CLOSURE

THER STUDIES OF THIS NATURE WILL BE BENEFICIAL TO TANT. SOME OF THESE ARE CLASSED AS MANAGEMENT WITH 3% PORTLAND CEMENT AND 8% WATER. THE STRETCH OF HIOHW AY IN NEV CHOP OLD ASPHALT INTO CHEAP NEW BASE GRINDING THE 8-IN.-THICK ASPHALT MAT INTO 2-IN.-MINUS CONTRACTORS AND MANUFACTURERS. /AUTHOR/

CONSIDBRABLE OPERATOR EFFICIENCY ARE SOME OF THE MOST THE OUTPUT OF POWER SHOVELS AND DRAOLINES IS AF­

Jones, RP Highway Res Abstracts Hwy Res Board July 1956

452

3A 215509

CHOP OLD ASPHALT INTO CHEAP NEW BASE A PROCESS FOR THE RECYCLING OF EXISTING ASPHALT PAVEMENT FOR BASE MATERIAL IS DESCRIBED. A TEN MILE STRETCH OF HIGHWAY IN NEVADA WAS RECLAIMED BY GRINDING THE 8-IN.-THICK ASPHALT MAT INTO 2-IN.-MINUS AGGREGATE PRODUCT, THEN BLENDING AND REMIXING IT WITH 3% PORTLAND CEMENT AND 8% WATER. THE RE­CLAIMED MATERIAL SERVED AS THE BASE FOR A NEW ASPHALT RIDING SURFACE WITH A SAVINGS OF 33-1/3% OVER ALL NEW AGGREGATE. DETAILS OF THE EQUIPMENT AND METHOD ARE GIVEN. /AUTHOR/

Construction Equipment Vol. 45 No. 3, Mar. 1972, p 37, 1 Phot

3A 215510

DEEP LIFT ASPHALTIC CONCRETE, WITH DISCUSSIONS AND CLOSURE DEEP LIFT ASPHALTIC PAVEMENTS, BY ELIMINATING THE NEED FOR BASES OF CRUSHED ROCK OR UNTREATED GRAVEL, ALLOW TRENCHING FOR UTILITIES AND SUBSEQUENT REINSTATEMENT TO BE UNDERTAKEN WITH LESS TRAFFIC DISRUPTION AND LESS DISTURBANCE TO THE ROAD ITSELF. RECOMMENDATIONS ON MIX CHARACTERISTICS AND DESIGN, PAVEMENT LAYING AND COMPACTION METHODS ARE MADE, BASED ON EXPERIENCE GAINED WITH DEEP LIFT ASPHALT PAVEMENTS IN NEW SOUTH WALES. THE METHOD WAS FOUND TO GIVE STRONG PAVEMENTS POSSESSING GOOD RIDING QUALITIES, WITHOUT THE PROBLEM OF REFLECTIVE CRACKING ASSOCIATED WITH CONCRETE PAVE­MENTS.

Giffen, JC Divnich, G Bone, EJ DISCUSSER Bils, JA DISCUSSER Larcombe, LA DISCUSSER Australian Road Research Board Proc. Vol 5 1970, pp 231-47, 5 Fig, 5 Tab, 7 Ref

3A 215515 END-RESULT SPECS GET CAUTIOUS OK ON EXPERIMENTAL ASPHALT JOB ACCEPTANCE OF ASPHALT PAVEMENT HAS BEEN STRICTLY ON THE BASIS OF END RESULTS ON A RECENT OVERLAY PROJECT IN ILLINOIS. THE EXPERIMENTAL SPECIFICATIONS AND JOB CONTROL PROCEDURES HAVE GIVEN THE CONTRACTOR VIRTUALLY A FREE HAND IN ESTABLISHING JOB MIXES, SCHEDULING HOTMIX PRODUCTION, AND IN DECID­ING ON EQUIPMENT AND CONSTRUCTION METHODS. STATE INSPECTORS HAVE SAMPLED AND TESTED ONLY THE MATERIAL IN PLACE ON THE ROADWAY, OFFICIALLY IGNORING PRODUCTION PROCEDURES. ACCEPTANCE WAS BASED ON ASPHALT CONTENT AND AGGREGATE GRADATION IN THE MIX, GAUGE ROADWAY, DENSITY, PAVEMENT THICKNESS AND SURFACE SMOOTHNESS IN ADDITION TO UPPER AND LOWER LIMITS. UNIFORMITY WAS A BIG FACTOR IN ACCEPTANCE. THE END-RESULT TESTING DID PERMIT SOME IN­CREASE IN PRODUCTION.

Roads and Streets Vol. 113 No. 12, Dec. 1970, pp 61-2, 3 Tab, 1 Phot

3A 215516 HRB QUESTIONNAIRE ON BRIDGE DECK FINISHING DUE TO THE INCREASINGLY WIDESPREAD USE OF MECH­ANICAL BRIDGE DECK SCREDDING EQUIPMENT, A QUESTION­NAIRE WAS RECENTLY PREPARED AND DISTRIBUTED TO HIGHWAY RESEARCH BOARD MEMBERS TO PROVIDE A CURRENT RECORD OF THE EQUIPMENT IN USE. THE QUESTION­NAIRE WAS EXPANDED TO INCLUDE SOME INFORMATION ON EQUIPMENT COST, PERFORMANCE, EFFECT ON DRIVING CONDITIONS OR OTHER LOAD EMBANKMENTS IN ACTUAL FIELDS AND LABORATORY TESTS, IN TERMS OF CREEP SETTLEMENT, ARE PERFORMED TO OBTAIN RELATION BETWEEN COMPACTION DEGREE AND SETTLEMENT STABILITY, TO ESTABLISH THE COMPACTATION STANDARD FOR ROAD EMBANKMENTS AND THEIR QUALITY CONTROL. RESEARCH ON CONSTRUCTION METHODS FOR EARTH EMBANKMENTS INCLUDE: (1) THE RELATIONSHIP BETWEEN COMPACTION DEGREE AND SETTLEMENT AFTER COMPLETION; (2) SETTLEMENT PREVEN­TION METHODS FOR APPROACH EMBANKMENTS; (3) EARTH-WORKS QUALITY CONTROL ITEMS AND METHODS; AND (4) FILLING MATERIALS AND THEIR STABILITY. RE­SEARCH ON ECONOMICAL DESIGN FOR EARTH RETAINING WALLS UTILIZES LARGE SCALE MODELS FOR THE EXAMINA­
CONSTRUCTION EQUIPMENT AND METHODS

3A 215530
COMPUTER ANALYSIS FOR MODIFICATION OF BASE ENVIRONMENTAL CONDITIONS TO PERMIT COLD WEATHER PAVING

Frenzel, BG Dickson, PF Corlew, JS Assoc Asphalt Paving Technol Proc Vol. 40 1971, pp 487-508, 10 Fig, 1 Tab, 5 Ref

3A 215532
GRADE SEPARATION PROJECT AT OH-HARA INTERSECTION COMPLETED WITHOUT DISTURBING URBAN TRAFFIC
TRAFFIC CONGESTION AT URBAN AT-GRADE INTERSECTIONS HAS BEEN RECOGNIZED AS ONE OF THE MOST SERIOUS PROBLEMS IN ANY LARGE CITY. THE RECENTLY COMPLETED GRADE SEPARATION PROJECT AT OH-HARA INTERSECTION IN TOKYO WAS EXECUTED TO SOLVE SUCH A PROBLEM BECAUSE, WITH AN AVERAGE DAILY TRAFFIC COUNT OF 130,000, THE INTERSECTION HAD BECOME INFAMOUS DUE TO THE HEAVY AIR POLLUTION FROM AUTOMOBILE EXHAUST. DURING THE THREE YEARS OF CONSTRUCTION, TRAFFIC WAS NOT STOPPED, I.E., FROM RIGHT-OFF-WAY ACQUISITION TO COMPLETION. DIFFICULTIES OF URBAN WORK PROJECT, PARTICULARLY OF TREATMENTS FOR TRAFFIC FLOW AND VARIOUS UNDERGROUND FACILITIES, ARE DISCUSSED. THE SYNCHRONIZED CONSTRUCTION OF JOINT-USE CONDUITS AND STRUCTURES OF TOKYO EXPRESSWAY IS EXPLAINED. THE TRAFFIC SITUATION AFTER COMPLETION IS ALSO REPORTED. /JRS/

Hasegawa, H Yagi, M Japan Road Association Annual Reports 1970, pp 67-75, 5 Fig, 4 Phot

3A 215536
INSTRUCTIONS FOR EARTHWORK CONSTRUCTION /IN PORTUGUESE/
STANDARD INSTRUCTIONS FOR THE EXECUTION OF BASIC HIGHWAY CONSTRUCTION, INCLUDING ENGINEERING STRUCTURES, DRAINAGE, AND SLOPE PROTECTION, ARE PRESENTED. /RR/
3A 215589
SYSTEMS CONCEPTS FOR PRECAST AND PRESTRESSED CONCRETE BRIDGE CONSTRUCTION

Recent advances in the fabrication, engineering, and erection of precast and prestressed concrete beams and structures are reviewed, with special attention to the engineering and construction of the Disney World Monorail in Orlando, Florida. Some 7 miles of 6-span continuous prestressed concrete box girder sections, supported on precast concrete columns, were constructed. The 350 girders ranged from 90 to 110 feet, and half were on vertical and horizontal curves to radii from 350 feet upward.

Anderson, A.R. Highway Research Board Special Reports No. 132, 1972, pp 9-21, 20 Fig, 1 Tab

3A 215590
CONSTRUCTION ECONOMY THROUGH SYSTEMS BUILDING

Although the systems building concept is 20 years old, and although systems components are being utilized in actual construction, current applications of the concept bear about the same relation to our understanding of it as does col. Lindbergh's air lane to supersonic jets. The present and anticipated economic climate dictates optimization in the economy of construction, but engineers are often required to innovate by using traditional tools under tight deadlines. What is needed are programs that permit advanced engineering studies at the very preliminary conception of a project idea to ensure that during the final design phase all possible cost-saving innovations can be included. Principles of innovation in procedure, design, and construction are listed. Of these, the most important are simplicity and modularity. The figures, keyed to textual descriptions, present examples of innovation in a progression from elementary components to very large, complex structures. Four of the figures are devoted to the geometric design, support, and installation of a 25-foot-long bridge made of paper.

Zeilin, L. Highway Research Board Special Reports No. 132, 1972, pp 22-30, 28 Fig

3A 215594
STEEL, CONCRETE, ALUMINUM, AND TIMBER IN SYSTEMS BRIDGES

Two major requirements of tomorrow's bridges are economy and aesthetics. Each of the four materials considered here is economically competitive in some situations and not in others, and each has its own aesthetic uses and limitations. Future concrete use includes adjustable, numerically controlled forms in both precast and slipform application. Strengths up to 10,000 psi should become commonplace, especially in present applications. New cement and improved methods of accelerating curing will produce greater economy in precast operations. Use of self-stressing concrete seems more promising than ever before. Lightweight aggregate promises to gain in acceptance. Steels will undergo still further increases in strength, and new, artificially contoured fabrication processes to improve not only speed but economy and precision as well. This will be beneficial to complex configurations as well as to repetitive standard units. While aluminum's great advantage is its light weight and flexibility of fabrication, it suffers from a relatively high first cost. Once this is reduced, aluminum will become competitive in a broader range of applications. Probably the great-
CONSTRUCTION EQUIPMENT AND METHODS

EST FUTURE DEVELOPMENT IN WOOD WILL BE IN EDUCATING ENGINEERS REGARDING THE CAPABILITY OF GLUED AND LAMINATED STRUCTURAL TIMBERS FOR BRIDGE CONSTRUCTION.

Scholer, CF Lally, A Pfeifer, DW Clark, JW Williamson, TG Highway Research Board Special Reports No. 132, 1972, pp 60-71

3A 215659 SLIPFORMER SETS 1000-YPH FACE
RUNWAYS TOTALING OVER 30,000 FEET IN LENGTH AT THE DALLAS/FORT WORTH REGIONAL AIRPORT ARE BEING LAYED BY A SLIPFORM Paver THAT PUTS DOWN A 30-FOOT SLAB WITH A DEPTH UP TO 17 INCHES. A SPREADER FLATTENS AND DISTRIBUTES FILES OF MUD Dumped ON THE GRADE BY A FLEET OF 10-YARD HAULERS. GRADE CONTROLS ARE ELECTRIC OVER HYDRAULIC AND RESPOND TO STRINGLINE SENSORS. THE AUTOMATIC GUIDANCE SYSTEMS USE TWO STRINGLINES: ONE SIDE CONTROLS ALIGNMENT, WHILE THE OTHER SIDES SET GRADE. THE SPREADER TOPS OFF A 12-INCH-THICK LIFT AT PRECISE GRADE FOR PLACEMENT OF 25 X 30-FOOT, 2300-LB REINFORCING MATS. THE MATS ARE SPOTTED WITH THE AID A TRUCK CRANE FITTED WITH SPECIAL ROLLING FLOATS TO GAIN STABILITY FOR THE LONG REACH. OF several APPROACHES TO ASSURE FULL KEYING OF THE REINFORCING INTO THE BOTTOM COURSE, THE MOST SUCCESSFUL WAS MAKING SEVERAL PASSES OVER EACH MATT WITH A VIBRATORY COMPACTOR.

Rehfield, J Construction Equipment Vol. 46 No. 4, Oct. 1972, pp 68-70, Photo

3A 215603 UNDERWATER TRANSPORTING OF CONCRETE WITH THE HYDRO-VALVE
A NEW METHOD DEVELOPED IN THE NETHERLANDS FOR PLACING CONCRETE UNDER WATER IS DESCRIBED. THE DEVICE ALLOWS CONCRETE TO ACHIEVE HIGHER QUALITY THAN PREVIOUSLY POSSIBLE AND PROVIDES A MEANS OF PLACING REINFORCED CONCRETE UNDERWATER.

Schollen, LC Hillen, HF Am Concrete Inst Journal & Proceedings Vol. 69 No. 9, Sept. 1972, pp 584-5, Fig, 1 Tab

3A 215626 GUIDELINES FOR EROSION AND SEDIMENT CONTROL PLANNING AND IMPLEMENTATION
THESE GUIDELINES PRESENT A COMPREHENSIVE APPROACH TO THE PROBLEM OF EROSION AND SEDIMENT CONTROL FROM THE BEGINNING OF PROJECT PLANNING TO COMPLETION OF CONSTRUCTION. THEY PROVIDE A DESCRIPTION OF HOW A PRELIMINARY SITE EVALUATION DETERMINES WHAT POTENTIAL SEDIMENT AND EROSION CONTROL PROBLEMS EXIST AT A SITE BEING CONSIDERED FOR DEVELOPMENT. GUIDANCE FOR THE PLANNING OF AN EFFECTIVE SEDIMENT AND EROSION CONTROL PLAN, AND PROCEDURES FOR THE IMPLEMENTATION OF THAT PLAN DURING OPERATIONS. TECHNICAL INFORMATION ON 42 SEDIMENT AND EROSION CONTROL PRODUCTS, PRACTICES, AND TECHNIQUES IS CONTAINED IN FOUR APPENDICES. /HRIS/

Becker, BC Mills, TR Hittman Associates 1972, 228 pp

3A 215629 RECLAMATION PROCESS CUTS STREET CONSTRUCTION COSTS BY 35%
RECLAMATION OF EXISTING PAVING MATERIALS IS PROVING TO BE A SATISFACTORY METHOD OF REBUILDING BITUMINOUS STREETS. THE OPERATION INVOLVES BREAKING UP THE OLD PAVEMENT, GATHERING THE MATERIAL IN WINDOWS, PULVERIZING AND MIXING THE BROKEN PIECES WITH A PORTABLE HAMMER MILL, THEN BLADING THE MIXTURE TO GRADE AND COMPACTING IT WITH A PNEUMATIC ROLLER. THE ONLY NEW MATERIAL ADDED IS THE WEARING SURFACE OF PLANT-MIX ASPHALT. AT NO TIME DURING THE WORK WERE RESIDENTS OF THE STREET UNABLE TO REACH THEIR HOMES BY CAR.


3A 215633 SAFETY BARRIERS SLIPFORMED IN TWO STEPS
IN THIS PROCESS, ONE MACHINE WITH A COMBINATION MULE, PLACED FOOTER AND GUTTER SIMULTANEOUSLY WHILE A SECOND FOLLOWED CLOSE BEHIND SHIPping A CONCRETE SAFETY BARRIER. THE DIESEL POWERED SLIPFORMING SYSTEM EMPLOYS SIDE MOUNTED MULES AND BEING INSTALLED AS LEFT HAND UNITS, THE TWO MACHINES WERE ABLE TO MOVE WITH TRAFFIC IN THE INTEREST OF PRODUCTION SAFETY. ONLY ONE LANE OF ACCESS WAS REQUIRED TO BRING READY MIX TRUCKS UP TO THE FORWARD HOPPERS WHICH COMPRISE PART OF THE UNITS. 1.5 CU YD ON-BOARD SUPPLY. AN ADVANTAGE IN SIDE MOUNTING MULES IS THAT THEY CAN GET CLOSE TO BRIDGE ABUTMENTS AND ADJACENT WALLS ALREADY POURED. THE CONFIGURATION OF THE FOOTER MULE ALLOWED PLACING THE REINFORCING RACKS THUS DEFERRING THE INSTALLATION OF THE BARRIER AS IT PROGRESSED UNDER THE MACHINES AUTOMATED GUIDANCE ALONG THE STRING LINE. SEVEN TRUCKS SUPPLIED THE FOOTER CURBER UNIT WITH CONCRETE HAVING A 1.5 TO 2 IN. SLUMP. THE FOOTER AND CURBING WAS POURED AT RATES PEAKING NEAR 4000 FT. PER 8 HOUR SHIFT. ONLY ONE OPERATOR PER MACHINE WAS REQUIRED. THE WALL MEASURES 32 IN. IN HEIGHT, AND IS 20 IN. THICK. AT ITS BASE, TABLED 6 IN. IN DIAMETER. THE MULE WAS REQUIRED FOR THE CONCRETE USED AND THIS CALLED FOR CAREFUL CONTROL AT THE SOURCE OF SUPPLY. IN THIS PROCEDURE WHICH HAS BEEN TERMED A 'LIFE SAVER' IN BOTH THE TECHNICAL AND ECONOMIC SENSE, THE WALL WAS SLIPPED AT A RATE OF 3900 FT. PER 8 HOUR SHIFT.


3A 215638 PAVING TRAINS PUT BIKEWAY WORK IN HIGH GEAR
THE U.S. BIKING POPULATION IS ESTIMATED TO REACH 100 MILLION BY 1975. IN 1963 THE CONGRESS PASSED A NATIONAL TRAILS SYSTEM ACT THAT DEFINED A NEED FOR 15,000 ROUTE MILES IN URBAN AND SUBURBAN AREAS ALONE, AND IN 1970 THE BICYCLE TRAVEL ALLIANCE RECOMMENDED PLANING FUNDS. HR 692 IN THE PRESENT CONGRESS WOULD ALLOW SOME USE OF HIGHWAY TRUST FUND MONEY FOR BUILDING EXCLUSIVE BIKE LINES. OREGON ALREADY SETS ASIDE 1% OF HIGHWAY FUNDS FOR PUTTING EXCLUSIVE BIKEWAYS ALONG ALL NEW ROADS. THERE ARE THREE RECOGNIZED CLASSES OF BIKEWAYS. CLASS 1 WAYS ARE COMPLETELY SEPARATED FROM OTHER TRAFFIC, TO THE EXTENT OF PROVIDING OVERPASSES AT BUSY INTERSECTIONS. CLASS 2 WAYS CONSIST MAINLY OF WIDENED AND IMPROVED SHOULDER STRIPS, OFTEN SEPARATED FROM OTHER TRAFFIC BY A SLIPFORMED CURB OR BARRIER. CLASS 3 WAYS ARE PATHS BUILT OUT OF EXISTING ROADWAYS, USUALLY THROUGH STRIPING A SECTION AT THE EDGE AND MARKING IT FOR BIKE USE. IN 1970, 25% OF THE 450 MILE BIKE PATHS IN THE UNITED STATES WERE IN CALIFORNIA. CALIFORNIA IS GOING TO BE A FORWARD PIONEER IN BIKEWAYS AND RECLAMATION, IT IS DEVELOPING A BIKE PATH WHICH WILL COVER 100 MILES OF PARKROADS.

Waller, D Roads and Streets Vol. 114 No. 6, Dec. 1972, p 9-11, 1 Fig, 1 Tab
CONSTRUCTION EQUIPMENT AND METHODS


3A 218446
A FASTER AND MORE ACCURATE BUILDING SURVEY WITH LASER EQUIPMENT

CONSTRUCTION LASERS WHICH ARE PROTECTED AGAINST IMPACT, DUST, FLUCTUATIONS OF TEMPERATURE FROM MINUS 20 TO PLUS 15 DEGREES C, ATMOSPHERIC SMOKE AND PRESSURE UP TO 2.5 ATMOSPHERES HAVE BEEN AVAILABLE FOR TWO YEARS IN GERMANY. THEY ARE USED TO ADVANTAGE IN TUNNEL CONSTRUCTION, CANAL AND PIPE CONSTRUCTION, IN PIPE PUSHING AND FILL CONSTRUCTION, AND ALSO FOR THE AUTOMATIC CONTROL OF CONSTRUCTION EQUIPMENT. THE PARTICULAR ADVANTAGES OF THE METHOD ARE ITS ACCURACY AND SIMPLICITY. CONSTRUCTION LASERS ARE USED FOR THE DETERMINATION OF THE BRIGHTNESS OF THE BEAM, MULTIPLE OF THE BRIGHTNESS OF THE SUN, THE HEIGHT OF THE BEAM IS kept IF POSSIBLE ABOVE HEAD LEVEL OR BELOW KNEE LEVEL. /TRL/

Trantobsky, P
Technische Hochschule /Germany/ Vol. 83 No. 5, 1971, pp 163-5

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 218677
THE COMPACTION OF THICK, SINGLE LAYER ROADBASES MADE OF BITUMINOUS MIXTURE AND STABLEIZING CONCRETE

The author gives examples of the economic use of double vibrating rollers for the compaction of single-layer roadbases. The disadvantages of an 18 cm thick bituminous layer put down in three sections are discussed: the necessity for three rolling procedures; unsatisfactory adhesion between the three layers, and insufficient transfer of the horizontal bear forces. The laying of the 18 cm thick bituminous course in one operation saves money, and because of the ability of the layer to store heat, rolling can take place when outdoor temperatures are low. The homogeneous structure of the layer also ensures greater resistance to traffic loading. Cores taken from a German motorway construction site show that with these passes of vibrating rollers, Marshall compaction of 101 percent can be obtained. Similar experience has been obtained with stabilizing concrete in Spain and Kenya. The constructional features of the double vibrating rollers use are described. /TRL/

Kaden, Bitumen, Terra, Asphalt, Pocher /Ger/ Vol. 25 No. 1, 1972, pp 28-30, 6 Fig

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 218683
EQUIPPING THE PROJECT


Lee, OA Highway Research Record, Hwy Res Board No. 454, 1973, pp 1-6, 2 Tab

3A 218687
OPTIMIZATION OF HAUL FLEET SIZE AND DISTANCE BETWEEN PLANT MOVES ON HIGHWAY PAVING PROJECTS

EQUIPMENT CONFIGURATIONS AND PROCEDURES ON HIGHWAY PAVING PROJECTS WERE INVESTIGATED AND A MEANS OF OPTIMIZING HAUL FLEET SIZE AND DISTANCE BETWEEN PLANT MOVES IS DISCUSSED. THE SIMULATION PROGRAM USED TO PREDICT PRODUCTION RATES IS DESCRIBED. AND A METHOD IS GIVEN FOR OBTAINING PRODUCTION IN TRUCK-LOADS PER HOUR FROM THE PLOTS OF THE SIMULATION RESULTS WITHOUT THE NEED TO RUN THROUGH SEVERAL APPROXIMATIONS. SIX PAVING CONFIGURATIONS AND PRODUCTION PROCEDURE MODELS ARE ANALYZED WITH REGARD TO COST PER CUMIC YARD OF CONCRETE IN PLACE FOR DIFFERENT TRUCK FLEET SIZES OR FOR RATES OF PAVING ADVANCE IN CONJUNCTION WITH DIFFERENT DISTANCES BETWEEN PLANT MOVES FOR EACH MODEL. LEAST-COST COMBINATION, AND LEAST-COST MODEL. THE STUDY REVEALED THAT SIMULATION IS ONE MEANS OF OBTAINING TO THE PRODUCTION RATES NEEDED FOR ANALYSIS OF PAVING SPREAD CONFIGURATIONS AND PROCEDURES. PLOTS ON LOG-LOG GRAPH PAPER WERE FOUND TO PROVIDE AN ECONOMICAL MEANS TO EXTRAPOLATE THE SIMULATED DATA. SIMULATION SHOWS THAT STEADY STATE IS ALWAYS REACHED IN A PAVING OPERATION AND USUALLY BETWEEN THE SECOND AND THIRD HOUR AFTER START OF PRODUCTION. MATHEMATICAL MODELING, IT WAS FOUND, ALLOWS A MEANS FOR ANALYZING DIFFERENT PAVING SPREAD CONFIGURATIONS AND PROCEDURES. A CONSIDERABLE DIFFERENCE WAS NOTED IN COST OF CONCRETE IN PLACE, DEPENDING ON THE PAVING SPREAD CONFIGURATION AND PROCEDURE USED. THE SENSITIVITY OF MODELS IN THE AREAS OF PRODUCTION AND NUMBER OF TRUCKS, MAKES THE PROCESS OF PICKING THE LEAST-COST COMBINATION WITHIN A MODEL A DIFFICULT ONE. DETAILS ARE GIVEN OF THE REDUCTION OF DATA AND THE RESULTS OF THE ANALYTICAL STUDY.

Ghare, PM Bidwell, EL Cabrera, JG DISCUSSER. Maher, MJ DISCUSSER Highway Research Record, Hwy Res Board No. 454, 1973, pp 16-31, 7 Fig, 4 Tab, 2 Ref

3A 218692
REVOLUTIONARY HOTMIX PLANT DRUMS OUT 500 T/H

THE INNOVATIVE HOTMIX PLANT CONSISTS OF A COMPACT UNIT IN WHICH THE DRUM DOUBLES AS BOTH DRYER AND MIXER. THE EQUIPMENT INCORPORATES SOPHISTICATED ELECTRONIC MECHANISMS FOR MEETING PRECISE AMOUNTS OF AGGREGATE AND ASPHALT AND A DRUM DESIGNED FOR CONTINUOUS MIX FLOW. THE DRUM MIXING PROCESS IS DETAILED. UNIFORMLY GRADED COLD FEED ENDS HIGH OUTPUT RATES. TWO WHEEL LOADERS MOVE MATERIALS FROM THE DRYER TO THE CONTRACTOR'S DEPARTMENT COLD-FEED BIN. IT IS PORTABLE UNIT MOUNTED TO A TANDEM-AXLE CHASSIS. THE BIN'S VARIABLE-SPEED FEEDERS ARE TIED ELECTRONICALLY TO METER THE EXACT AMOUNT OF EACH SIZE REQUIRED BY THE CURRENT OUTPUT RATE OF THE PLANT. THE AGGREGATE IS WEIGHED AUTOMATICALLY BY A SCALE AS IT MOVES UP THE CONVEYOR TO THE DRUM. STONE AND SAND ENTER THE DRUM AT THE BURNER END AND MOVE
CONSTRUCTION EQUIPMENT AND METHODS

THROUGH A CONCURRENT PARALLEL-FLOW PATTERN, AN ASPHALT PUMP METER IS EMPLOYED. FURTHER DETAILS ARE GIVEN. MODIFIED SPECIFICATIONS FOR DRUM-MIXING PLANTS HAVE BEEN ADOPTED BY SEVERAL STATE HIGHWAY AGENCIES.

Day, R. Construction Equipment: Vol. 49 No. 1, Jan. 1974, pp 28-31, 3 Fig

3A 218701

UNDERGROUND PIERCING TOOL

A MODERN UNDERGROUND PIERCING TOOL MAKES IT EASY AND EFFICIENT TO INSTALL LINES UNDER ROADWAYS. IT CAN BE PROPELLED THROUGH THE SOIL FOR DISTANCES OF 100 FEET OR MORE WITH REASONABLE ACCURACY. THE SPIRALLY GROOVED NOSECONDE IMPROVES OPERATING PERFORMANCE IN DAMP AND WET SOILS. IT IS POWERED BY A COMBINED COMPRESSED AIR. THE ADVANTAGES OVER OTHER METHODS OF UNDERGROUND PIERCING CAN BE SUMMED UP AS COST SAVING UNDER NORMAL CIRCUMSTANCES.

Florence, HV Frank, JA Vol. 65 No. 2, pp 800-2

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 218722

CONSTRUCTION OF A SIXTEEN INCH CONCRETE PAVEMENT

THIS REPORT ON THE EXTENSION OF THE NUMBER 1 RUNWAY AT HEATHROW (LONDON) AIRPORT GIVES DETAILS OF THE METHOD AND EQUIPMENT USED IN THE CONSTRUCTION OF A 16-IN THICK CONCRETE PAVEMENT, AND SHOWS THAT MODERN CONCRETE PAVEMENTS CAN BE FABRICATED AT COST SAVINGS IN COMPARISON WITH THE CUSTOMARY WET-MIX PROCESS. THE PAVEMENT SLAB IS SUPPORTED ON A 6-IN LAYER OF LEAN CONCRETE ON AN 18-IN THICKNESS OF COMPACTED GRANULAR SUB-BASE.


ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 218772

TUNNELS IN THE TONGARIRO POWER DEVELOPMENT


Davie, J Tunnels & Tunnelling /UK/ Vol. 3 No. 6, Nov. 1971: pp 420-4, 1 Fig, 7 Phot

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 215737

CONSTRUCTION OF A WINTER CONSTRUCTION SITE IN A HALL TO GIVE PROTECTION FROM WEATHER CONDITIONS

Davie, J Tunnels & Tunnelling /UK/ Vol. 3 No. 6, Nov. 1971: pp 420-4, 1 Fig, 7 Phot

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 215740

DESIGN OF TUNNEL LININGS TAKING ACCOUNT OF THE CONSTRUCTION PROCEDURE

THE DESIGN OF THE TUNNEL LINING IS USUALLY TREATED AS A PLANE PROBLEM, WITH NO ACCOUNT BEING TAKEN OF THE CONSTRUCTION PROCEDURE. THE ADVANTAGES OF THIS IS THAT THE DEFORMATION OF THE ROCK WHICH TAKES PLACE BEFORE THE LINING IS INCORPORATED IS NOT CONSIDERED. THE AUTHOR SHOWS HOW THESE DEFORMATIONS, WHICH ARE ASSOCIATED WITH THE CONSTRUCTION OF THE TUNNEL, MAY BE INCLUDED IN THE DESIGN. IT IS PROVED THAT THE EFFECTIVE PRESSURE OF ROCK ON THE LINING IS TO A LARGE EXTENT DETERMINED BY THE CON-


3A 215669

MEMBRANE-ENCAPSULATED SOIL LAYERS

AS A RESULT OF THE DEVELOPMENT OF A DURABLE INEXPENSIVE MEMBRANE, MEMBRANE-ENCAPSULATED SOIL LAYERS (MESL) CONSTRUCTION IS NOW ECONOMICALLY COMPETITIVE WITH CONVENTIONAL PAVEMENT CONSTRUCTION. TESTS HAVE SHOWN THAT SOIL LAYERS CAN BE EFFECTIVELY PROTECTED AGAINST INTRUSION OF MOISTURE WITH AVAILABLE MATERIALS AND EXISTING CONSTRUCTION TECHNIQUES. IT WAS CONCLUDED THAT THE EFFECTS OF RESIDUAL STRESSES INDUCED DURING CONSTRUCTION AND THE DENSIFICATION OF THE ENCAPSULATED MATERIAL DURING TRAFFIC RESULTED IN A STIFFER SYSTEM, WHICH WAS MORE EFFECTIVE IN DISTRIBUTING THE LOAD, THAN WAS PROVEN BY ORIGINAL SOIL PARAMETERS OBTAINED FROM THE AS-CONSTRUCTED CONDITIONS.


3A 215695

TIEBACK WALL CONSTRUCTION RESULTS AND CONTROLS

THE TIEBACKS WERE USED IN CONJUNCTION WITH SOLDIER PILES AND DAGGING TO SUPPORT THE VERTICAL-WALLED EXCAVATION FOR THE OPERATIONS CONTROL CENTER BUILDING ON THE WASHINGTON METROPOLITAN AREA'S RAPID TRANSIT SYSTEM (METRO). UTILIZING WIRE-STRAND TENDONS, THE TIEBACKS WERE ANCHORED IN TERRACE DEPOSITS OF CLAY AND SAND. PRACTICAL TESTING PROCEDURES, WHICH WERE DEVELOPED ON THE JOB TO ENSURE SYSTEM SAFETY WHILE PERMITTING TIMELY EXECUTION OF THE WORK, ARE EXAMINED IN DETAIL. EMphasis IS PLACED ON THE IMPORTANCE OF ESTABLISHING A SYSTEM TO MONITOR THE PERFORMANCE OF TIE-BACK WALLS DURING AND AFTER EXCAVATION.

AC. TIEBACK WALLS ARE EXAMINED IN DETAIL. EMPHASIS IS PLACED ON THE IMPORTANCE OF ESTABLISHING A SYSTEM TO MONITOR THE PERFORMANCE OF TIE-BACK WALLS DURING AND AFTER EXCAVATION.

3A 218693

POST-TENSIONED STRUCTURAL SYSTEMS--DALLAS-Ft. WORTH AIRPORT


3A 215712

CONSTRUCTION OF THE LOISACH BRIDGE--WINTER CONSTRUCTION SITE IN A HALL TO GIVE PROTECTION FROM WEATHER CONDITIONS

AC. TIEBACK WALLS ARE EXAMINED IN DETAIL. EMPHASIS IS PLACED ON THE IMPORTANCE OF ESTABLISHING A SYSTEM TO MONITOR THE PERFORMANCE OF TIE-BACK WALLS DURING AND AFTER EXCAVATION.

Lamberson, EA Precast Concrete Institute Journal Vol. 18 No. 6, Nov. 1973, pp 72-91, 20 Fig

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 215791

UNDERGROUND PIERCING TOOL

A MODERN UNDERGROUND PIERCING TOOL MAKES IT EASY AND EFFICIENT TO INSTALL LINES UNDER ROADWAYS. IT CAN BE PROPELLED THROUGH THE SOIL FOR DISTANCES OF 100 FEET OR MORE WITH REASONABLE ACCURACY. THE SPIRALLY GROOVED NOSECONDE IMPROVES OPERATING PERFORMANCE IN DAMP AND WET SOILS. IT IS POWERED BY A COMBINED COMPRESSED AIR. THE ADVANTAGES OVER OTHER METHODS OF UNDERGROUND PIERCING CAN BE SUMMED UP AS COST SAVING UNDER NORMAL CIRCUMSTANCES.

Florence, HV Frank, JA Vol. 65 No. 2, pp 800-2

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3A 215772

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ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 215727

TUNNELS IN THE TONGARIRO POWER DEVELOPMENT


Davie, J Tunnels & Tunnelling /UK/ Vol. 3 No. 6, Nov. 1971: pp 420-4, 1 Fig, 7 Phot

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 215737

CONSTRUCTION OF THE LOISACH BRIDGE--WINTER CONSTRUCTION SITE IN A HALL TO GIVE PROTECTION FROM WEATHER CONDITIONS

Davie, J Tunnels & Tunnelling /UK/ Vol. 3 No. 6, Nov. 1971: pp 420-4, 1 Fig, 7 Phot

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 215740

DESIGN OF TUNNEL LININGS TAKING ACCOUNT OF THE CONSTRUCTION PROCEDURE

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CONSTRUCTION EQUIPMENT AND METHODS

11. JNELL (MAINLY SEWERAGE) OF LESS THAN 3 M. DIAMETER. THIS QUENTLY BEEN USED FOR THE DRIVING OF TUNNELS

3A 21574G
PRINCIPLES AND PRACTICE OF BITUMINOUS SURFACING-VOLUME 1-SPRAYED WORK-FIRST EDITION IN PART 1, ENTITLED 'PRINCIPLES AND DESIGN OF BITUMINOUS SURFACING', INFORMATION IS PRESENTED UNDER THE FOLLOWING CHAPTER HEADINGS: (1) TYPES OF WORK, (2) MATERIALS, TYPES AND QUALITY, (3) PRIMING, (4) PRIMER-SEALS, (5) SEAL COATS, (6) THE ADHESION OF BINDER TO AGGREGATES, (7) SPECIAL TREATMENTS. PART 2, ENTITLED 'FIELD PROCEDURE FOR BITUMINOUS SURFACING', INCLUDES THE FOLLOWING CHAPTERS: (1) PREPARING FOR WORK, (2) PLANT AND EQUIPMENT, (3) PREPARING THE SURFACE, (4) PREPARING PRIMERS AND BINDERS, (5) SPRAYING OF PRIMERS AND BINDERS, (6) HANDLING AND INCORPORATING AGGREGATE, (7) TRAFFIC CONTROL, AND (8) WORK RECORKS. AMENDMENTS TO VOLUME 1 ARE INCLUDED.

Acknowledgment: Transport & Road Research Lab /UK/

3A 21576G
HOLLAND EVALUATES HYDROVALVING CONCRETE HYDROVALVING, A NEW DEVELOPMENT IN UNDERWATER CONCRETE PLACING, IS BRIEFLY DESCRIBED. THE METHOD USES A FLEXIBLE TUBE AND A POURING TUBE WITH A RIGID CYLINDRICAL SHIELD AT THE BOTTOM. THE WATER PRESSURE FORCES THE FLEXIBLE WALLS AGAINST EACH OTHER WHEN THE PIPE IS EMPTY. THE CONCRETE MOVES DOWNWARD SLOWLY UNDER ITS OWN WEIGHT. CORES WERE DRILLED FROM CONCRETE PLACED UNDER WATER BY VARIOUS METHODS AND SUBJECTED TO COMPRESSIVE STRENGTH TESTS. A COMPARATIVE STUDY IS MADE OF THE COSTS OF METHODS OF PLACING CONCRETE UNDERWATER. /TRRL/

Acknowledgment: Transport & Road Research Lab /UK/

3A 215764

Acknowledgment: Transport & Road Research Lab /UK/

3A 215766

Acknowledgment: Transport & Road Research Lab /UK/

3A 215770
WILL IT STOP AT TWO? THE ARTICLE DISCUSSES IN GENERAL TERMS THE ARGUMENTS FOR AND AGAINST DIFFERING TYPES OF PROPOSED CHANNEL TUNNELS. THESE ARE: 1) BORED TUNNEL, 2) IMMERSED TUBE, 3) COMBINED TUNNEL/BRIDGE, 4) RAIL/ROAD COMBINATIONS, 5) MID-CHANNEL CITY DEVELOPMENT. TECHNIQUES FOR DESIGN AND CONSTRUCTION ARE EXAMINED. A NUMBER OF EXAMPLES ARE GIVEN SUCH AS THE CHESAPEAKE BAY BRIDGE, THE OOSTERSCHELDE BRIDGE, THE HONG KONG TUNNEL, ETC. POLLUTION PROBLEMS ASSOCIATED WITH THOSE HAVING VENTILATION, ESPECIALLY IN LONG TUNNELS AND THOSE HAVING HIGH GRADIENTS FOR RAIL. TUNNELS ARE MENTIONED TOGETHER WITH PROBLEMS ARISING FROM THE DIFFERENCES BETWEEN BRITISH AND CONTINENTAL RAIL LOAD GAUGES, TIDE FLOW AND NAVIGATION, AND SEDIMENT TRANSPORT, AND ITS SOURING EFFECT. /TRRL/

Acknowledgment: Transport & Road Research Lab /UK/

3A 215774

Acknowledgment: Transport & Road Research Lab /UK/

3A 215778
POLYESTER OVERLAYS FOR PORTLAND CEMENT CONCRETE SURFACES- AND DISCUSSION THE USE OF THERMOSETTING POLYESTER RESINS IN PROTECTIVE COATINGS FOR PORTLAND CEMENT CONCRETE /PCC/ SURFACES IS DESCRIBED. SPECIFIC REFERENCE IS MADE TO THE USE OF POLYESTER-AGGREGATE SYSTEMS AS COATINGS ON PCC BRIDGE DECKS. TWO POLYESTER OVERLAY SYSTEMS ARE EXAMINED. ONE USES ORDINARY SEAL COAT APPLICATION METHODS IN WHICH POLYESTER RESIN IS SPRAYED DIRECTLY ONTO A CAREFULLY CLEANED PCC SURFACE.
CONSTRUCTION EQUIPMENT AND METHODS

STONE CHIPS ARE ADDED FOR SKID RESISTANCE. THE SECOND SYSTEM USES A POLYESTER-SAND MORTAR APPLIED AS A 1/4-IN. OVERLAY. THIS TYPE OF SYSTEM ALSO ACTS AS A LEVELING COURSE WHICH ALLOWS READJUSTMENT OF IRREGULAR WEARING SURFACES TO A DESIRED GRADE. SELECTIVE GRADATION OF THE AGGREGATE AND PROPER PROPORTIONING OF THE GRATED AGGREGATE WITH POLYESTER RESIN GIVE A DENSE IMPERMEABLE MORTAR OVERLAY. THE VARIATION OF COMpressive STRENGTH WITH AGGREGATE GRADING IS DEMONSTRATED. THE PROPERTIES OF SELECTED POLYESTER MORTARS ARE EXAMINED IN THE LABORATORY. THE MORTAR IS SHOWN TO REACH 80 PERCENT OF ITS ULTIMATE COMpressive STRENGTH IN LESS THAN 24 HR. THE COMPLETED MORTAR IS ALSO SHOWN TO BE RESISTANT TO HYDROCARBON SOLVENTS. METHODS USED FOR SURFACE PREPARATION AND FOR APPLYING THE POLYESTER OVERLAYS ARE EXAMINED. SPECIAL CONSTRUCTION EQUIPMENT IS DESCRIBED. BOTH OVERLAY SYSTEMS HAVE BEEN SHOWN TO BE EFFECTIVE IN SEVERAL LARGE-SCALE FIELD TESTS. /AUTHOR/

Santucci, IE Highway Research Record, Hwy Res Board 1963

3A 215784 FURTHER STUDIES OF EPOXY BONDING COMPOUNDS SIMULATED COMPOSITE BEAM TESTS ARE BEING USED TO STUDY AN EPOXY FORMULATION. FORMULATION G, FOR HEAVY DUTY STEEL-TO-CONCRETE CONNECTORS IN COMPOSITE BEAMS OF STEEL-TO-CONCRETE. INFORMATION ON THE PHYSICAL PROPERTIES OF A SINGLE EPOXY FORMULATION AS A PLASTIC AND AS AN ADHESIVE WITH DIFFERENT CONDITIONING TEMPERATURE AND CURING TIMES WAS DEVELOPED.

Mikolassy, HA Gonstor, MJ Highway Research Record, Hwy Res Board 1964

3A 215969 BRIDGE EXPANSION JOINT SEALANTS STATE SPECIFICATIONS ARE CONTINUALLY UPDATED INCLUDING DATA IN EFFECT IN JULY 1969. DETAILS AND BEHAVIOR OF 21 DIFFERENT SEALANTS IN APPROXIMATELY 200 VARIOUSLY SHAPED BRIDGE JOINTS ARE ALSO PRESENTED. A MOVEMENT RATING SYSTEM IS DEVELOPED FOR PREFORMED ELASTOMERIC SEALS AND A NOMOGRAPH PRESENTED FOR DETERMINING THE PROPER GROOVE WIDTH TO MATCH THE SEALANT SIZE USED IN A PARTICULAR ENVIRONMENT. CONSTRUCTION DIFFICULTIES ARE DISCUSSED AND GENERAL BEHAVIOR OF THE VARIOUS SEALANTS ARE COMPARED. OVERALL IT WAS CONCLUDED THAT: (1) Poured-IN-PLACE SEALANTS SHOULD ONLY BE USED IN JOINTS EXPERIENCING LESS THAN 1/2 INCH MOVEMENT; (2) PREFORMED ELASTOMERIC SEALS ARE BEST, BUT ARE STILL NOT IDEAL; (3) SAW CUT JOINTS ARE BEST, AND (4) THE JOINT MUST BE PROPERLY DESIGNED AND CONSTRUCTED. /AUTHOR/


ACKNOWLEDGEMENT: Federal Highway Administration, Illinois Dept of TransportationFHWA S0034, NTIS PB 219 405, IC5023491

3A 216108 NEW BRAZING METHOD BY USING THE LOW-PenETRATION CHARACTERISTICS OF INFRA-RED HEAT, NORTHRoP-NORAIR /A DIVISION OF NORTHRoP CORPORATION/ HAS EVOLVED AN IMPROVED PROCESS FOR BRAZING HONEY-COMB SANDWICH STRUCTURES. KNOWN AS NORTR BRAZING, THE NEW METHOD CONSISTS OF USING THE HEAT OUTPUT OF QUARTZ INFRA-RED /QIR/ LAMPS. THE HEAT VULNERABILITY OF QUARTZ LAMP TERMINALS HAS NOW BEEN REDUCED TO THE POINT WHERE THEY WILL REMAIN OPERABLE AS MANY AS 90 HOURS WITH A PART TEMPERATURE OF 3,000 DEGREES F BY MEANS OF SPECIAL CERAMIC TERMINAL INSULATORS AND SHIELDS. BECAUSE HAVING LOW THERMAL CONDUCTIVITY, THE INSULATORS ARE CHANNELED SO THAT GAS COOLANTS CAN BE CIRCULATED TO MINIMIZE THE EFFECTS OF REFLECTED HEAT ON TERMINALS. MADE AS PLUG-IN COMPONENTS, THEY ALSO FACILITATE THE TASK OF INSTALLING OR REMOVING QIR LAMPS.

Welding & Metal Fabrication Jan. 1966

3A 216170 PHILOSOPHY OF SERVICE LIFE IN CULVERT DESIGN THE PHILOSOPHY OF SERVICE LIFE IN THE DESIGN OF CULVERTS HAS CHANGED OVER THE YEARS. WITH THE IMPROVEMENT AND ENLARGEMENT OF OUR HIGHWAY SYSTEM, CULVERT COSTS ARE SIGNIFICANT AND THE SERVICE LIFE OF THESE STRUCTURES DESERVE THE ATTENTION OF DESIGNERS. MANY ENGINEERS USE DURABILITY OF CULVERTS AS THE ONLY MEASURE OF SERVICE LIFE, BUT OTHER FACTORS SUCH AS FLOOD DAMAGE AND CONSTRUCTION METHODS AFFECT THE LIFE OF A CULVERT. EVALUATION OF SERVICE LIFE IN THE DESIGN OF CULVERTS IS A COMPLEX SUBJECT INVOLVING LIFE OF THE HIGHWAY, HAZARDS AND DELAYS TO TRAFFIC, AND COSTS OF CONSTRUCTION, REPLACEMENT, AND MAINTENANCE. COST ANALYSIS AND USE OF COMPARABLE ALTERNATES ON BID SCHEDULES ARE TWO METHODS PROPOSED TO IMPROVE THE ECONOMIC CULVERT WITH A SERVICE LIFE CONSISTENT WITH THE HIGHWAY BEING CONSTRUCTED. FIELD OBSERVATIONS OF THE PERFORMANCE OF CULVERT MATERIAls AND METHODS OF CULVERT SELECTION AS USED BY SOME DESIGNERS ARE EXAMINED. (AUTHOR)


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CONSTRUCTION EQUIPMENT AND METHODS

3A 216364
EVALUATION OF A CONTINUOUS-LOGGING NUCLEAR MOISTURE-DENSITY MEASUREMENT SYSTEM (LANE-WELLS ROAD LOGGER)

3A 216402
DESIGN AND CONSTRUCTION OF SANITARY AND STORM SEwers

3A 216405
JOINTS AND JOINT CONSTRUCTION IN CONCRETE AND PRESTRESSED CONCRETE

3A 216416
CORROSION PROTECTION IN REINFORCED CONCRETE AND PRESTRESSED CONCRETE

3A 216587
QUALITY CONTROL IN CIVIL ENGINEERING

Culley, RW
Saskatchewan Dept Hwys, Regina /Canada/ Mar, 1967

Metal Progress Aug, 1966

460
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DUCED, AND THE CONTINUOUS EVOLUTION OF CONSTRUCTION PROCEDURES, CONTROL IS NOT A ROUTINE PROCESS AS IN OTHER INDUSTRIES. ITS AIM IS TO ENSURE SAFETY AND REDUCE TOTAL COSTS INCLUDING INITIAL TOTAL COSTS, MAINTENANCE COSTS AND COSTS OF CORRECTING DEFECTS. CONTROL IS AN INDIRECT CONTRIBUTION OF IMPROVEMENTS IN CONSTRUCTION TECHNIQUES. EMPHASIS IS LAYED ON THE IMPORTANCE OF CAREFULLY SELECTING THE PARTS OF THE WORK TO BE CONTROLLED, AND THE NEED FOR CONTROLLING MATERIALS CHARACTERISTICS, OPERATING CONDITIONS OF THE EQUIPMENT, SITE ORGANIZATION, PENALTIES TO BE IMPOSED AS A RESULT OF CONTROL, SAMPLING METHODS, AND STATISTICAL CONTROL CHARTS. /LCPC(A)/RRL/

Bouziter, J Bull Liaison Lab Routieh /France/ Sept. 1969

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 216827
INSTALLATION OF PREFORMED NEOPRENE COMPRESSION JOINT SEALS
THE EFFECTIVENESS AND IN-SERVICE PERFORMANCE OF A COMPRESSION JOINT SEAL IS DEPENDENT TO SOME DEGREE UPON PROPER INSTALLATION. TYPICAL COMPRESSION SEAL CONFIGURATIONS ARE, IN REALITY, ELASTOMERIC SEALING DEVICES, EACH WITH A RATED MOVEMENT CAPABILITY, DESIGNED TO FIT INTO A DEFINITE PREDETERMINED GEOMETRIC SHAPE. EMERGENCE IS LAYED TO MACHINES AND RANGES OF MOVEMENTS, SUGGESTED POSITIONING, CONSTRUCTIVE PRACTICE, AND GEOMETRY OF JOINT SHAPES FOR CONTRACTION, EXPANSION, LATERAL, BRIDGE APPROACH AND BRIDGE STRUCTURE JOINTS, ARE ILLUSTRATED AND DEFINED. USE OF LUBRICATION-PHOSPHATES ARE DISCUSSED AND THE GROWTH STRETCH PHENOMENON DESCRIBED WITH SUGGESTED ELONGATION LIMITS TO PREVENT WEAK SPOTS ON THE SEALING DEVICES. WEAR RESISTANCE, JOINT WIDTHS, AND OTHER FACTORS AFFECTING THEIR ELONGATION. AN ANALYSIS OF CURRENT INSTALLATION MACHINES AND PRACTICES: AUTOMATIC, SEMI-AUTOMATIC AND MANUAL IS GIVEN, AND ILLUSTRATIONS OF TYPICAL MACHINES ARE SHOWN. A NEW EUROPEAN APPROACH TO SEAL GEOMETRY AND SEAL POSITIONING WHICH IS ILLUSTRATED GIVES PROMISE OF PROLONGING THE MAINTENANCE FREE LIFE OF JOINTED CONCRETE PAVEMENT.

Watson, SC Am Assoc State Highway Officials Proc Oct. 1967

3A 218634
HOLOGRAPHIC NONDESTRUCTIVE TESTING (HNDT)
SANDWICH STRUCTURES, DISK BRAKES AND NUMEROUS OTHER ARTICLES USED IN TRANSPORTATION CAN NOW BE TESTED NONDESTRUCTIVELY WITH IMPROVED SPEED, ACCURACY AND RELIABILITY. KEY TO THIS VERSATILE NEW METHOD IS HOLOGRAPHIC INTERFEROMETRY, WHICH USES COHERENT LIGHT TO RECORD AND RECONSTRUCT THREE-DIMENSIONAL IMAGES. MINUTE SUBSURFACE ANOMALIES ARE CAUSED BY HEAT, VIBRATION, VACUUM, PRESSURE AND OTHER STRESSES (WELL BELOW THE ELASTIC LIMIT) TO PRODUCE CORRESPONDING MINUTE DEFORMATIONS OF THE TEST-OBJECT SURFACE, WHERE INTERFERENCE-FRINGE ANOMALIES ARE FORMED, AND DRAMATICALLY INDICATE THE POSITIONS, SHAPES AND SIZES OF THE HIDDEN FLAWS. /AUTHOR/

Grant, RM Brown, GM Materials Evaluation Apr. 1969

3A 218680
Futher studies of epoxy bonding compounds
A STUDY IS REPORTED OF AN EPOXY FORMULATION CALLED FORMULATION G WHICH IS SUITABLE FOR APPLICATION IN THE FIELD OF HEAVY CONSTRUCTION. LONG-TIME STUDIES WERE CONDUCTED INVOLVING THE AGING AND DECOMPOSITION CHARACTERISTICS OF THE MATERIAL. SEVERAL EPOXY FORMULATIONS WERE STUDIED. THE FACTORS OTHER THAN STRENGTH WHICH GOVERN THE CHOICE OF A SUITABLE FORMULATION ARE SPRAY-ABILITY, VISCOSITY, BRITTLENESS, ABILITY TO SET IN THE PRESENCE OF WATER, POT LIFE AND RESILIENCY. FORMULATION G SATISFIES ALL OF THESE CONSIDERATIONS FOR THE APPLICATIONS INVESTIGATED. A SIMPLE SHEAR ADHESION TEST, WASHED WHICH IS CONSIDERED RELIABLE FOR PREDICTING THE STRENGTH OF A METAL-TO-CONCRETE ADHESIVE SYSTEM, POWER MIXING WAS FOUND TO BE SUPERIOR TO RANDOM MIXING FOR PREPARATION OF THE COMPONENTS AND FOR MIXING THE COMPONENTS. SANDBLASTING IS THE MOST SATISFACTORY METHOD FOR PREPARING A STEEL SURFACE, AND IS RECOMMENDED FOR COMPOSITE BEAM CONSTRUCTION IN THE FIELD. THE MAJOR STRENGTH OF THE EPOXY FORMULATION IS DEVELOPED WITHIN THE FIRST THREE DAYS. IN USING THE RECOMMENDED FORMULATION, THE CONCRETE SHOULD BE APPLIED WITHIN FOUR HOURS AFTER APPLICATION OF EPOXY TO THE STEEL. TEST RESULTS ARE REPORTED ON CREEP, FATTIGUE ON GLUED JOINTS, IMPACT, STRENGTH GAIN UNDER VARIOUS TEMPERATURES, STRENGTH AND DURABILITY EFFECT OF CHANGES IN FILLER CONTENTS, CATALYSTS, FLEXIBILIZERS, AND DEFORMATION CHARACTERISTICS OF MATERIALS. THE PERFORMANCE CHARACTERISTICS OF FORMULATION G AS A SHEAR CONNECTOR WERE FURTHER STUDIED BY ADDITIONAL COMPOSITE BEAM TESTS. FREEZETHAW CYCLING OF STEEL TO MORTAR ADHESION SPECIMENS DETERMINED TO AFFECT THE COhesive STRENGTH. AN EPOXY ADHESIVE SYSTEM CONSISTING OF 4 SLAB GLUED TO A STEM WITH EPOXY, PROVED EQUAL IN STATIC TESTS ONLY TO MONOLITHIC T-BEAMS OF THE SAME DIMENSIONS. A SINGLE COMPOSITE STEEL-TO-CONCRETE BEAM, USING THE EPOXY AS A SHEAR CONNECTOR DEVELOPED 10/11 OF THE ULTIMATE FLEXURAL STRENGTH OF A LIKE BEAM IN WHICH STUD CONNECTORS WERE USED. THE EPOXY GLUED BEAMS SHOWED A DECREASE IN HIGH LOADS. THE EPOXY FORMULATION PROVED SUPERIOR TO A MORTAR SLIRKY IN A GROUTING APPLICATION AS DEMONSTRATED BY A SERIES OF PULL-OUT TESTS. THE EPOXY WAS MORE EASILY APPLIED, AND SHOVED MUCH GREATER BOND STRENGTH BETWEEN THE STEEL INSERTS AND CONCRETE CORES WHICH WERE TESTED. THE COST OF AN EPOXY FORMULATION FOR USE AS A SHEAR CONNECTING DEVICE IN COMPOSITE CONSTRUCTION IS NOT PROHIBITIVE.

Mklofsky, HA Gonior, MJ Santini, JJ Highway Research Board 1965

3A 219017
STATISTICAL QUALITY CONTROL OF HIGHWAY CONSTRUCTION MATERIALS
THE GREAT INCREASE IN HIGHWAY CONSTRUCTION WORK WHICH WAS EXPERIENCED DURING THE 1950S AND EARLY 1960S RESULTED IN RAPID ADVANCEMENT OF CONSTRUCTION METHODS, WITH EMPHASIS BEING PLACED UPON HIGH PRODUCTION, TESTING AND CONTROL PROCEDURES. THIS TENDENCY TO A SMALLER PRODUCTION IN OVERALL QUALITY. HOWEVER, THE HIGHWAY INDUSTRY WAS CHALLENGED AND, THROUGH REASSIGNMENT OF CONTROL PROCEDURES, IMPROVEMENT IN QUALITY WAS MADE. TO DATE, SPECIFICATIONS HAVE BEEN OF THE ABSOLUTE TYPE WITH CONSIDERABLE RELIANCE BEING PLACED UPON THE EXPERIENCE OF THE ENGINEER AND HIS ABILITY TO SELECT THE REPRESENTATIVEサンプル OF THE PRODUCT. SHORTCOMINGS PARTICULARLY UNDER THE STRESS OF AN INCREASING TEMPO OF CONSTRUCTION AND LACK OF TRAINED INSPECTORS, IN AN ATTEMPT TO IMPROVE SPECIFICATIONS, WAS TAKEN BY THE UNITED STATES BUREAU OF PUBLIC ROADS WHO HELD WORKSHOPS ON QUALITY CONTROL THROUGHOUT THE NATION IN THE FALL OF 1963. AT THESE WORKSHOPS, STATISTICAL QUALITY CONTROL PROCEDURES WERE INTRODUCED, WITH THE OBJECTIVE OF PROVIDING A MEANS OF ASSESSING THE QUALITY OF MATERIALS AND LABOR, AND MAKING AN EFFICIENT USE OF THE AVAILABLE TESTING FACILITIES. THE GOAL OF QUALITY CONTROL IS TO IMPROVE THE EFFICIENCY OF THE CONSTRUCTION PROCESS, AND NOT TO MAKE THE WORK LOVELY. THE USE OF STATISTICAL QUALITY CONTROL METHODS IS NOT LIMITED TO THE HIGHWAY INDUSTRY, AND CAN BE APPLIED TO OTHER INDUSTRIES. /AUTHOR/
CONSTRUCTION EQUIPMENT AND METHODS

SHOPs THE BUREAU PROPOSED THAT THE STATE HIGHWAY DEPARTMENTS RESEARCH THE SUBJECT OF USING STATISTICAL CONTROL METHODS. IN THE SPRING OF 1966, THE CALIFORNIA DIVISION OF HIGHWAYS SUBMITTED A RESEARCH PROPOSAL INTENDED TO DETERMINE THE CONTROL LIMITS TO BE USED IN STATISTICAL SPECIFICATIONS FOR NINE CONSTRUCTION ITEMS. THE RESEARCH HAS BEEN COMPLETED ON THESE NINE ITEMS AND EIGHT INTERIM REPORTS CONTAINING THE FINDINGS RELATIVE TO THESE CONSTRUCTION ITEMS HAVE BEEN COMPLETED, AND ARE LISTED IN BIBLIOGRAPHY. /AUTHOR/

Sherman, GB Watkins, RO California Division Highways May 1968

3A 217030
A CONCEPT OF PREENGINERED, PREFABRICATED, PRESTRESSED MODULAR AND MULTIMODULAR SEALING SYSTEMS FOR MODERN BRIDGES AND STRUCTURES

A SIMPLE-MODULE, MODULAR, AND MULTIMODULAR SEALING SYSTEMS APPEAR TO OFFER LONG-TERM, MAINTENANCE-FREE SOLUTIONS TO NEWLY DEVELOPING PROBLEMS AT BRIDGE JOINTS Brought About By NEW DESIGN SOPHISTICATION. THE NEED FOR ARMORED JOINTS AND THEIR DAMPING EFFECT TOGETHER WITH IMPROVED EMBEDMENT PRACTICES ARE DISCUSSED. UPWARD AND DOWNWARD VERTICAL FORCES, ROTATION, DEFLECTION, AND HORIZONTAL THRUST MOVEMENTS AND THEIR EFFECT ON SEAL SHAPES ARE ILLUSTRATED. THE TYPICAL BRIDGE-JOINT ENVIRONMENT CLEARLY DEMONSTRATES THE NEED FOR HEAVY-DUTY SEAL CONFIGURATIONS. WEB, TOP, AND SIDE MINIMUMS, DEPTH-TO-WIDTH RATIOS, AND PRESSURE-GENERATION REQUIREMENTS ARE PRESENTED AND ANALYZED. SOME METHODS OF RELIABLE DECK TEMPERATURE DETERMINATION AND ADJUSTMENT FOR TEMPERATURE ARE GIVEN. CREEP-SHRINK CALULATIONS AND TESTING OF MODULAR AND MULTIMODULAR SYSTEMS ARE ILLUSTRATED. /AUTHOR/

Watson, SC Highway Research Record, Hwy Res Board 1970

3A 217199
COARSE GRID SANDWICH CONSTRUCTION FOR WELDED STEEL STRUCTURES

BECAUSE OF THE MANY INNOVATIONS BEING MADE IN THE DEVELOPMENT OF MATERIALS AND IN FABRICATION AND CONNECTION TECHNIQUES, SANDWICH CONSTRUCTION FOR WELDED STEEL STRUCTURES MAY SOON BE FEASIBLE. METHODS OF ANALYSIS ARE DISCUSSED ALONG WITH A FABRICATION METHOD THAT MAY LEAD TO ECONOMIC SOLUTIONS. THE COARSE GRID SANDWICH AS DEFINED HERE CONSISTS OF A RELATIVELY COARSE PATTERN OF STEEL BARS FRAMED AND SANDWICHED BETWEEN TWO SHEETS OF STEEL. THIS GENERAL TYPE OF SANDWICH IS PARTICULARLY WELL SUITED FOR WELDED STRUCTURES NOT ONLY BECAUSE OF THE LIKELIHOOD OF THE EXISTENCE OF HIGH SHEAR AND BENDING CONDITIONS BUT ALSO BECAUSE QUALITY OF CORE MATERIAL CAN BE CLOSELY CONTROLLED; SHEAR STRENGTH OF THE CORE CAN BE DESIGNED FOR ANY DESIRED VALUE, AND THE CORE CAN BE LOCALLY REINFORCED AND ITS ARRANGEMENT AND ORIENTATION ALTERED TO SUIT A GIVEN DESIGN. IN GENERAL, SANDWICH MATERIALS CAN BE USED EFFECTIVELY WHERE EITHER LOCAL OR GENERAL INSTABILITY DOES NOT ALLOW THE FULL UTILIZATION OF THE STRENGTH OF CONVENTIONAL MATERIALS. A FEW OF THE POSSIBLE APPLICATIONS IN CIVIL ENGINEERING STRUCTURES WOULD INCLUDE GIRDERS, WELDING BOX GIRDERS, BUILT UP COLUMNS, LOAD CARRYING WALLS, BRIDGE DECKS AND FOLDED PLATES. /AUTHOR/


3A 217309
STRENGTH OF STUD SHEAR CONNECTORS

RESULTs ARE DESCRIBED OF TESTS ON 47 PUSH-OUT SPECIMENS DESIGNED TO STUDY THE STRENGTH OF STUD SHEAR CONNECTORS FOR COMPOSITE STEEL AND CONCRETE CONSTRUCTION. DIFFERENT STUD STEELS, TWO CONCRETE TYPES, AND VARIATIONS IN CONCRETE STRENGTHS WERE EXAMINED; SPECIMENS WITH STUDS OF DIFFERENT DIMENSIONS AND HAVING SLABS WITH AND WITHOUT REINFORCEMENT WERE ALSO TESTED. THE SHEAR STRESS-SLIP CURVES FOR LOW LOADS WERE PREDICTABLE BY MODELLING THE CONNECTORS AS A FLEXIBLE ELASTIC DOWEL ON AN ELASTIC FOUNDATION. FOR HIGH LOADS AN EMPIRICAL EXPRESSION IS DEVELOPED DEFINING THE RELATIVE INFLUENCES OF THE VARIABLES EXAMINED.

Hawkins, NM Inst Engin Civil Eng Trans /Australia/ Vol. 0 No. a1&2, pp 46-52

3A 217446
A STATISTICAL ANALYSIS OF CONCRETE AGGREGATE TEST RESULTS

THE REPORT DESCRIBES A STATISTICAL STUDY TO DETERMINE THE REPRODUCIBILITY OF CURRENT TEST METHODS AND FEASIBILITY OF USING STATISTICAL QUALITY CONTROL PROCEDURES FOR PORTLAND CEMENT CONCRETE AGGREGATE. THREE BRIDGE PROJECTS WERE STUDIED, TEST RESULTS ON RANDOMLY SELECTED SAMPLES WERE STATISTICALLY ANALYZED FOR VARIANCES. THE CONCLUSIONS WERE THAT SAND EQUIVALENT AND CLEANNESS TESTS WERE SATISFACTORY FOR FIELD CONTROL. LARGE VARIANCES OF MATERIAL AND SIZING OPERATIONS INDICATE NEED FOR MODIFICATION OF SPECIFICATIONS. THE REPORT RECOMMENDED THE USE OF MOVING AVERAGE BASED ON THE FIVE MOST RECENT INDIVIDUAL TEST RESULTS. THE REPORT CONTAINS VALUABLE ANALYSIS OF VARIANCE DATA CHARACTERISTIC OF MATERIAL, SAMPLING AND TESTING PROCEDURE. /AUTHOR/

Sherman, GB Watkins, RO Folmar, JJ California Division Highways Hpr, Feb. 1967

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4601123 67)

3A 217576
CRUSHED STONE; PRODUCTION AND GRADATION

IT IS PREDICTED THAT A MILLION TONS PER DAY OF CRUSHED LIMESTONE AND DOLOMITE FOR ROADSTONE AND CONCRETE WILL BE REQUIRED TO SATISFY THE PROJECTED DEMAND FOR EACH OF THE NEXT SEVERAL YEARS. THE EQUIPMENT REQUIRED TO HANDLE THIS TERRIFIC AMOUNT OF CRUSHED MATERIALS AND VARIOUS SIZES IN PRODUCTION EQUIPMENT AND PLANT SITES NECESSARY TO MEET THE CURRENT DEMAND FOR CRUSHED STONE CAN BE ESTIMATED TO BE IN THE BILLIONS OF DOLLARS. IT IS POSSIBLE BY VARYING THE篸IEVE SIZES AND THE AMOUNTS OF MATERIALS PASSING A GIVEN SIEVE TO OBTAIN EITHER AN AGGREGATE CONTAINING ESSENTIALLY A SINGLE SIZE OR ONE HAVING A BALANCED COMBINATION OF DECRASING SIZES WHICH IS COMMONLY TERMED DENSE GRADED. THE MOST COMMON TYPE OF CRUSHED STONE PRODUCED FOR CONCRETE OR HIGHWAY WORK. THE SIMPLIFIED PRACTICE RECOMMENDATION (SPR) WAS INITIATED IN 1948 BY THE BUREAU OF PUBLIC ROADS: (1) TO DEVELOP A MINIMUM NUMBER OF STANDARD AGGREGATE GRADATIONS THAT CAN BE UNIFORMLY ADOPTED NATIONWIDE FOR GENERAL USAGE, WHILE AT THE SAME TIME, RECOGNIZING THE NEED FOR SOME VARIATION BY SPECIAL PROVISIONS TO FIT LOCALLY AVAILABLE MATERIALS, (2) TO ACHIEVE UNIFORMITY IN THE NUMBER AND SIZES OF SIEVES TO BE USED IN SPECIFYING THE AGGREGATE GRADATIONS, AND (3) TO DEVELOP AND ADOPT A SIMPLE AND UNIFORM SYSTEM FOR IDENTIFICATION OF THE STANDARD AGGREGATE GRADATIONS WITH THE ADDITION OF SANDS AND MINERAL FILLERS. THE SPR COULD ADEQUATELY DESCRIBE THE MA-
CONSTRUCTION EQUIPMENT AND METHODS

3A 217707
BLAST-FURNACE SLAG FOR ROADBASES--PART 2
This second part presents construction data, in order to protect the roadbase, a surface dressing strengthened with sand was applied. The penetration of the slag, which had medium hardening properties, was satisfactory although, because of the irregularity of the texture, an excess of bitumen remained in places. Data are presented on laboratory tests, behavior of the experimental section, and advantages of granulated slag. /LTE-LTPC-RRL/

Penna, AC
Carreteras /Argentina/ No. 47, July 1968, pp 12-5, 2 Fig, 5 Tab, 4 Phot, 3 Ref

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 217867
STUDY OF THE FINE AGGREGATES MADE WITH CATIONIC EMULSIONS
Observations are made at the laboratory and track of asphalt mixtures with sand and cationic emulsions used in road paving. A report is to be made of the technological characteristics obtained and the construction technique used in the experimental. Strip of " Bom Despacho" located at Itaparica Island, Bahia as part of the Ferry-boat system Salvador-Itaparica-Nazare. /RRI/

Tavares, P
Road Research Institute /Brazil/ 1970

ACKNOWLEDGMENT: Road Research Institute /Brazil/

3A 217909
ASPHALT SANDS MADE WITH CATIONIC EMULSIONS /IN PORTUGUESE/
A study of fine aggregates with medium rupturing was made using several types of sands. Conclusions made by determining particle size distribution are presented along with construction methods. /RRI/

Tavares, NETO P
Fed Dist Hwy Dept. Salvador /Brazil/ 1970

ACKNOWLEDGMENT: Road Research Institute /Brazil/

3A 217942
MAKE NEW BASE FROM OLD CONCRETE
The equipment used to form the new base consists of two CAT-980 wheel loaders which feed broken rubble to a universal 30 x 42 double-jaw crusher which with its hopper. Makes up the first of two portable units, and minus 4-in. result goes from there to the second portable, consisting of a double-deck 5 x 16 ft screen mounted ahead of a 4-ft. crusher. The closed circuit operation feeds material through the screen until it passes through the top deck, the oversized from the second screen goes to one file, the unders to another. The 75-ft. radial stacker has belt scales so that actual weight of the material can be obtained within half of a percent margin.

Construction Equipment Vol. 49 No. 1, Jan. 1974, p 84, 1 Phot

3A 217950
EXPERIMENTAL ROADWAY HEATING PROJECT ON A BRIDGE APPROACH /AND DISCUSSION/
Electric heating cables were installed with a bituminous concrete resurfacing on the 3 percent grade of the drawbridge approach to aid in snow removal and ice control. The installation operation was designed to produce minimum delay since the drawbridge approach was part of a heavily traveled highway. The methods and equipment and materials for construction are given, installation and operating costs and design data are presented.

Henderson, DJ Highway Research Record, Hwy Res Board 1963

3A 218005
ROADSIDE MAINTENANCE AND ITS EFFECT ON HIGHWAY DESIGN AND CONSTRUCTION
Plots were established on median and cut and fill slope areas to determine the relationships between incidence of erosion, turf density and nitrogen, phosphorous and potassium nutrients applied in varying amounts. Moderate quantities of nitrogen and phosphorous were necessary to prevent the development of bare areas on slopes. Well organized cost/time studies and extensive observations showed that a reduced-controlled mowing program combined with appropriate equipment can reduce mowing cost savings of 25 to 30 percent, on rights-of-way averaging 27 acres of roadside area per mile. This represents an important segment of the maintenance budget. The effectiveness of retardants/growth inhibitors is closely related to time of application. Use of vegetation control chemicals must be carefully undertaken, and proper equipment is essential particularly in areas adjacent to ornamental plants and susceptible farm crops. Karmex and Simazine are effective soil sterilants, when used singly, the amounts needed for vegetation control beneath guardrails are large and costs are high. Karmex plus Wk surfactant and Simazine with Amitrol-T are effective and reasonably safe combinations. To successfully establish plantings of woody species it is essential that a properly prepared planting bed be provided, and that the following factors be considered /A/ proper selection of species /ecological propriety. /B/ good planting techniques. /C/ maintenance during establishment period.

Coffman, B. Edwards, W Ohio State University Ees-185, Jun. 1966

ACKNOWLEDGMENT:

3A 218026
RESEARCH STUDY OF MAINTENANCE OF HIGHWAY OKLAHOMA, 1969
A means has been sought to develop proper consideration of maintenance cost in the design and construction process, to develop required maintenance standards and to develop a reliable method of estimating required maintenance funds on a long-range basis from historical records. Statistical information presented here is described. Thirty four factors are identified that might affect maintenance costs. Results of multiple regression analysis are presented along with other statistical tabulations of maintenance costs by type of construction. Conclusions by the author embrace the following items of significance: (1) yearly expenditures do not adequately represent maintenance performed, (2) routine and special
CONSTRUCTION EQUIPMENT AND METHODS

MAINTENANCE DO NOT APPEAR TO BE WELL DEFINED. (3) RANDOM MILE APPROACH OF OBSERVING MAINTENANCE AND ITS COSTS WAS INHIBITED BY LACK OF RECORDS OF ACTUAL COSTS OF MAINTAINING THE MILES IN THE SAMPLE. (4) VARIOUS DESIGNS AND ENVIRONMENTAL FACTORS SEEMED TO HAVE NO MATHEMATICAL RELATIONSHIP WITH MAINTENANCE COSTS AND (5) AN OBJECTIVE METHOD OF ESTIMATING FUTURE COSTS MUST WAIT FOR A DEFINITION OF THE LEVEL AT WHICH MAINTENANCE WILL BE PERFORMED. /BPR/

Hartcroft, BC

ACKNOWLEDGEMENT: Bureau of Public Roads /US/ (4731572 68)PB 79 250, 1C40021386

3A 218000
SYNTHETIC AGGREGATE SEAL COAST-CURRENT TEXAS HIGHWAY DEPARTMENT PRACTICES

PERSONAL VISITS, QUESTIONNAIRES, AND A REVIEW OF AVAILABLE LITERATURE WERE USED TO IDENTIFY CURRENT STRUCTURAL AGGREGATE SEAL COAT DESIGN AND CONSTRUCTION PRACTICES UTILIZED BY THE TEXAS HIGHWAY DEPARTMENT. PROBLEMS ASSOCIATED WITH THE PERFORMANCE OF SEAL COATS UTILIZING SYNTHETIC AGGREGATES FOR CONCRETE ARE DEFINED. POOR PERFORMANCE ASSOCIATED WITH WET AGGREGATES AND DEGRADATION OF AGGREGATES IS MAINLY RESPONSIBLE FOR POOR RESULTS. SUGGESTED SOLUTIONS TO THESE PROBLEMS ARE PRESENTED INCLUDING: CONTROL OF AGGREGATE QUANTITIES, ROLLING PRACTICES, DESIGN FOR TRAFFIC DENSITY, TRAFFIC CONTROL, AND CONSTRUCTION TIMING RELATIVE TO EXISTING ENVIRONMENTAL CONDITIONS. /FHWA/

Epps, JA Gallaway, BM
Texas Transportation Institute, Texas State Department of Highways & Public Transp Res Rpt No. 83-1, May 1972, 68 pp

ACKNOWLEDGEMENT: Federal Highway Administration FHWA M-0018, NTIS PB 218 550, 4C40021386

3A 218100
DEVELOPMENT OF UNIFORM PROCEDURES FOR ESTABLISHING CONSTRUCTION EQUIPMENT RENTAL RATES

A SURVEY OF STATE HIGHWAY DEPARTMENT PRACTICES DETERMINED THAT THE MAJOR CURRENT USE OF RENTAL RATES IS TO REIMBURSE CONTRACTORS FOR EQUIPMENT COSTS WHEN UNIT PRICES FOR CONSTRUCTION WORK DO NOT APPLY. THE RATES USED REPRESENT MODIFICATIONS OF THE ASSOCIATED EQUIPMENT DISTRIBUTORS RENTAL RATES OR ARE BASED ON THE ASSOCIATED GENERAL CONTRACTORS OF AMERICAS SCHEDULE OF EQUIPMENT OWNERSHIP COSTS. THE USE OF THESE BASES HAS CERTAIN DEFICIENCIES BECAUSE THEY ARE NATIONAL AVERAGES, THEY INCLUDE INAPPLICABLE COSTS, AND SUCH FORMULAE DO NOT ACCOUNT FOR EQUIPMENT USED MAY BE FULLY DEPRECIATED. AN EXAMINATION OF THE BASES REPORTED BY THE STATES LED TO AN IDENTIFICATION OF THE APPROPRIATE EQUIPMENT COSTS AND OTHER FACTORS PERTINENT TO RATE DETERMINATION. A FORMULA TO EXPRESS EQUIPMENT COSTS AS AN HOURLY RATE WAS DEVELOPED. A CASE STUDY WAS MADE TO EXPERIENCE THE PROBLEMS OF APPLYING THE FORMULA AND TO DEMONSTRATE THE DEVELOPMENT OF RENTAL RATES. THE GUIDELINES WERE DEVELOPED ON THE PREMISE THAT THE RATES AT WHICH CONTRACTORS ARE REIMBURSED FOR EQUIPMENT USE SHOULD BE BASED ON ACTUAL COSTS, AND COST INFORMATION SHOULD BE SUSCEPTIBLE TO VERIFICATION BY THE HIGHWAY DEPARTMENT. THE COST SYSTEM OUTLINED CAN BE APPLIED TO THE ACCOUNTING FOR STATE-OR COUNTRY-OWNED EQUIPMENT. RATES USED INTERNALLY FOR THE ALLOCATION OF EQUIPMENT COSTS TO MAINTENANCE DISTRICTS OR OTHER COST CENTERS WOULD BE ON A SIMILAR FULLY-ALLOCATED COST BASIS.

Dudick, TS Ravenacraft, Fl Highway Research Board Nchrp Reports 1966

3A 218200
CONCRETE BRIDGE DECKS' DETERIORATION AND REPAIR, PROTECTIVE COATINGS, AND ADMIXTURES

FURTHER OBSERVATIONS PERTAINING TO THE PERFORMANCE OF CONCRETE BRIDGE DECKS AND VARIOUS MATERIALS EMPLOYED FOR PROTECTION AND REPAIR ARE REPORTED. CONSTRUCTION PRACTICES ARE DISCUSSED IN SUPPORT OF THE BELIEF THAT SCALING IS A MANIFESTATION OF FINISHING PRACTICES AND NOT NECESSARILY AN INHERENT PROPERTY OF CONCRETE. AN HISTORICAL ACCOUNT OF DAMAGE SUSTAINED BY BOTH NEW AND OLD CONCRETE BRIDGE DECKS. REFERENCES CONCRETE, BRIDGE DECKS-DETERIORATION, COATINGS AND REPAIRS, JAS. H. HAVENS AND W.B. DRAKE, FEBRUARY, 1963.

Hughes, RD Scott, JW
Kentucky Department Highways June 1966

3A 218310
SLAVAGING OLD PAVEMENTS BY RESURFACING

THESE REFERENCES ON THE SALVAGING OF OLD PAVEMENTS BY RESURFACING INCLUDE PORTLAND CEMENT OVERLAYS FOR CONCRETE PAVEMENT, INCLUDING AIRFIELDS, PERFORMANCE OF RESURFACE, CONSTRUCTION METHODS AND EQUIPMENT, AND ROAD WIDENING METHODS. THE USE OF EPOXY RESIN AND LATEX MORTARS FOR STRUCTURAL REPAIR OF CONCRETE PAVEMENTS IS DISCUSSED.

Highway Research Information Service Dec. 1968

3A 218344
SLAB JACKING

TO ELIMINATE UNEVENNESS IN THE PROFILE OF A ROAD SURFACE DUE TO SLAB SETTLEMENT, THE FOLLOWING MEASURES CAN BE CONSIDERED: (1) REMOVING SUBSIDING AND BROKEN SLABS, REPLACING THEM BY NEW ONES AND, IF NECESSARY, REINFORCING AND LEVELLING THE BASE AND SOIL BENEATH THE SLABS; (2) OVERSLABBING THE SUBSIDING SLABS; (3) SLAB JACKING THE SUBSIDING SLABS TO THE DESIRED LEVEL. VARIOUS METHODS OF CARRYING OUT THE ABOVE MEASURES ARE DESCRIBED: MECHANICAL LIFTING, COMPRESSED AIR INJECTION TO LOOSEN THE SLABS AND INTRODUCTION OF SAND UNDER PRESSURE TO HOLD THE SLAB AT THE CORRECT LEVEL, AND PRESSURE GROUTING WITH CEMENT MORTAR OR BITUMEN /LCPC/RRL/

European Cement Association /France/ July 1969

ACKNOWLEDGEMENT: Road Research Laboratory /UK/

3A 218417
PAVEMENT WIDENING AND RESURFACING IN IDAHO

MANY MILES OF ASPHALTIC AND PORTLAND-CEMENT CONCRETE PAVEMENTS WERE STRUCTURALLY INADEQUATE AND IN NEED OF IMMEDIATE RECONSTRUCTION IN IDAHO AT THE END OF WORLD WAR II. A PROGRAM OF WIDENING AND RESURFACING WAS INITIATED TO TAKE IMMEDIATE ACTION TO ACCOMMODATE TRAFFIC AND REDUCE MAINTENANCE COSTS. PROCEDURES USED FOR WIDENING AND RECONSTRUCTION OF STRUCTURALLY INADEQUATE ASPHALTIC CONCRETE PAVEMENTS ARE ILLUSTRATED. PORTLAND-CEMENT CONCRETE PAVEMENTS THAT WERE STRUCTURALLY ADEQUATE WERE WIDENED AND RESURFACED AS SHOWN. ALL OF THE RESURFACING PROJECTS WERE GIVEN A SEAL COAT NOT SOONER THAN 10 DAYS AFTER LAYING THE PAVEMENT. CONSTRUCTION METHODS AND PERFORMANCE RESULTS ARE DISCUSSED. IT IS RECOMMENDED THAT THE
CONSTRUCTION EQUIPMENT AND METHODS

ADDED BASE AND STABILIZED BASE BE COMPACTED EQUAL IN DENSITY TO THE EXISTING BASE AND PAVEMENT TO REDUCE GROOVING AND REFLECTIONS OF THE OLD PAVEMENT EDGE. IT IS SUGGESTED THAT BY USING BITUMINOUS STABILIZED BASE A DISTANCE OF ONE FOOT OR MORE OUTSIDE THE FINISHED PAVEMENT WOULD HELP REDUCE PAVEMENT EDGE REFLECTION CRACKS BY INCISING THE EDGE SURGE THUS MAKING THE BASE TO BE OF THE SAME THICKNESS, AND WITH THE SAME MATERIAL AS THE PAVEMENT WOULD HELP. STABILIZING THE CRUSHED BASE WIDENING WITH PORTLAND CEMENT IS SUGGESTED TO ELIMINATE COMPACTION OF THE AGGREGATE BY TRAFFIC. STABILIZATION OF THE WIDENED BASE SHOULD BE FOR THE FULL DEPTH. PORTLAND-CEMENT CONCRETE PAVEMENTS SHOULD HAVE ALL ROCKING AND LOOSE SLABS MUCKED TO PREVENT MUD TRENCHING. IT WAS OBSERVED THAT A MINIMUM OF SIX INCHES OF CRUSHED GRAVEL BASE OVER THE OLD PAVEMENT IS REQUIRED IF REFLECTION CRACKS ARE TO BE ELIMINATED. A UNIFORMITY OF SECTION FULL WIDTH IS RECOMMENDED FOR GOOD RIDING QUALITY.

Erickson, LF Marsh, PA Highway Research Board Bulletin 1956

3A 218573
OPEN-GRADED PLANT-MIXED SEALS
THE OPEN-GRADED PLANT-MIX SEAL IS A CHIP-SEAL AGGREGATE CONTAINING SOME SAND-SIZED MATERIAL WHICH IS PREMIXED IN A PLANT AND HAS RELATIVELY HIGH ASPHALT CONTENT. A GENERAL IMPROVEMENT IN SMOOTH RIDE QUALITY OF SURFACE. A DURABLE SEAL IS PRODUCED WHICH HAS GOOD SKID RESISTANCE QUALITIES. A NUMBER OF WESTERN STATES ARE CONSTRUCTING OPEN-GRADED PLANT-MIXED SEALS AS A STANDARD ON ALL HIGH-QUALITY ASPHALT PAVEMENTS. GRADATION USED AND ASPHALT CONTENT ARE DISCUSSED. AGGREGATE PARTICLES ARE COATED WITH A FILM OF ASPHALT 3 TO 4 TIMES THICKER THAN THAT FOR A DENSE-GRADED MIX. THIS PROVIDES DURABILITY AND RESISTANCE TO MOISTURE IN SPITE OF THE HIGH VOID RATIO. IN CONTRAST TO THE EXTREMELY WIDE RANGE OF SKID RESISTANCE VALUES OF CHIP-SEAL SURFACES, A UNIFORM GOOD SKID-RESISTANCE SURFACE IS PRODUCED. THE LOSS OF SKID NUMBER WITH SPEED IS RELATIVELY SMALL BECAUSE OF THE VOIDS AT THE SURFACE. THE OPEN-GRAD PLANT-MIXED SEAL REDUCES RIDING SURFACE. WHILE A CHIP-SEAL ADDS ROUGHNESS, A SMOOTH PAVEMENT. WITH AN OPEN-GRAD PLANT-MIXED SEAL THERE IS PRACTICALLY NO LOSS OF MATERIAL AND NO FINE PARTICLES TO DAMAGE WINDSHIELDS. SURFACE WATER CAN ESCAPE THROUGH THE VOIDS INSTEAD OF FLOWING OVER THE SURFACE. PAINTED STRIPES ARE MORE VISIBLE AND DURABLE BECAUSE OF THE SURFACE VOIDS. NO CURING IS NECESSARY. LARGE UNDERLYING DEFICIENCIES OR POOR PAVEMENT. ONE OBJECTION TO THE USE OF THE SEAL IS ITS SUSCEPTIBILITY TO OIL DRIPPINGS AT AN EARLY AGE.

Hewett, JW Highway Research Record, Hwy Res Board 1969

3A 218617
TOP DRESSING OR DRY MAINTENANCE ROADS
A RESUME OF PUBLICATIONS, CORRESPONDENCE, CONFERENCES AND FIELD INSPECTIONS, CONCERNING TRAFFIC BOUND SURFACES OF STONE, SLAG, OR GRAVEL SUITABLE FOR THE USE OF 500 TO 600 VEHICLES PER DAY IS PRESENTED. THE USUAL CONSTRUCTION PRACTICE IS TO BUILD A CRUST FIVE OR SIX INCHES THICK BY TRAFFIC COMPACTION IN COMPARATIVELY THIN LAYERS. IT IS MAINTAINED IN SMOOTH RIDING CONDITIONS BY FREQUENT BLADING OR DRAGGING.

Counter, CN Highway Research Record 1928

3A 218628
TREATMENT OF LOW COST ROADS
A DISCUSSION OF BASIC CONSIDERATIONS IN THE CONSTRUCTION OF CRUSHED STONE OR GRAVEL ROADS IS FOLLOWED BY MORE DETAILED EXAMINATION OF TWO EXPERIMENTAL TREATMENTS STUDIED BY SOUTH CAROLINA OVER A THREE-YEAR SPAN: THE DOUBLE SURFACE TREATMENT (BUILDING A BITUMINOUS CARPET OVER AND IN BOND WITH THE TOP-SOIL ROAD SURFACE) AND MIXING TREATMENTS (SCARIFYING AND PULVERIZING THE ROAD SURFACE TO A SUFFICIENT DEPTH, THE ADDING THE BITUMINOUS MATERIAL IN SEVERAL APPLICATIONS WITH SLIGHT DISKING BETWEEN APPLICATIONS).

Pauls, JT Highway Research Board Proceedings 1928

3A 218629
"PUDDLE MACADAM", USING SOFT SANDSTONES
WEST VIRGINIA HAS BEEN EXPERIMENTING WITH A NEW-ROAD CONSTRUCTION METHOD IN WHICH THE PAVEMENT IS CONSTRUCTED AS FOR WATER-BOUND MACADAM UP TO THE POINT WHERE WATER IS ADDED. WHEREUPON THE SURFACE SWEEP FREE OF SURPLUS DUST AND SCREENINGS AND COLD TAR IS APPLIED. THE SPECIFICATION FOR THE TAR IS GIVEN. THE ADVANTAGES OF THE METHOD ARE CONSIDERED TO BE THAT IT PERMITS THE USE OF SOFTER GRADES OF STONE, ECONOMICAL USE OF THE COMPLETE CRUSHER RUN, MINIMAL DELAYS TO TRAFFIC, AND EXCEPTIONAL SURFACE SMOOTHNESS.

Gray, BE Highway Research Board Proceedings 1928

3A 218732
UNDERWATER BUSINESS-CRAWLER GRABS OCTOPUS
THE SCRIPPS INSTITUTION OF OCEANOGRAPHY HAS DEVELOPED A TRACKED, REMOTE-CONTROLLED VEHICLE CAPABLE OF OCEAN BOTTOM OPERATIONS AT DEPTHS UP TO 6,000 FEET. CONTEMPLATED USES ARE UNDERWATER CONSTRUCTION, RETRIEVAL OF SCIENTIFIC INSTRUMENTS, DEEP-SEA SEARCH AND RESCUE, AND GEOLOGICAL INVESTIGATIONS. THE FRAME ATTACHES A LONG JOINTED MANIPULATOR ARM AND OPERATED FROM THE SURFACE BY MEANS OF SONAR AND TELEVISION CAMERAS ON THE VEHICLE.

Constructor Dec. 1970

3A 218801
CONSTRUCTION EQUIPMENT SECTION
RESEARCH ON DEVELOPMENT OF CONSTRUCTION EQUIPMENT INCLUDES: (1) A BIG HOLE DRILLING MACHINE FOR THE FOUNDATION CONSTRUCTION OF LARGE STRUCTURES IN THE SEA; (2) FUNDAMENTAL STUDIES TO DEVELOP AN OPERATORLESS BULLDOZER CONTROLLED AUTOMATICALLY BY PRE-SET PROGRAMS; (3) A DEFLECTOGRAPH TO MAKE POSSIBLE THE MEASUREMENT DEFLECTION OF ROAD SURFACE CONTINUOUSLY AND AUTOMATICALLY; AND (4) A SAND JETTING MACHINE FOR IMMERSED TUNNELS AND AN EXCAVATION SYSTEM ON THE SEA BOTTOM. RESEARCH ON THE ESTABLISHMENT OF WORKING PERFORMANCE AND MAINTENANCE CHARACTERISTICS OF CONSTRUCTION EQUIPMENT CONTAINS: (1) FIELD EXPERIMENTS TO DEVELOP COMPACTED SNOW REMOVAL EQUIPMENT; (2) FUNDAMENTAL INVESTIGATIONS ON COMPACTABILITY AND FINISHABILITY OF THE CONCRETE PAVERS; (3) STUDY OF COMPUTERIZED ESTIMATION ON THE PERFORMANCE EFFICIENCY OF EARTH MOVING EQUIPMENT; (4) STUDIES ON ROCK CUTTING APPLIED TO MECHANICAL BORINGS, USING DRILLING TEST STAND AND A TWO DIMENSIONAL CUTTING APPARATUS; (5) KEEP-AWAY METHODS FOR NOISE AND VIBRATIONS DUE TO THE CONSTRUCTION WORKS; AND (6) OPTIMUM CONDITIONS IN MAN-MACHINE SYSTEMS OF CONSTRUCTION EQUIPMENT.

Public Works Res Inst, Cm Japan/ Sept. 1971, pp 16-7, 1 Fig. 1 Tab
3A CONSTRUCTION EQUIPMENT AND METHODS

3A 219040
HEATER-REMIXER METHOD OF BITUMINOUS SURFACING
THE SPECIFICATIONS FOR THE SURFACING OF 4.7 MILES OF ROADWAY WITH AN AVERAGE WIDTH OF 80 FEET, REQUIRED THE USE OF A SELF-PROPELLED HEATER-REMIXER FIRED BY BUTANE AND CAPABLE OF COVERING 300 SQUARE YARDS PER HOUR, WHILE HEATING THE EXISTING BITUMINOUS SURFACE TO THE EXTENT THAT IT COULD BE SCARIFIED AND REMIXED TO A DEPTH OF NOT LESS THAN 0.75 OF A INCH. CONSTRUCTION PROCEDURE IS DETAILED. THE BITUMINOUS SURFACING WAS APPLIED IN SEVEN ADJACENT PASSES AND REQUIRED 12 WORKING DAYS. THE CONTRACTORS' EFFORTS MEET PROCEDURAL REQUIREMENTS ARE DESCRIBED. THE APPLICATION OF THE ASPHALT REJUVENATING AGENT AND THE SPECIFICATIONS THAT IT IS REQUIRED TO MEET ARE OUTLINED. THE APPLICATION OF THE 0.75-INCH PLANT-MIX BITUMINOUS SEAL IS DESCRIBED. PHOTOGRAPHS OF THE OPERATION ARE PRESENTED AND COMMENTS ARE MADE ON THE COST AND SOME PROCEDURAL PROBLEMS THAT HAVE BEEN ENCOUNTERED.

Kasper, WL Highway Focus Vol. 4 No. 3, Apr. 1972, pp 42-7, 6 Phot

3A 219068
THIN CONCRETE OVERLAY FOR RESIDENTIAL STREETS TO TEST THE FEASIBILITY OF USING THIN CONCRETE OVERLAY IN A RESIDENTIAL LOCATION, A TEST SITE WAS CHOSEN ADJACENT TO AN ASPHALT OVERLAY WHICH COULD SERVE AS A CONTROL SECTION FOR EVALUATION. BRASS COATED AND PLAIN STEEL FIBERS WERE USED AND THE ADDING PROCEDURE FOR THE MIXTURE TO MAKE WET CONCRETE ON THE PAVEMENT AHEAD OF THE FINISHER, THE PAVEMENT HAVING BEEN PREVIOUSLY WET DOWN. PROCEDURAL DETAILS ARE OUTLINED AND PERFORMANCE OVER A 6-MONTH PERIOD IS DISCUSSED. RELIABLE COST DATA ARE NOT AVAILABLE. A SERIES OF QUESTIONS ON THE CONSTITUTION OF THE MIX, PROBLEMS ENCOUNTERED, AND DEVELOPMENT OF STRENGTHS ARE ANSWERED.

Better Roads Vol. 43 No. 4, Apr. 1973, pp 24-6, 4 Phot

3A 219110
WRITE A LEASE THAT WORKS FOR YOU ALL THE AVAILABLE CHOICES OPEN TO RENTERS AND/OR LEASERS OF CONSTRUCTION EQUIPMENT ARE DISCUSSED IN TERMS OF TYPICAL SITUATIONS THAT MIGHT ARISE FOR INSTANCE, IF MAINTENANCE IS TO BE HANDLED SEPARATELY THIS SHOULD BE SPLEND OUT UNDER A "WET" LEASE CLAUSE. SHOULD THE EQUIPMENT BECOME OBSOLETE BEFORE THE LEASE EXPIRES A CANCELLATION CLAUSE, WHICH SHOULD BE CAREFULLY NEGOTIATED PRIOR TO SIGNING THE LEASE, OUGHT TO BE INCLUDED. SHOULD THE DESIRE TO BUY THE EQUIPMENT BE EXPRESSED, THIS TOO SHOULD BE REQUESTED IN A FULL-PAYMENT CONTRACT WITH AN OPTION TO BUY. LIKESLWISH SHOULD USED EQUIPMENT BE DESIRED THEN (1) SECOND-HAND EQUIPMENT SHOULD BE SPECIFIED, (2) LEASED EQUIPMENT CAN BE TRADED AT THE EXPIRATION OF EACH LEASE FOR COMPARABLE NEW EQUIPMENT, (3) A VERY HIGH PURCHASE OPTION CAN BE AGREED UPON, (4) THE EQUIPMENT CAN BE LEASED FROM THE DISTRIBUTOR ON A NON-FULL-PAYMENT BASIS. SHOULD CASH BE QUICKLY NEEDED, SELL SOME EQUIPMENT TO A LEASING FIRM AND THEN LEASE THE SAME EQUIPMENT FROM THE SAME FIRM ON A FULL-PAYMENT BASIS ON THE REMAINING VALUE OF THE EQUIPMENT, SHOULD THE WORK BE SEASONAL THEN, IF POSSIBLE, ARRANGE WITH THE LEASING FIRM FOR THE MONTHLY PAYMENTS NOT TO BE MADE DURING THE MONTHS WHEN NO WORK IS DONE. SHOULD OUTRIGHT OWNERSHIP BE DESIRED, ALTHOUGH THE FINANCIAL SITUATION MIGHT BE SUCH THAT IT IS NOT POSSIBLE, THEN LEASE THE EQUIPMENT WITH AN EARLY TERMINATION OPTION SHOULD A TAX ADVANTAGE BE REQUIRED, DO NOT BECOME AN OWNER, INSTEAD INSERT A RENEWAL CLAUSE INTO THE LEASE.

Construction Equipment Vol. 47 No. 7, June 1973, pp 60-4, 5 Phot

3A 219274
THE ECONOMICS OF HEAVY CONSTRUCTION EQUIPMENT STANDARDIZATION THE PROBLEM OF STANDARDIZATION OF HEAVY CONSTRUCTION EQUIPMENT IS ANALYZED FROM THE VIEWPOINT OF A MEDIUM-SIZED HEAVY CONSTRUCTION COMPANY AND AS VIEWED BY CERTAIN GOVERNMENT ORGANIZATIONS. IT IS HOPED THAT THIS ANALYSIS WILL ACCOMPLISH TWO OBJECTIVES (1) DEVELOP THE SIGNIFICANT FACTORS AND VARIABLES WHICH AFFECT FAMILY STANDARDIZATION OF HEAVY CONSTRUCTION EQUIPMENT, AND (2) OUTLINE A METHOD OF ANALYSIS WHICH CONTRACTORS CAN USE TO IMPROVE THEIR EQUIPMENT POLICY. IT IS CONCLUDED THAT STANDARDIZATION OF EQUIPMENT WILL RESULT IN INCREASED PROFITS. THEREFORE, A FORMAL PROCEDURE SHOULD BE SET UP IN EACH CONSTRUCTION COMPANY TO ANALYZE THE BENEFITS AND SPECIFY THE METHOD OF IMPLEMENTATION OF A FAMILY STANDARDIZATION POLICY ON EACH PROJECT.

Koster, PD Stanford University Sept. 1964 AD5474423.00, 1P41085004

3A 219275
EARTHMOVING TRENDS TO WATCH IN YOUR BUSINESS A REVIEW IS PRESENTED OF EARTHMOVING TRENDS ON SCRAPER FLEET MAKE-UP, MACHINE SIZE PREFERENCES, SELF-LOADING SCRAPERS, ALL-WHEEL-DRIVE /TWIN-ENGINE/ SCRAPERS, TANDEM BOWL RIGS, CRAWLER-DRAWN PANS, RIPPING, EARTH COMPACTORS, AND A FEW WORDS ABOUT THE ROLE OF THE COMPUTER IN THE EVOLUTION OF EARTHMOVING INTO SOME BALANCE OF A BUSINESS-LIKE BUSINESS. A MACHINE THAT MERTS INCREASED CONSIDERATION IN THE LARGER EARTHMOVING FLEETS IS THE TWO-ENGINE UNIT WITH POWER ON TWO AXLES. THE TWIN SCRAPER HAS ESTABLISHED ITSELF AS A LOW-COST PRODUCER ON A WIDE RANGE OF JOBS. TWO-ENGINE SCRAPERS ARE ALSO BEING CONSIDERED FOR THEIR VALUE IN HELPING TO REDUCE UNBALANCED PUSH-LOADING, AS WITH THE PADDLE SCRAPERS A NEW IDEA THAT WILL CAUSE SOME REFINING IS THAT OF LINKED PADDLE-TYPE SCRAPERS. THIS RESULTED FROM THE NEED FOR REDUCING PUSH-LOADING COSTS AND PLANNING THE OVERALL FLEET TO MAKE Push SERVICE MORE EFFICIENT. GREATER USE OF THE LARGE RUBBER-TIRE TRACTOR SHOVEL, FRONT-END LOADER, WHEEL-LOADER IS RECOMMENDED. LARGER, SELF-PROPELLED COMPACTORS THAT REALLY DELIVER THE YARDAGE AND KEEP UP WITH BIGGER SCRAPERS ON THE FILL ARE IN CONSTANT USE NOW. THE USE OF THE ELECTRIC COMPUTER TO CLOSE IN ON THE COMPLEXITIES OF EARTHMOVING EQUIPMENT PRODUCTIVITY AND COST ANALYSIS IS THE MOST RECENT DEVELOPMENT. IT IS EMPHASIZED THAT IT IS IMPORTANT TO HAVE THE BEST EQUIPMENT FOR THE JOBS AT HAND FOR THE MARKET OUTLOOK OF COST REDUCTION.

Rods and Streets Feb. 1967

3A 219279
TO RENT???? OR NOT TO RENT??? THE COSTS AND PROFITS INVOLVED IN AN EQUIPMENT RENTAL BUSINESS ARE ANALYZED AND DISCUSSED. MAINTENANCE DURING THE MONTHLY PAYMENTS NOT TO BE MADE DURING THE MONTHS WHEN NO WORK IS DONE. SHOULD OUTRIGHT OWNERSHIP BE DESIRED, ALTHOUGH THE FINANCIAL SITUATION MIGHT BE SUCH THAT IT IS NOT POSSIBLE, THEN LEASE THE EQUIPMENT WITH AN EARLY TERMINATION OPTION SHOULD A TAX ADVANTAGE BE REQUIRED, DO NOT BECOME AN OWNER, INSTEAD INSERT A RENEWAL CLAUSE INTO THE LEASE.

Arnold, RG Construction Equipment Distribution Jan. 1967
CONSTRUCTION EQUIPMENT AND METHODS

3A 219280

WHERE DO WE GET TO SEE THE PROFIT?

Rental-purchase equipment agreements are discussed and a rental-purchase analysis formula presented. Financing methods for distributors are analyzed. Hidden costs in rental-purchase agreements are discussed.

Bentowski, WT  Construction Equipment Distribution Jan. 1967

3A 219281

A STUDY TO DETERMINE THE FEASIBILITY OF DEFINING EARTHMOVING VEHICLE SYSTEMS BY ANALYTICAL TECHNIQUES.

The feasibility of defining earthmoving vehicle systems by analytical techniques has been demonstrated. The basic methodology and skeletal computer program have been developed to determine the cost/effectiveness advantages of special equipment systems such as those consisting of multipurpose, multifunction vehicles. The computer program developed has verified the analytical approach by structuring a hypothetical vehicle system whose cost for performing a specific airfield construction was substantially less than the cost incurred by each of three specified engineer combat battalions. [ARTICLE]

Jaquish, PE Erickson, GB Jobari, IE
April 1967

AD650764, IP41086234

3A 219289

NEW BELT CONVEYOR UNDER TEST

Government engineers are testing a pilot model of a new type of conveyor belt which wiggles rather than moves—and may open the way to a completely modular system. The material to be conveyed moves along a flexible belt, without any forward movement of the belt itself. This is accomplished by support yokes that move up and down in sequence. This gives an undulatory motion to the belt, which, in turn, imparts a forward motion to material on it. Reportedly, such a system, built in modules, could be quickly and easily lengthened without shutdown or disassembly. Arcs and y's could be formed, and the belt could be designed to negotiate corners and either merge or separate streams of moving materials. [ARTICLE]

Bureau of Mines /US/

Acknowledgment: Washington Science Trends, Dc

3A 219286

1967 RIPPING AND BLASTING RESULTS IN SOUTHWESTERN U.S.A.

Improvements in tractors and ripper's, and in blast-hole drills and explosives have increased production and decreased unit cost in the fragmentation of earth-rock structures. These methods are summarized and results currently in practice presented. Practices are correlated with the seismic shock wave velocities of the structures. Seismograph studies were made of 500 job sites and 200 of the studies correlated with the contractors' and the miners' excavating methods and production. The rocks of southwestern U.S.A. are generally warped, folded, dipped, and faulted by earthquakes and are of igneous, sedimentary, and metamorphic types. The seismograph is an accepted means of measuring the cost of excavation of rocks by deriving: (1) ripping costs and blasting costs which are proportional to the degree of consolidation of the material. (2) consolidation which is proportional to the seismic shock wave velocity of the material, and (3) the cost of preparing the material for movement which is proportional to the shock wave velocity of the earth-rock structure. Tractors are increasing in horsepower and weight, and the parallelgram type ripper is more efficient than the swing type ripper. These factors have increased the production of medium and heavy-duty tractor rippers. The performance and operation of these rippers are reviewed. Averaging production and unit cost equations for both medium and heavy-duty tractor rippers, production varies inversely, approximately as the 3.15 power of the shock wave velocity. The unit cost varies approximately as the 3.15 power. Percussion drills and blasting are also discussed. The selection of ripping or blasting methods depends on the consolidation found in the earth-rock structure. Secondary considerations are method of haulage, thickness of bedding or stratification of the rock.

Church, HK Roads and Streets Sept. 1967

3A 219300

RESEARCH WORK CARRIED BY THE INSTITUTE FOR CONSTRUCTION MACHINERY AND OPERATIONS /IN GERMANY/

The following reports are included in this publication: (1) Annual survey of construction machinery—new developments in concrete mixers and mixing plants, and impressions from American concrete road construction by W. Juricka; (2) Dynamic soil compaction by H. Fincking, H. Prickartz, and R. Sonnenberg; (3) the influence of wetting agents on the compaction of soils by H. Wolf; (4) the influence of the shape of the shoe of tracked vehicles on their power by K. Ogaki; (5) the drainage of fresh concrete by electro-osmosis by W. Kohler; (6) the selection of apparatus for intensive preparation of cement mortar by J. Pick; (7) measurement of moisture in concrete aggregates by W. Slowak; (8) heating and drying processes in mixing plants for heavy-duty engines; and (9) the development of network planning technology in construction operations by R. Seeling /TRRL/.

Technische Hochschule, Aachen /Germany/ 1967

Acknowledgment: Road Research Laboratory /UK/

3A 219309

COMPLETELY MECHANIZED TUNNEL DRILLING MACHINES /IN GERMAN/

A description of a fully-mechanized drilling machine for the construction of tunnels and irrigation canals, mainly built for work in hard rock, is given. The machine is designed for tunnel diameters between 1.90 and 2.20 m. Economics of the machine are discussed. /FG/TRRL/

Titbauer /Germany/ 1967

Acknowledgment: Road Research Laboratory /UK/

3A 219327

DIESEL EXHAUST CONTAMINATION OF TUNNEL AIR

The Bureau of Mines studied air contamination caused by diesel exhaust in a 10,000-ft ventilated tunnel. Sequential air samples were taken at the ends and middle of the tunnel during an operating cycle observed and calculated results for carbon dioxide, carbon monoxide, and nitrogen oxides were essentially in agreement. Nitrogen dioxide
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WAS PRESENT ONLY IN TRACE AMOUNTS. IT WAS FOUND THAT CONTAMINATION WAS RELATED TO THE VOLUME OF VENTILATING AIR, THE NUMBER OF HAULAGE TRIPS, TRAIN SPEED, AND ENGINE LOAD. /AUTHOR/

Holtz, JC Dalzell, RW Bureau of Mines /US/
TN23A45 NO. 7074, IP412101922

3A 219343
FLORIDA STATE ROAD DEPARTMENT TOTAL COST PURCHASING

THE TOTAL COST PURCHASING CONCEPT WAS INVESTIGATED IN FLORIDA TO REFINE ITS PURCHASING PROCEDURES IN REGARD TO HEAVY EQUIPMENT. ACQUISITION AND OPERAITION, WITH PARTICULAR REFERENCE TO THE REPAIR SERVICES AND ACQUISITION OF PARTS. THIS PURCHASING PROCEDURE WAS HELD LEGAL BY THE STATE ATTORNEY GENERAL PROVIDING THAT THE BIDS WERE PUBLIC AND COMPETITION WAS NOT ELIMINATED ON EACH INDIVIDUAL ITEM ADVERTISED. A CHANGE OF FORM WAS MADE IN THE BID BLANK AND LENGTHY SPECIFICATIONS WERE WRITTEN COVERING THE GUARANTEED MAXIMUM TOTAL COST. THE COST OF REPAIRS TO BE INCORPORATED IN THE BID. COPIES ARE PRESENT OF BID PROPOSALS AND OTHER PERTINENT INFORMATION INCLUDING A SAMPLE OF THE BID TABULATIONS.


3A 219353
HIGHWAY CONSTRUCTION EQUIPMENT NOISE HAZARDS

PROLONGED EXPOSURE OF PERSONNEL TO THE INTENSE NOISE PRODUCED BY DIESEL-POWERED HIGHWAY CONSTRUCTION EQUIPMENT CAN CAUSE PARTIAL DEAFNESS AND FIENDS IN HEARING. THIS NOISE MUST BE CONSIDERED IN DETERMINING THE PROBABLE EFFECT ON HEARING. THE SUSCEPTIBILITY OF INDIVIDUALS TO NOISE-INDUCED HEARING LOSS VARIES WIDELY. THE NOISE-INDUCED HEARING LOSS ACCUMULATES GRADUALLY AND IS PERMANENT AND CANNOT BE CORRECTED BY ANY KNOWN MEDICAL TREATMENT OR BY USING A HEARING AID. IT IS A COMPENSABLE OCCUPATIONAL DISEASE IN MANY JURISDICTIONS. SOME REGULATIONS INTENDED TO CONTROL OCCUPATIONAL EXPOSURES THAT CAN CAUSE IT. THE BEST METHOD OF PREVENTION IS TO ELIMINATE HARMFUL NOISE EXPOSURES BY ENGINEERING METHODS OR OPERATING PROCEDURES, WHERE THESE MEASURES FAIL, PERSONAL PROTECTIVE EQUIPMENT CAN BE USED.

Botaford, JH Highway Research Record, Hwy Res Board 1969

3A 219354
SOUND REDUCTION OF EARTH-MOVING MACHINERY

THE FOLLOWING NOISE SOURCES OF EARTH MOVING MACHINERY ARE DISCUSSED: (1) ENGINE NOISE FROM ENGINE EXHAUST, (2) COOLING FANS, (3) NOISE RADIATED BY ENGINE, (4) COMBUSTION AIR INTAKE NOISE, (5) ACCESSORY NOISE, AND (6) OPERATOR LOCATION NOISE. EXPERIENCE HAS SHOWN THAT EXHAUST AND COOLING FAN NOISE HAVE BEEN THE MAJOR PROBLEMS AS AN OBSERVER HEARS A VEHICLE. RADIATION DIRECTLY FROM DIESEL ENGINES CAUSES A DISTINCT SOUND THAT IS ANNOYING TO SOME PRIMARILY BECAUSE OF ITS CHARACTER. THE USE OF TURBO-CHARGERS MAY RESULT IN SOME UNOBTRUSIVE NOISE, PERHAPS BECAUSE NO MUFFLERS ARE USED, AND SOMETIMES BECAUSE THE TURBO-CHARGER OPERATION RESULTS IN EXCESSIVE WHINE. FUTURE TRENDS CALL FOR QUIETER EQUIPMENT OF ALL SORTS.

Groning, JA Highway Research Record, Hwy Res Board 1969

3A 219357
INFORMATION NEEDS FOR CONTROLLING EQUIPMENT COSTS

SOME OF THE VARIATIONS IN EQUIPMENT COSTS ARE PRESENTED AND DISCUSSED. EQUIPMENT MANAGEMENT IS AN INTEGRAL AND INSEPARABLE PART OF CONSTRUCTION MANAGEMENT. THE SOLUTION TO THE EQUIPMENT PROBLEMS DEPENDS ON THE MANAGER'S ACCESS TO FACTS AND TO HIS ABILITY TO USE THEM. THE FUNCTIONS AND INFORMATION NEEDS OF EQUIPMENT MANAGEMENT MAY BE CLASSIFIED AS: (1) SCHEDULING, SELECTION AND REPLACEMENT, (2) PURCHASING AND FINANCING, AND (3) MAINTENANCE. EACH OF THESE FUNCTIONS WHICH MUST CONTRIBUTE TO ATTAINMENT OF THE COMPANY'S GOALS FOR EQUIPMENT MANAGEMENT ARE DESCRIBED AND DISCUSSED. INFORMATION SYSTEMS USING ELECTRONIC DATA PROCESSING EQUIPMENT FOR EACH OF THESE FACTORS ARE ANALYZED. THE INFORMATION SYSTEM MUST PROVIDE THE COMMUNICATIONS NECESSARY TO ATTAIN THE MANAGEMENT GOALS OF ACHIEVING THE OPTIMUM LEVELS OF MOST SUITABLE EQUIPMENT.

Cox, EA Highway Research Record, Hwy Res Board 1969

3A 219358
AVERAGE PRODUCTION RATES FOR MAJOR EQUIPMENT

A CONCISE SUMMARY IS PRESENTED OF AVERAGE PRODUCTION RATES FOR KEY ROAD CONSTRUCTION EQUIPMENT UNITS. THESE RATES WERE DEVELOPED BY ANALYZING DATA FROM FIELD RESEARCH STUDIES CONDUCTED BY THE U. S. BUREAU OF PUBLIC ROADS. THE EQUIPMENT STUDIED WAS OPERATED UNDER A VARIETY OF JOB CONDITIONS AND MANAGEMENT PRACTICES DURING CONSTRUCTION OF SEVERAL HUNDRED HIGHWAY PROJECTS LOCATED THROUGHOUT THE UNITED STATES. EACH TYPE OF KEY EQUIPMENT STUDIED EXPERIENCED LOST TIME DUE TO A VARIETY OF DELAY CAUSES. THE MAGNITUDE OF THESE TIME LOSSES IS REFLECTED IN THE PRODUCTION RATES REPORTED UNDER THREE DIFFERENT TIME CLASSIFICATIONS AS FOLLOWS: (1) PROGRESSIVE TIME RATES, COMPUTED WITH THE TIME FOR ALL DELAYS EXCLUDED, (2) NET AVAILABLE WORKING TIME RATES, COMPUTED BY EXCLUDING ONLY THE TIME FOR INDIVIDUAL DELAYS THAT LASTED 15 MINUTES OR MORE, AND (3) SCHEDULED SHIFT TIME RATES, COMPUTED BY EXCLUDING ONLY THE TIME FOR INDIVIDUAL WEATHER-CAUSED DELAYS THAT LASTED 15 MINUTES OR MORE.

Highway Research Record, Hwy Res Board 1969

3A 219361
CONSTRUCTION AND MAINTENANCE EQUIPMENT

THIRTY-NINE INFORMATIONAL REPORTS ON PERFORMANCE, TIME UTILIZATION, AND COSTS PERTAINING TO EQUIPMENT EMPLOYED ON HIGHWAY CONSTRUCTION AND MAINTENANCE WORK ARE COMPILED IN THIS PUBLICATION. THE REPORTS ARE GROUPED BY MAJOR CATEGORIES OF WORK: (1) PORTLAND CEMENT CONCRETE PAVING, (2) BITUMINOUS PAVING, (3) POWER SHOVEL GRADING, (4) SCRAPER GRADING CRAWLER TRACTOR DRAWN UNITS, (5) OTHER EQUIPMENT, AND (7) HIGHWAY MAINTENANCE OPERATIONS.

Highway Research Board Special Reports 1962

3A 219366
OFF-THE-ROAD TIRES, PART II-MAINTENANCE AND REPAIR PRACTICES

FACTORS AFFECTING TIRE LIFE ARE ENUMERATED AND PROCEDURES FOR THE EXTENSION OF LIFE THROUGH MAINTENANCE, RETREADING, AND REPAIR ARE DISCUSSED. PART I OF THIS SERIES DEALS WITH THE SELECTION CRITERIA FOR VARIOUS DUTIES, GIVING A DESCRIPTION OF THE NUMEROUS TYPES OF TIRES AVAILABLE, ETC. THE FIVE MAJOR FACTORS AFFECTING TIRE LIFE ARE DISCUSSED: (1) DRIVER EDUCATION, (2) VEHICLE MAINTENANCE, (3) ROAD MAINTENANCE, (4) TRUCK OPERATIONAL PROCEDURES, AND
CONSTRUCTION EQUIPMENT AND METHODS

3A 219367
OFF-THE-ROAD TIRES. PART 1
INFORMATION IS PRESENTED ON THE SELECTION, USE, MAINTENANCE AND REPAIR OF OFF-THE-ROAD TIRES. ONE OF THE HIGH COST ITEMS IN MANY OPERATIONS AND CONSTRUCTION PROJECTS, THE SELECTION OF EQUIPMENT AND TIRES IS DISCUSSED IN RELATION TO LOAD, SPEED, DISTANCE, SAFETY, TYPE OF OPERATION, SURFACE CONDITIONS AND ECONOMY. ALSO INCLUDED IS INFORMATION ON TREAD DESIGNS, TIRE CONSTRUCTION, AND TREAD COMPOUNDS. IN THE SECOND PART OF THE SERIES FACTORS AFFECTING TIRE LIFE ARE ENUMERATED AND PROCEDURES FOR THE EXTENSION OF TIRE LIFE THROUGH MAINTENANCE, RETREADING, AND REPAIR ARE COVERED. /AUTHOR /

Clarke, WH
National Crushed Stone Association

ACKNOWLEDGMENT: Canadian Pit and Quarry

3A 219369
AUTOMATIC GRADER OPENS WAY TO FAST SIDEWALK CONSTRUCTION
A NEW TRACK-MOUNTED FINE-GRADING MACHINE ADVANCES 5 FEET PER MINUTE AS IT LEVELS THE EARTH TO FINAL ELEVATION FOR A CONTRACTOR INSTALLING SIDEWALKS IN MINNESOTA. GUIDED BY A SENSOR, THE MACHINE AUTOMATICALLY ESTABLISHES A PRECISE GRADE, CUTTING THE EARTH TO A SELECTED DEPTH AND FEEDING IT INTO A CONVEYOR FOR DISCHARGE AT THE REAR. THE FINE GRADER INCREASES PRODUCTION 15 TO 30% AND ELIMINATES OTHER RIGS, THREE LABORERS, AND VIRTUALLY ALL HAND WORK.

Construction Methods & Equipment Dec. 1969

3A 219384
PART 2: REPLACE FOR MORE PROFIT
REPLACEMENT OF CONSTRUCTION EQUIPMENT CAN BE DECIDED UPON BY ONE OF THE FOLLOWING THREE METHODS: REPLACEMENT BY INTUITION, REPLACEMENT FOR MINIMIZING COSTS, OR REPLACEMENT FOR MAXIMIZING PROFITS. A SUMMARY IS PRESENTED OF THE DECISIONS REACHED BY THE THREE METHODS IN SOLVING AN EXAMPLE PROBLEM. A DISCOUNTED CASH FLOW MATHEMATICAL MODEL WAS DEVELOPED WHICH IS DESCRIBED. IN MAKING DECISIONS ABOUT EQUIPMENT POLICY, THE FOLLOWING FACTORS ARE CONSIDERED: (1) TIME VALUE OF MONEY, (2) TECHNOLOGICAL ADVANCES IN EQUIPMENT (OBsolescence), (3) EFFECT OF TAXES (DEPRECIATION TECHNIQUES, ETC.), (4) INFLUENCE OF INFLATION, INVESTMENT CREDIT, GAIN ON SALE, (5) INCREASED COST OF BORROWING MONEY, (6) CONTINUING REPLACEMENTS IN THE FUTURE, (7) INCREASED COST OF FUTURE MACHINES, AND (8) EFFECT OF PERIODIC OVERHAUL COSTS AND REDUCED AVAILABILITY. THE OPTIMIZATION OF PROFITS IS THE KEY TO THE SOLUTION OF MOST PROBLEMS BY USING A COMPUTER MODEL. ANOTHER MATHEMATICAL MODEL IS PRESENTED IN WHICH REVENUES AND COSTS ARE CONSIDERED FOR ALL MACHINES. THE REVENUES AND COSTS ARE CLASSIFIED AS: (1) REVENUES FROM THE SERVICES OF THE MACHINES, (2) MAINTENANCE AND OPERATING COSTS, INCLUDING ANNUAL FIXED COSTS, PENALTIES AND OVERHEAD, (3) CAPITAL COSTS, INCLUDING INTEREST ON INVESTMENTS, DEPRECIATION CHARGES, AND INTEREST ON BORROWED FUNDS, (4) DISCRETE COSTS SUCH AS ENGINE, TRACK, AND FINAL DRIVER OVERHAULS, AND (5) INCOME AND CORPORATION TAXES, CONSIDERING DEPRECIATION METHOD, RECAPTURE OF INCOME ON SALE AND INVESTMENT CREDIT. THESE MATHEMATICAL MODELS HELP IN PROPER ANALYSIS OF EQUIPMENT WHICH IS BASIC IN THE DEVELOPMENT OF SOUND REPLACEMENT POLICY. REPLACEMENT POLICY.


3A 219389
CHANGES IN THE EQUIPMENT INDUSTRY
THE USE OF CMI EQUIPMENT IS DESCRIBED IN MARKING GRADE, TRIMMING GRADE, SPREADING MATERIALS, STABILIZATION, CONCRETE AND ASPHALT PAVING. AUTOMATED GRADING EQUIPMENT (AUTOGRADE) CAN PLACE EACH DAY ALL OF THE ROCK, SOIL, CEMENT, ASPHALT OR CONCRETE THAT CAN BE HAULED. THE MACHINE CAN GRADE 1/2 TO 2 MILES OF SUBGRADE PER DAY OR CAN FINE TRIM AS MUCH AS 6 TO 7 MILES PER DAY OF MATERIAL THAT IT HAD PREVIOUSLY SPREAD. THE SAME MACHINE WITH SLIGHT MODIFICATIONS CAN DO LIME, CEMENT, AND ASPHALT STABILIZATION. IT CAN DO AERATION AND MIXING OF SUBGRADE SOILS OR OF BASES. THE SAME MACHINE WITH A HEATED COMPACTING SCREW CAN DO BASE AND SUBBASE WORK AND CAN PLACE ASPHALT IN FULL WIDTH COURSES. WITH THE SLIPFORM MODIFICATION IT CAN DO FULL WIDTH PAVING, CAN PAVE WITH OR WITHOUT FORMS, CAN DO WIDENING AND HAS BEEN USED BY SEVERAL CONTRACTORS FOR SLIPFORMING RAMPS. AUTOMATED EQUIPMENT IS CAPABLE OF ACCURATE GRADE MAKING. THE CMI EQUIPMENT OPERATES USING SIX SENSORS, ONE FOR THE FRONT TRACK STEERING, ONE FOR THE REAR TRACKS, ALLOWING THE NEGOTIATION OF SHORT RADIUS CURVATURES. FOUR SENSORS, ONE AT EACH CORNER, MAINTAIN GRADE TAKEN FROM STRINGLINE OR SKIS. THE SENSORS ARE ALIKE AND ARE DIRECT CURRENT TWO-CONTACT ROTARY SWITCHES WHICH ACTIVATE SOLENOID VALVES EQUIPPED WITH HYDRAULIC LOCKS TO PREVENT LEAKAGE. THE SOLENOID VALVES IN TURN CORRECT FOR GRADE OR ALIGNMENT BY ADJUSTING TWO WAY HYDRAULIC CYLINDERS. FLOW TO THE CYLINDER IS CONTROLLED BY VALVES TO INCREASE OR DECREASE THE REACTION RATE. AUTOMATED EQUIPMENT MAY BE USED TO SPREAD UNIFORM COURSES OF MATERIALS SUCH AS PUGMILLED AGGREGATE OR SOIL CEMENT METERED AHEAD OF THE MACHINE BY WINDROW BOXES. IN THE WEST, HIGH SPEED PROJECTION OF BASE IS PERFORMED BY DUMPING AHEAD WITH BELLY-DUMP UNITS, SPREADING WITH AN AUTOGRADE, ALLOWING EXCESS MATERIAL TO FLOW OUT THE REAR MOLDBOARD CENTER WINDOWS WHERE IT IS RECLAIMED AND HAULED AHEAD. THE RECLAIMING OF THIS MATERIAL MAY BE DONE BY A BELT WHICH IS A NORMAL PRACTICE IN MISSOURI. MATERIALS MAY BE METERED INTO THE MACHINE BY THE USE OF A JERSEY TYPE OF THESE ATTACHMENTS AS POSSIBLE, ESPECIALLY THE HYDRAULIC PLACING HOT MIX ASPHALT BASES, BINDER, AND SURFACE COURSES. AUTOMATIC FOUR-CORNER GRADE CONTROL AND FRONT AND REAR STEERING ARE USED EFFECTIVELY IN SLIPFORM PAVING FOR SPREADING, PAYING AND FINISHING. MESH DEPRESSORS CAN BE AUTOMATED AND CROWN CHANGES THROUGH TRANSITION SECTIONS CAN BE DONE AUTOMATICALLY.

Minor, WH Ohio Highway Engineering Conf Proc pp 143-149, Apr. 1969

3A 215995
MARKET RESEARCH OF THE BRAZILIAN HIGHWAY EQUIPMENT
A SURVEY WAS MADE OF THE NATIONAL MANUFACTURING OF HIGHWAY EQUIPMENT. /RRI/

Botelho, CM
Road Research Institute /Brazil/ 1967

ACKNOWLEDGMENT: Road Research Institute /Brazil/
CONSTRUCTION EQUIPMENT AND METHODS

3A 219396
CONTRIBUTION TO THE STUDIES AND CODIFICATION OF LUBRICANTS, FUELS, AND HYDRAULIC FLUIDS FOR HIGHWAY EQUIPMENT.

THE NEED IS EMPHASIZED OF ESTABLISHING A CENTRAL AGENCY OF LUBRICATION IN THE HIGHWAY AGENCIES, WHICH WOULD UNDERTAKE THE STUDY AND SOLUTIONS OF THE PROBLEMS CONCERNED WITH LUBRICANTS. DETAILED REFERENCES TO ITS ORGANIZATION ARE GIVEN. TWO MANUALS ARE AVAILABLE WITH TREATMENT, COMPOSITION, ETC. OF LUBRICANTS. THE OTHER IS CONCERNED WITH INSTRUCTIONS FOR ACQUISITION, STORAGE, HANDLING, REVIEWING, ETC. FINALLY, THE AUTHOR PROPOSES THE ADOPTION OF A CODE FOR THE STANDARDIZATION OF LUBRICANTS, DEVELOPED BY THE CENTRAL AGENCY OF LUBRICATION. THE CODE SHOULD BE USED FOR TABLES OF GENERAL RECOMMENDATIONS AND IN SPECIFICATIONS OF EACH TYPE OF VEHICLE IN LUBRICATION SYSTEMS.

Burger, PE
National Highway Department /Brazil/ 1962

ACKNOWLEDGMENT: Road Research Institute /Brazil/

3A 219397
ELEVATING SCRAPERS PROVE VALUE IN HIGH-PRODUCTION JOBS.

ELEVATING SCRAPERS HAVE AN HourLY PRODUCTION CAPACITY LESS THAN COMPARABLY RATED CONVENTIONAL SCRAPERS, BUT THEY HAVE THE EFFICIENT CHARACTERS OF BEING SELF-LOADING WHICH IS MORE ECONOMICAL IN MANY MANY MOBILE MOVING SITUATIONS. SELF-LOADING SCRAPERS ARE WORKING IN HIGHWAY CONSTRUCTION, DAM AND WATER CONTROL PROJECTS, AIRPORT CONSTRUCTION, AS WELL AS IN RESIDENTIAL AND COMMERCIAL BUILDING SITE DEVELOPMENTS. ABOUT 4 TO 5 INCH DEPTH OF PENETRATION IS PERFORMED BY THE CUTTING EDGE. THIS BOLDS THE MATERIAL UP IN FRONT OF THE ELEVATOR FLIGHTS, AND MOVING FLIGHTS SWEEP IT INTO THE SCRAPER BOWL. THIS LOADING SWEEPING ACTION REQUIRES FAR LESS HORSE POWER THAN PUSHING A CONVENTIONAL SCRAPER, BECAUSE THE MATERIAL ENTERING THE BOWL IS ALWAYS BEING PLACED ON TOP OF THE INCREASING LOAD. FIELD WEIGHT STUDIES OF THE CATERPILLER 32-CUBIC-YARD-CAPACITY ELEVATING SCRAPER DEMONSTRATE THE ABILITY TO LOAD A WIDE RANGE OF MATERIALS. ELEVATOR SPEEDS SHOULD BE CORRELATED WITH THE LOADING CHARACTERISTICS OF THE MATERIAL. ALL LOADING SHOULD BE DONE IN FIRST-GEAR TORQUE-CONVERTER DRIVE FOR MAXIMUM RIM-PULL WITH MINIMUM WHEEL SLIPPAGE. TO ASSIST IN LOADING AND CONTAINING SAND, OTHER GRANULAR MATERIALS WITH LOWER MOISTURE BARRIERS ARE AVAILABLE WHICH CAN BE FITTED BEHIND THE ELEVATOR. THESE REDUCE LOSS OF MATERIAL OVER THE FRONT OF THE CUTTING EDGE. UTILITY APPLICATIONS FOR THE ELEVATING SCRAPER ARE FINSISH GRADING, HAUL ROAD MAINTENANCE, SLOPE WORK, CLEAN-UP WORK, INTERCHANGE LANDSCAPING, REPLACING STRIPPED TOPSOIL, STRIPPING AND LOADING ASPHALT PAVEMENT AND MANY OTHER JOBS.

Roads and Streets Apr. 1969

3A 219398
A STUDY OF THE HIGHWAY CONSTRUCTION EQUIPMENT INDUSTRY IN CONNECTION WITH THE CONTINUING HIGHWAY PROGRAM: THE AASHO-ARBA JOINT COOPERATIVE COMMITTEE PREPARED A REPORT TO IDENTIFY PROBLEM AREAS WHICH MIGHT NEED SPECIAL ATTENTION IN CONNECTION WITH THE FUTURE HIGHWAY PROGRAM. THE DATA PRESENTED WAS DRAWN ESSENTIALLY FROM HIGHWAY CONSTRUCTION EQUIPMENT INDUSTRY SOURCES WITH THE COOPERATION OF HIGHWAY OFFICIALS. THE REPORT RELATES SPECIFICALLY TO THE HIGHWAY CONSTRUCTION EQUIPMENT INDUSTRY REQUIREMENTS ANTICIPATED FOR THE YEARS BETWEEN 1975 AND 1985; THE STUDIES WILL ALSO BE USEFUL AS AN OVERVIEW OF PRODUCTION AND CAPACITY TRENDS.

/AUTHOR/

American Road Builders Association July 1970

3A 219403
EQUIPMENT FOR STABILIZED BASE CONSTRUCTION.

EQUIPMENT AND TECHNIQUES ARE DESCRIBED FOR SOIL COMPACTION AND SOIL STABILIZATION OF THE ADDITIVE AND MECHANICAL TYPES. THE IMPORTANCE IS EMPHASIZED OF SELECTION DURING MATERIAL HANDLING AND DURING THE BLENDING AND MIXING OPERATION. THE FOLLOWING EQUIPMENT IS DESCRIBED AND ILLUSTRATED: MIXING AND BLENDING EQUIPMENT WITH ITS OWN LUBRICATION SYSTEM; A METERED FLUID DISTRIBUTOR WITH SPRAY BAR; MEANS OF RAPID DRYING OF OVER-WET MATERIALS BY AERATION; HIGH SPEED, OPEN SEGMENTED WHEEL, SHEEPFOOT ROLLER; A HIGH SPEED ROLLER EQUIPPED WITH PAD TYPE WHEEL; A PNEUMATIC ROLLER USED IN HIGHWAY CONSTRUCTION; A TANDEM STEEL WHEEL ROLLER USED PRIMARY FOR SURFACE ROLLING OF ASPHALTIC CONCRETE; AND HEAVY CLAY CUSHIONED WITH A PULVI-MIXER.

Trainor, MJ Ohio Highway Engineering Conf Proc Apr. 1967

3A 219404
AUTOMATIC CONTROLS ON CONSTRUCTION EQUIPMENT: STATE OF THE ART.

THE USE OF ELECTRONIC DEVICES FOR AUTOMATIC CONTROL OF CONSTRUCTION EQUIPMENT HAS INCREASED STEADILY SINCE THE INCEPTION IN 1956. SEVENTY PERCENT OF THE STATE HIGHWAY DEPARTMENTS IN THE UNITED STATES HAVE REQUIRED AUTOMATIC CONTROL AT SOME TIME OR ANOTHER, AND 65 PERCENT REGULARLY SPECIFY AUTOMATICALLY CONTROLLED EQUIPMENT. HIGHWAY DEPARTMENTS IN CANADA HAVE BEEN LEADERS IN THE USE OF AUTOMATIC CONTROL, AND UNITED STATES AND EUROPEAN PLANT MANUFACTURERS ARE EXPERIENCING AN INCREASING DEMAND FOR ELECTRONIC GUIDANCE SYSTEMS ON ROAD CONSTRUCTION MACHINERY. A DESCRIPTION OF TYPICAL ELECTRONIC CONTROL DEVICES NOW ON THE MARKET IS INCLUDED IN THIS EVALUATION. EXAMPLES ARE GIVEN OF THE SMOOTHNESS THAT MAY BE EXPECTED WITH ELECTRONICALLY CONTROLLED PAVERS WHEN CONDITIONS ARE FAVERAGED BY GOOD WORKMANSHIP AND GOOD EQUIPMENT. ALTHOUGH AUTOMATIC CONTROLS REDUCE THE DEPENDENCE ON OPERATING PERSONNEL, THERE IS INJECTED THE ADDED PROBLEM OF SETTING AND MAINTAINING THE CONTROLS. PERSONNEL PROPERLY TRAINED IN AUTOMATIC CONTROLS MUST EBE AVAILABLE ON THE JOB.

/AUTHOR/

Bower, LC Gerhardt, BB Highway Research Record, Hwy Res Board 1970

3A 219454
DEVELOPMENT OF EQUIPMENT FOR HIGHWAY CONSTRUCTION.

ALTHOUGH THIS JOINT HRC/ARBA COMMITTEE WAS ORGANIZED SOME YEARS AGO, ITS WORK WAS SEVERELY CURTAILED BY THE WAR, AND THE 26TH ANNUAL MEETING WAS ITS FIRST OPPORTUNITY SINCE THEN TO MAKE A MAJOR ASSESSMENT OF THE HIGHWAY EQUIPMENT FIELD. A TWO-DAY CONFERENCE WAS ATTENDED BY 115 REPRESENTATIVES FROM 15 STATES; ITS PURPOSE WAS LARGELY TO AQUAINT MANUFACTURERS WITH THE NEEDS OF ENGINEERS AND CONTRACTORS. THE MAJOR TOPICS OF DISCUSSION ARE NOTED BRIEFLY.

CONSTRUCTION EQUIPMENT AND METHODS

3A 219462
HOW TO SPECIFY A LOADER: SIZING IT TO PRODUCTION REQUIREMENTS
THE WHEEL LOADER MARKET IS HIGHLY COMPETITIVE, WITH OVER 30 MANUFACTURERS PRODUCING MORE THAN 100 DIFFERENT MODELS, OF WHICH ABOUT 75% ARE SPECIFICALLY DESIGNED AND MANUFACTURED FOR THE CONTRACTOR END USE MARKET. A SYSTEMATIC ANALYSIS MUST BE MADE IN ORDER TO CHOOSE THE LOADER OR MIX OF LOADERS APPROPRIATE FOR A GIVEN JOB OR TYPE OF ACTIVITY. THE ELEMENTS OF SUCH AN ANALYSIS ARE JOB CONDITIONS, CALCULATION OF LOADER PRODUCTION, BUCKET CAPACITY, AND CORRECTION FACTORS FOR EFFICIENCY. MEANS OF QUANTIFYING THESE ELEMENTS AND RELATING THEM IN AN ARITHMETIC EQUATION ARE GIVEN.

Thomson, P
Public Works Vol. 103 No. 3, Mar. 1972, pp 64-6, 3 Tab

3A 219466
STOP EQUIPMENT NOISE
TWO CHARTS SHOW CONSTRUCTION EQUIPMENT NOISE LEVEL DECIBELS AT 50 FEET AND THE ESTIMATED LEVELS OBTAINABLE BY SELECTING QUIETER PROCEDURES OR MACHINES AND IMPLEMENTING NOISE CONTROL FEATURES REQUIRING NO MAJOR REDESIGN OR EXTREME COST. THE FOUR BASIC WAYS TO CONTROL NOISE POLLUTION ARE: STOP IT AT THE SOURCE, BLOCK IT, MOVE IT AWAY, AND USE SOMETHING QUIETER. EXAMPLES OF RECENT DEVELOPMENTS ALONG THESE LINES ARE REPORTED.

Construction Equipment Vol. 46 No. 1, July 1972, pp 32-5

3A 219491
CONTRACTORS-MEASURE THAT NOISE
THE OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA) ESTABLISHES SOUND LEVELS THAT MUST NOT BE EXCEEDED FOR A GIVEN AMOUNT OF TIME PER DAY UNLESS THE CONTRACTOR PROVIDES MEANS OF PROTECTING THE WORKERS FROM THE NOISE. THE PRESENT ARTICLE AFFORDS CONTRACTORS SOME BASIC INFORMATION ABOUT THE MEASUREMENT OF NOISE; THE CONSTRUCTION, OPERATION, AND CARE OF NOISE LEVEL Meters; MEANS OF REDUCING EQUIPMENT NOISE AT THE SOURCE; AND MATERIALS THAT CAN BE USED TO BLOCK OR ABSORB SOUND.

Constructor Vol. 54 No. 7, July 1972, pp 18-22, 1 Tab

3A 219494
CATERPILLAR PERFORMANCE HANDBOOK EDITION 3
MACHINE PERFORMANCE MUST ULTIMATELY BE MEASURED IN UNIT COST OF MATERIAL MOVED. A MEASURE THAT INCLUDES BOTH PRODUCTIVITY AND COSTS. FACTORS BEARING DIRECTLY ON PRODUCTIVITY INCLUDE SUCH THINGS AS WEIGHT TO HORSEPOWER RATIO, CAPACITY, TYPE OF TRANSMISSION, SPEED, AND OPERATING COSTS, WHICH THIS PERFORMANCE HANDBOOK CONSIDERS IN DETAIL. THERE ARE OTHER LESS DIRECT PERFORMANCE FACTORS FOR WHICH NO TABLES, CHARTS OR GRAPHS ARE POSSIBLE. SERVICEABILITY, SAFETY, PARTS AVAILABILITY, AND OPERATOR CONVENIENCE ARE EXAMPLES. MANY SECTIONS OF THE HANDBOOK INCLUDE TABLES OR CURVES SHOWING CYCLE TIMES OR HOURLY PRODUCTION FIGURES FOR CATERPILLAR MACHINES UNDER CERTAIN CONDITIONS. STATEMENTS OF CONCLUSIONS ALWAYS INCLUDE MEANS OF REDUCING EQUIPMENT NOISE AT THE SOURCE, AND MATERIALS THAT CAN BE USED TO BLOCK OR ABSORB SOUND.

Results indicated in the handbook tables by appropriate factors to allow for the anticipated actual job efficiency, operator efficiency, material characteristics, haul road conditions, altitude, and other factors which may reduce performance or production on a particular job. /Author/
Caterpillar Tractor Company Jan. 1973

3A 219501
MAINE DOT USES DIESEL POWER
ALTHOUGH PAYING THE WAY FOR EVENTUAL DIESELIZATION OF THE FLEET OF HIGHWAY MAINTENANCE AND CONSTRUCTION EQUIPMENT WAS STARTED IN 1935, THE MOST SIGNIFICANT TRANSITION FROM GASOLINE TO DIESEL POWER INVOLVED THE DEPARTMENT'S LARGE FLEET OF DUMP TRUCKS EACH OF WHICH IS EQUIPPED FOR WINTER SERVICE INCLUDING SNOW REMOVAL AND ICE CONTROL. TWO HUNDRED AND FIFTY UNITS POWERED BY DOMESTIC ENGINES AND SMALLER CLASS VEHICLES HAVE BEEN USED. SIX YEARS OF TEST, EVALUATION AND COMPARISON HAVE PROVED THAT THE DIESEL IS COMPLETELY ADAPTABLE FOR PATROL DUTY AT A SUBSTANTIAL DECREASE IN FINAL OPERATING COST. FINAL COMPARATIVE ANALYSIS REVEALED A TOTAL ENGINE OPERATING AND REPAIR COST AVAILABILITY FOR THE DIESEL, COMPARED WITH $1.0411 FOR THE GASOLINE UNITS. INCREASINGLY RIGID ECOLOGY STANDARDS PROMPT UTILIZING DIESEL POWER UNTIL A SUPERIOR, CHEAPER SOURCE OF POWER IS READILY AVAILABLE. ALTHOUGH IMPROVEMENTS IN PERFORMANCE, DEPENDABILITY AND LONGER ENGINE LIFE ARE IMPORTANT, SAVINGS IN FUEL COST IS SEEN TO BE THE PRIMARY JUSTIFICATION FOR DIESELIZATION.

Vigue, RF
Public Works Vol. 103 No. 11, Nov. 1972, pp 66-9, 2 Tab, 5 Phot

3A 219502
EQUIPMENT PLUS INFLATION EQUALS LOSS
A COMPUTER AND A MATHEMATICAL MODEL CAN CLARIFY THE ECONOMICS OF EQUIPMENT OWNERSHIP, AIDING CONTRACTORS IN DETERMINING THE EFFECTS INFLATIONARY CHANGES SHOULD HAVE ON THEIR EQUIPMENT POLICIES. IN DEVELOPING THIS MATHEMATICAL MODEL, A GROUP OF EQUATIONS IS WRITTEN TO SIMULATE THE COSTS OF OWNING, MAINTAINING, AND OPERATING CONSTRUCTION MONEY, OBSOLESCENCE, DEPRECIATION TECHNIQUES, INFLUENCE OF INFLATION, COST OF BORROWING MONEY, CONTINUING FUTURE REPLACEMENTS AND INCREASED COST OF FUTURE MACHINES. /Author/

Douglas, J
Constructor Vol. 55 No. 4, Apr. 1973, pp 22-5

3A 219503
EFFECT OF CONSTRUCTION EQUIPMENT VIBRATIONS ON NEARBY BUILDINGS
VARIOUS CRITERIA THAT HAVE BEEN USED TO EVALUATE DAMAGE CAUSED TO STRUCTURES BY VIBRATION ARE OUTLINED. THREE TYPES OF GROUND WAVES THAT ARE GENERATED ARE: LONGITUDINAL OR COMPRESSION WAVES IN WHICH LOW FREQUENCIES PREDOMINATE; VERTICAL WAVES IN WHICH HIGH FREQUENCIES PREDOMINATE, AND TRANSVERSE OR SHEAR WAVES THAT BEGIN WITH HIGH FREQUENCIES AND ROLL OFF TO LOW FREQUENCIES. A DAMAGE CRITERION IS DEFINED AS THE MAGNITUDE OF ONE OR MORE QUANTITIES ASSOCIATED WITH THE VIBRATION IMPELLING ON THE STRUCTURE, AND IF EXCEEDED, WILL RESULT IN SOME DEGREE OF FAILURE WITHIN THE STRUCTURE. DATA FROM TESTS CARRIED OUT BY THE BUREAU OF MINES ARE OF 3 CLASSES. NAMELY, MAJOR DAMAGE; MINOR DAMAGE; AND NO DAMAGE. AN EMPIRICAL FORMULA HAS BEEN DEVELOPED THAT GIVES THE AMOUNT OF GROUND ENERGY PRODUCED BY A CHARGE OF DYNAMITE IN TERMS OF A MEASURE OF VIBRATION LEVEL CALLED ENERGY RATIO (ER) ER MAY BE USED FOR THE DETERMINATION OF
3A CONSTRUCTION EQUIPMENT AND METHODS

THE UPPER LIMITS FOR VIBRATION OF MANY TYPES OF CONSTRUCTION ACTIVITY. A STUDY CONDUCTED TO FIND A SIMPLE VIBRATION MEASUREMENT THAT WOULD PROVIDE A DEPENDABLE INDICATION OF DAMAGE RISK IS DESCRIBED. THE STUDY CONCLUDED THAT THERE WAS A WELL-DEFINED THRESHOLD LEVEL OF VIBRATION ABOVE WHICH DAMAGE COULD OCCUR. PEAK PARTICLE VELOCITY GAVE THE BEST INDICATION OF THAT THRESHOLD WHICH OCCURS BETWEEN 4 AND 5 IN./SEC. TESTS ARE DESCRIBED WHICH WERE CONDUCTED TO ESTABLISH THE VIBRATION LEVEL OF VIBRATION FROM DIFFERENT TYPES OF CONSTRUCTION EQUIPMENT AND TO DETERMINE HOW THE VIBRATION VARIES WITH DISTANCE. BLASTING OPERATIONS MUST BE MONITORED BY INSTRUMENTATION, TO ENSURE THAT SAFE VELOCITY LEVELS ARE NOT EXCEEDED. INVESTIGATORS USED A PORTABLE VELOCITY SEISMOGRAPH IN WHICH THREE-AXES VELOCITY SIGNALS ARE RECORDED ON MAGNETIC TAPE AND DISTANT FIELD READOUT IS ACHIEVED BY REDUCING THE TAPE SPEED 10:1 AND DISPLAYING THE SIGNALS ON A PEN-CHART RECORDER BUILT INTO THE INSTRUMENT. DIAGRAMS ILLUSTRATING GROUND WAVES RESULTING FROM VIBRATIONS AND RECORDED SIMULTANEOUSLY BY SEISMOGRAPH. VERTICAL VIBRATIONS, AND LONGITUDINAL VIBRATIONS ARE PRESENTED.

Brown, LM Highway Research Board Special Reports No. 138, 1973, pp 117-31, 33 Fig, 6 Ref

3A 219506 CONSTRUCTION EQUIPMENT: ENVIRONMENTAL TOOLS FOR PROGRESS OR DESTRUCTION MANUFACTURERS, WHILE CONTINUING TO DESIGN AND BUILD PRODUCTIVE, LONG-LASTING, HEAVY DUTY MACHINES, CAN EXPAND THEIR CONCERN AND EFFORTS TO MAKE THEM CONTRIBUTE LESS NOISE AND AIR POLLUTION. EFFORT MUST BE DIRECTED TOWARD ACHIEVEMENT TO MACHINE SAFETY. EXAMPLES ARE GIVEN OF THE WIDE VARIATION IN ENVIRONMENTALLY ORIENTED REGULATIONS WRITTEN BY GOVERNMENT AGENCIES. THE CONSTRUCTION INDUSTRY MANUFACTURER ASSOCIATION (CIMA) WAS ORGANIZED TO RECOGNIZE AND PROMOTE THE DEVELOPMENT OF UNIFORM PERFORMANCE STANDARDS THAT WILL SERVE THE OBJECTIVES OF GOVERNMENT REGULATIONS. THE ISSUANCE OF THE OCCUPATIONAL SAFETY HEALTH ACT (OSHA) AND THE ESTABLISHMENT OF U S ENVIRONMENTAL PROTECTION AGENCY (EPA) ARE SIGNIFICANT EVENTS WHICH AFFECTED THE MANUFACTURING SEGMENT OF THE CONSTRUCTION INDUSTRY. THE CIMA IS SPONSORING A PRODUCT REQUIREMENT INDEX FOR OSHA AND A PRODUCT CLASSIFICATION SYSTEM. THE EFFORTS OF THE CIMA IN THE STANDARDIZATION OF SAFETY DEVICE REQUIREMENTS ARE DESCRIBED. THE PROPOSED STRUCTURES (ROPS) IS DISCUSSED AND THE TYPE OF MACHINES THAT WILL BE AFFECTED ARE MENTIONED. ALTHOUGH MANUFACTURERS SAW NO MAJOR OBSTACLES PROVIDED SUFFICIENT LEAD TIME WAS ALLOWED TO COMPLY WITH THE REQUIREMENTS. OBJECTIONS WERE RAISED TO RETROFITTING MACHINES ALREADY IN THE FIELD. TECHNICAL AND SAFETY FACTS POINT TO THE INADVISABILITY OF ARBITRARILY WELDING A STRUCTURE WITHOUT CONSIDERATION BEING GIVEN TO THE INTEGRITY OF THE MACHINE TO SUPPORT THE STRUCTURE. THE RESULTS OF AN INVESTIGATION OF THE INCIDENTS OF ROLL-OVER ACCIDENTS IS PRESENTED. SAFETY RULINGS DIRECTED AT THE OPERATOR OF THE CONSTRUCTION EQUIPMENT ARE LACKING. WHILE OPERATOR EDUCATION IS PRIMARILY RESPONSIBILITY OF THE EMPLOYER, THE CIMA OFFERS TECHNICAL ASSISTANCE IN THIS AREA. CURRENTLY AVAILABLE SAFETY MANUALS ARE REVIEWED. SAFETY STANDARDS FOR CRANES ARE DISCUSSED. IN A CONSIDERATION OF THE ECONOMICS OF NOISE ABATEMENT, IT IS NOTED THAT CONSULTANTS WARN THAT THE COST IS NOT IN EXACT PROPORTION TO THE NUMBER OF DECIBELS REDUCED. TO COMPLY WITH EPA AIR POLLUTION CONTROL REGULATIONS, DUST-SUPPRESSION DEVICES MUST BE USED ON DRILLING OPERATIONS. STRINGENT PARTICULATE EMISSION STANDARDS WILL REQUIRE EXPENSIVE CONTROL DEVICES. THE OBSERVATION IS MADE THAT MANY OF THE REGULATIONS ARE UNECONOMIC AND IMPRACTICAL, AND WILL HAVE TO BE SOLVED THROUGH NEGOTIATION AND COMPROMISE BETWEEN GOVERNMENTAL AGENCIES AND INDUSTRY.

Messinger, RD Highway Research Board Special Reports No. 138, 1973, pp 132-41, 1 Tab, 7 Ref

3A 219507 THE LONGEST ROAD TUNNEL THIS ARTICLE BRIEFLY DESCRIBES METHODS AND MACHINERY IN USE IN THE DRILLING OF THE ST. GOTHARD TRANS-ALPINE ROAD TUNNEL FROM GOSCHENEN IN SWITZERLAND TO AIREOLE IN ITALY. THE 16.3 KM TUNNEL DUE TO OPEN BETWEEN 1978 AND 1979 WILL BE THE LONGEST IN EUROPE. /TRRL/

Engineering /UK/ Vol. 211 No. 9, 1971, pp 1004-8, 4 Fig, 5 Phot

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/IRRD 201 671, 3C41232333

3A 219510 SILENT CONCRETE AND ROCK BREAKER A NEW TYPE OF PAVEMENT BREAKER, SIMILAR TO THE COMMON AIR-OPERATED JACKHAMMER, HAS BEEN SHOWN TO BE RAPID AND SILENT. THE SPLITTER USES A SMALL COMPRESSOR POWER PACK WHICH CAN BE OPERATED WITH AIR, ELECTRICITY, OR GAS DRIVES. THE UNIT WORKS BEST AT NORMAL 100 PSI AIR PRESSURE BUT CAN OPERATE EFFECTIVELY AT PRESSURES DOWN TO 60 PSI. CONTROL OF SPLITTING LINES IS SO ACCURATE THAT PATTERNS CAN BE CUT FROM CONCRETE SLABS WITHOUT DAMAGE TO THE SURROUNDING SLAB MATERIAL.

Military Engineer Vol. 66 No. 429, Jan. 1974, p 56

3A 219511 EUROPEAN STANDARD ON CRAWLER TRACTORS AND THEIR EQUIPMENT THIS STANDARD SPECIFIES THE GERMAN, ENGLISH, SPANISH, FRENCH, ITALIAN AND SWEDISH TERMINOLOGY FOR CRAWLER TRACTORS AND THEIR SUPPLEMENTARY EQUIPMENT AND GIVES STANDARD CONDITIONS UNDER WHICH TESTS SPECIFIED BY THE MANUFACTURER SHOULD BE CARRIED OUT. /TRRL/

Comm for European Constr Equipment /UK/ Standard 1965, 29 pp, 16 Fig

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/IRRD 203 017, 3C41235485

3A 219512 EUROPEAN STANDARD ON CRUSHING MACHINERY THIS STANDARD DEALS ONLY WITH DEFINITIONS AND METHODS OF MEASUREMENT IN REGARD TO CRUSHING MACHINERY USED FOR PRODUCING AGGREGATES FOR CONSTRUCTION WORK. THE DOCUMENT SPECIFIES TERMINOLOGY TO BE ADOPTED IN CRUSHING MACHINERY (WITH SKETCHES), THE DEFINITION OF ESSENTIAL FEATURES OF THE MACHINERY AND THE CONDITIONS UNDER WHICH THE
CONSTRUCTION EQUIPMENT AND METHODS

3A 219515
ANALYSIS OF THE WORK OF MACHINES FOR EARTHWORKS IN A MODERN MACHINE-SOIL SYSTEM
IN PLANNING THE ORGANIZATION OF WORK THE OPERATION OF MACHINES IS ASSESSED GENERALLY ACCORDING TO SOIL CLASS, AN OVERSIMPLIFICATION SINCE IT FAILS TO TAKE INTO ACCOUNT THE CHANGES ON THE SOIL SURFACE DUE TO MOISTURE, CHANGING COMPACTNESS, OR FROST ACTION. CALCULATIONS HAVE BEEN MADE TO DETERMINE THE VARIABILITY OF THE DRIVING FORCE AND LOOSENING AND PUSHING RESISTANCE FOR SANDY LOAM AS A FUNCTION OF VARIABLE MOISTURE CONTENT. AT VARIOUS PARAMETERS DRIVING FORCE DEPENDS ON THE MAGNITUDE OF SLIP AND MOISTURE, WITH THE MAXIMUM FORCE APPEARING AT MOISTURE W EQUALS 10 PERCENT. AS MOISTURE INCREASES THE DRIVING FORCE DECREASES; FOR EXAMPLE, AT W EQUALS 20 PERCENT IT AMOUNTS TO BARELY 60 PERCENT OF THE FORMER VALUE. THE EXAMPLE PRESENTED HERE SHOWS THAT THE ANALYSIS OF THE WORK OF MACHINES FOR EARTHWORKS IN A MACHINE-SOIL SYSTEM IS MORE EFFECTIVE THAN ASSESSMENT ACCORDING TO "SOIL CLASS".

Wislicki, A
Building Review /Poland/ Vol. 42 No. 11-2, 1970, pp 152-7

3A 219518
MAKE YOUR EQUIPMENT DOLLAR SMARTER
CONSTRUCTION EQUIPMENT MAGAZINE AND MANAGEMENT CONCEPTS INTERNATIONAL SPONSORED A SERIES OF SEMINARS WHICH DELT WITH TAX ACCOUNTING, ACQUISITION ANALYSIS, LEASING, FINANCING, RENTAL, AND GENERAL ECONOMICS. EXCEPTS ARE PRESENTED. DR. ROBERT AERUBACH, PROFESSOR OF ECONOMICS AT THE UNIVERSITY OF ILLINOIS, PRESENTS AN EXPLANATION OF THE ORIGINS OF THE CURRENT INFLATION WHICH HE ATTRIBUTES TO FISCAL AND MONETARY POLICY MISMANAGEMENT ON THE FEDERAL LEVEL. WALLACE BUHLER, VICE PRESIDENT OF CORBETTA EQUIPMENT, DISCUSSES THE RELATIVE MERITS OF RENTAL, LEASING, FINANCING, AND PAYING STRAIGHT CASH. AN EXAMPLE IS GIVEN.

Construction Equipment Vol. 49 No. 7, June 1974, pp 17-24, 1 Tab

3A 219519
LONG TERM CREDIT FOR SHORT TERM NEEDS: BAD NEWS
DR. JAMES R. RATLIFF, PROFESSOR OF ACCOUNTING AT NEW YORK UNIVERSITY, OBSERVES THAT ACCOUNTING AS RELATED TO CONSTRUCTION IS A VERY SUBJECTIVE THING; HE RECOMMENDS KEEPING THREE SETS OF BOOKS FOR TAX SAVINGS ON DEPRECIATION (ONE EACH FOR GOVERNMENT, SHAREHOLDERS, AND MANAGEMENT). ALSO DISCUSSED ARE: (1) LEASING; (2) PRESENT VALUE; (3) INVESTMENT TAX CREDIT; (4) COST OF CAPITAL. WARD M. HARRICK, PRESIDENT OF PLANIN MACHINERY COMPANY, DISCUSSES RENTING HEAVY EQUIPMENT FROM THE POINT OF VIEW OF THE COMPANY LEASING OUT EQUIPMENT. RONALD H. ZECH, LEASING OFFICER WITH FIRST CHICAGO LEASING CORP., DISCUSSES TAX BENEFITS OF A CONDITIONAL SALE; SHORT-AND LONG TERM FINANCING; RAISING CAPITAL. ROBERT V. RIEKER, MANAGER OF MARKETING RELATIONS AT GENERAL ELECTRIC CREDIT CORP., DISCUSSES LOANS FOR EQUIPMENT. PAUL O'BRIEN, FACULTY MEMBER OF THE SCHOOL OF BUSINESS OF THE UNIVERSITY OF ILLINOIS (CHICAGO) STATES THAT THERE ARE TWO WAYS TO EVALUATE THE CHOICE OF EQUIPMENT IN TERMS OF GAIN OR LOSS:

PAYBACK AND BAILOUT ANALYSES. AN EXAMPLE IS GIVEN TO DEMONSTRATE THE UTILITY OF EACH APPROACH.

Construction Equipment Vol. 49 No. 7, June 1974, pp 19-20, 1 Tab

3A 219520
STRAIGHT ANSWERS TO RENTAL & LEASING QUESTIONS
CONSTRUCTION EQUIPMENT MAGAZINE AND MANAGEMENT CONCEPTS INTERNATIONAL SPONSORED A SERIES OF SEMINARS DEALING WITH VARIOUS ECONOMIC QUESTIONS. AN EXAMPLE IS PRESENTED OF THE WRAPUP SESSIONS, A QUESTION AND ANSWER PERIOD. THIS SPECIFIC ONE DEALS WITH INTERNAL REVENUE SERVICE PROCEDURES REGARDING LEASING.

Construction Equipment Vol. 49 No. 7, June 1974, p 24

3A 219521
RENTAL LEASING GAIN STRONGLY
FINANCING ACTIVITY IS OFF, POTENTIAL BUYERS OF EQUIPMENT ARE LOOKING AT OUTRIGHT ACQUISITION TWICE, AND RENTAL, ESPECIALLY WITH OPTION TO PURCHASE, IS INCREASING EVEN FASTER THAN IT HAS IN THE PAST FEW YEARS. THESE ARE THE CONCLUSIONS OF CE'S FOURTH ANNUAL SURVEY OF RENTAL, LEASING AND FINANCING TRENDS AMONG ITS READERS. WHILE THE DOMINANT PATTERN AMONG CE SURVEY RESPONDENTS CONTINUED TO BE OUTRIGHT PURCHASE FOR CASH, OR FINANCING, IT IS SLIPPING. THE POSSIBLE REASON IS HIGH INTEREST RATES AND UNCERTAINTY OF MONEY. THE PERCENTAGE OF RESPONDENTS RENTING OR LEASING FROM 1 TO 50 PERCENT OF THEIR SPREAD GREW CONSIDERABLY OVER LAST YEAR, WITH A CORRESPONDING DROP IN OUTRIGHT PURCHASE AND FINANCE (THE GROUP CLAIMING NO FINANCING HELP GREW ALMOST 50 PERCENT OVER LAST YEAR). ANOTHER INDICATION ONLY A LITTLE OVER HALF THE READERS FOUND IT NOW EASIER TO REASONABLE THAN A YEAR AGO. WHILE LAST YEAR THREE-QUARTERS OF THEM FOUND IT EASIER, EQUIPMENT ACQUISITION PLANS FOR THE NEXT TWO YEARS INDICATE NO INCREASE IN DIRECT PURCHASE OR FINANCING, BUT A MAJOR JUMP IN RENTAL AND SOME IN LEASING. AND EVIDENTLY RENTAL IS NOW THE ROUTE TO BUYING. THE PERCENTAGE OF USERS ON RENTAL-PURCHASE OPTIONS JUMPED, WHILE THE FREQUENCY OF PURCHASING RENTAL MACHINES AMONG RENTAL-OWNERS RISE SIGNIFICANTLY. (ZIP 10 TO 50 PERCENT GAINED, WHILE OTHER FREQUENCIES LOST). THERE SEEMS TO BE A TREND AMONG RENTERS TO SWITCH TO LEASING. WHILE THE PROPORTION OF THESE RENTING THE MOST POPULAR TYPES OF EQUIPMENT STAYED RELATIVELY THE SAME, THOSE LEASING THE SAME EQUIPMENT GAINED CONSIDERABLY. LAST YEAR, FOR EXAMPLE, 43 PERCENT OF THE RESPONDENTS RENTED BACKHOE, THIS YEAR 40%; BUT THE PERCENT LEASING WENT FROM 15 TO 21. FOR AIR COMPRESSORS, 36 PERCENT RENTED; DOWN FROM 44, BUT 15 PERCENT LEASED, UP FROM NOTHING A YEAR AGO. LEASING OF CRAWLER TRACTORS AND WHEEL LOADERS HAS ALMOST DOUBLED.

Construction Equipment Vol. 49 No. 7, June 1974, pp 30-1, 8 Fig

3A 225859
ELECTRICAL ROAD HEATING
INFORMATION OBTAINED FROM AUTHORITIES OPERATING ROAD HEATING INSTALLATIONS IS USED TO ASSESS THEIR COST AND PERFORMANCE. CONSTRUCTION METHODS ARE DESCRIBED AND POWER REQUIREMENTS ARE GIVEN. THE USE OF UNINSULATED STEEL MESH AS A CONDUCTOR AT NOT MORE THAN 50 VOLTS HAS BEEN FOUND TO BE GENERALLY MORE RELIABLE THAN INSULATED CABLE AT A HIGHER VOLTAGE. THE AVERAGE CAPITAL COST OF ROAD HEATING INSTALLATIONS TO DATE HAS BEEN 14.64 PER SQUARE METRE AND THE AVERAGE OPERATING COST LO.15 PER SQUARE METRE PER ANNUM. THE METHOD COSTS 15-30 TIMES THE COST OF CHEMICAL TREATMENT. /HSL/
3A CONSTRUCTION EQUIPMENT AND METHODS

Williamson, P.J., Hogbin, L.E.
Road Research Laboratory /UK/ 1969

ACKNOWLEDGMENT: Highway Safety Literature/NSHB HSL-007 702 FLD, 2/4, NTIS-PB-190 319, 3C32314127

3A 225908
EXPERIMENTAL INSTALLATION OF RUMBLE STRIPS IN INDIANA

RUMBLE STRIPS WERE INSTALLED AT HIGH FREQUENCY ACCIDENT LOCATIONS. DIFFERENT SPACINGS WERE USED FOR THE FIVE EXPERIMENTAL INSTALLATIONS ACCORDING TO THE LABORATORY DESIGN STANDARDS. THE THICKNESS VARIED FROM 1/4 INCH TO 1/8 INCHES. THE INSTALLATIONS WERE INSTALLED IN THE SAME GENERAL MANNER WITH THE SAME TYPE OF MATERIAL AND EQUIPMENT. EACH INSTALLATION COST BETWEEN $350. TO $500. THE APPENDIX INCLUDES INFORMATION ON MATERIALS REQUIRED, CONSTRUCTION PROCEDURES, AND INSTALLATION PROCEDURES.

Saville, K.M. Purdue University Road School Proc 1969

3A 226516
UNSHIELDED STEEL CAR PARK OVER RAILWAY AIRSPACE

A DESCRIPTION IS GIVEN OF THE METHODS EMPLOYED TO SOLVE THE PROBLEM OF ERECTING A 300-CAR PARKING GARAGE OVER A WEDGE-SHAPED PORTION OF RIGHT-OFF OVER RAILROAD TRACKS THAT WERE LARGELY INACCESSIBLE FOR HEAVY BUILDING EQUIPMENT. THE STRUCTURE, WHICH UTILIZED PLATE WEB GIRDER, WAS COMPLETED IN ABOUT THREE MONTHS, APART FROM FINISHES. THE MAIN REQUIREMENT FOR ERECTION WAS CENTRAL LOCATION OF A LARGE-CAPACITY CRANE.

Bamforth, J.D. Acer Stahl Steel, Brussels /Belgium/ June 1972, pp 285-7, 6 Fig

3A 228369
TACK-UP FOR HORSHAM CAR PARK

DETAILS ARE GIVEN OF THE CONSTRUCTION OF A MULTI STORY PARKING GARAGE BUILT IN HORSHAM, WHICH PROVIDES ACCOMODATION FOR 420 VEHICLES ON FIVE PARKING LEVELS. IT WAS CONSTRUCTED BY MEANS OF THE LIFT SLAB SYSTEM WHEREBY THE ENTIRE REINFORCED CONCRETE FLOOR AND ROOF SLAB WERE CAST IN-SITU AT GROUND LEVEL AND JACKED UP IN TURN. /TRRL/

Contract Journal /UK/ Vol. 248 No. 4848, Aug. 1972, 29 pp, 1 Fig, 1 Phot

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/IRRD 202 830, 2C32325513

3A 228717
DISPLACEMENT DETECTORS AND MEASUREMENTS

THIS PAPER IS RESTRICTED TO THE RELATIVE DISPLACEMENT DETECTORS BASED ON VARIATIONS OF ELECTRIC RESISTANCES /POTENTIOMETERS/ OR INDUCTANCES, AS WELL AS TO THE ABSOLUTE DISPLACEMENT DETECTORS /WITHOUT REFERENCE BASIS/ SUCH AS ACCELEROMETERS BASED ON THE VARIATIONS OF AN INDUCTANCE, PIEZO-ELECTRIC ACCELEROMETERS AND GEOPHONES. AFTER A BRIEF DESCRIPTION OF THE BASIC PRINCIPLE AND A FEW CONSTRUCTION METHODS OF SUCH DETECTORS, THE MAIN ADVANTAGES AND DISADVANTAGES OF EACH TYPE OF DETECTORS ARE INDICATED. THE ELECTRONIC SYSTEM NORMALLY ASSOCIATED FOR MEASUREMENTS OF FAST AND SLOW OCCURRING DISPLACEMENTS ARE ALSO DESCRIBED, AND THE PRINCIPLE OF THEIR OPERATION IS EXPLAINED, WITHOUT REFERENCE TO CONSTRUCTION DETAILS. FOLLOWING THE DESCRIPTION OF EACH CATEGORY OF DETECTORS, A NUMBER OF EXAMPLES OF MEASUREMENT ARE MENTIONED. /LCPC/A/RRR

Donnat. J. Bull Liaison Labs Routiers /France/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 228942
CONSTRUCTION CLAIMS AND THE ENGINEERING GEOLOGIST

THE PROBLEMS OF CONSTRUCTION CLAIMS, ALTHOUGH WITH US FOR MANY YEARS, HAVE INCREASED IN THE LAST DECADE. CLAIMS AGAINST OWNERS AND CONTRACTORS HAVE INCREASED IN NUMBER AND SIZE. JUST AS THE NUMBER, SIZE AND COMPLEXITY OF ENGINEERING PROJECTS HAVE INCREASED. THE AREAS MOST FERTILE AS A BASIS FOR CONTRACTORS CLAIMS ARE SUBSURFACE CONDITIONS, WHERE PRECONSTRUCTION UNKNOWNS ARE MOST NUMEROUS. THE ENGINEERING GEOLOGIST IS URGED TO MAKE EVERY EFFORT TO UNDERSTAND THE NATURE OF CLAIMS, THEIR BASIS AND JUSTIFICATION. IN ADDITION, THE ENGINEERING GEOLOGIST MUST KEEP CURRENT NOT ONLY ON GEOLGIC INVESTIGATION METHODS AND INTERPRETATION, BUT ON CONSTRUCTION METHODS. FOUR GUIDE-POSTS AN ENGINEERING GEOLOGIST MUST DEVELOP ARE THESE /1/ WILLINGNESS TO FURNISH THE CONTRACTOR WITH HIS THINKING AND KNOWLEDGE ON A PROJECT AS WELL AS THE FACTUAL DATA AVAILABLE /2/ WILLINGNESS TO ACCEPT RESPONSIBILITY, NOT ONLY FOR INVESTIGATIONAL FACTS, BUT FOR PERSONAL INTERPRETATIONS AND THINKING /3/ DESIRE TO KNOW CONSTRUCTION METHODS AND EQUIPMENT /4/ SYSTEM TO TRANSMIT INFORMATION FROM THE FIELD INVESTIGATION STAGE TO THE SPECIFICATION WITHOUT LOSING IMPORTANT FACTS OR ADDING MISLEADING OR ERRONEOUS ITEMS. /GA/

Waggoner, E.B. Engineering Geology /Netherlands/

ACKNOWLEDGMENT: Geoscience Abstracts July66

3A 229290
RECOMMENDATIONS FOR THE DESCRIPTION AND EVALUATION OF SOIL CONDITIONS (IN GERMAN)

THese RECOMMENDATIONS OF THE PUBLICATION "SOIL SURVEYS IN ROAD CONSTRUCTION" EXPLAIN SOIL SURVEYS, OF THE "SPECIFICATIONS FOR DESIGN IN ROAD CONSTRUCTION". THE NOTE DEALS WITH THE GENERAL DESCRIPTION OF SOIL CONDITIONS. THE CONSTRUCTION OF INDIVIDUAL SOIL LAYERS AND EVALUATION OF AND SUGGESTIONS FOR CONSTRUCTION METHODS. THE APPENDIX REFERS TO PERTINENT SPECIFICATIONS, STANDARDS AND RECOMMENDATIONS. /RRL/

Road Research Society /Germany/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 229630
ENGINEERING GEOLOGY IN KANSAS HIGHWAY CONSTRUCTION

A BRIEF HISTORY IS PRESENTED OF THE GEOLOGICAL NEEDS AND THE GEOLOGICAL SECTION OF THE KANSAS HIGHWAY DEPARTMENT ON HIGHWAY DESIGN AND CONSTRUCTION. WHEN HIGHWAY DESIGN WAS CHANGED FROM THAT OF TERRAIN GRADES TO THE LONG RADIUS CURVES AND RUILING GRADES IT RESULTED IN SHENGER OF ROADHOTTS AND INCREASED HEIGHT OF THE FILL SECTIONS. THESE IMPROVED DESIGN AND CONSTRUCTION PRACTICES INCREASED THE NEED FOR ENGINEERING GEOLOGISTS WHO HAVE THE RESPONSIBILITY OF IDENTIFYING THE VARIOUS GEOLGIC MATERIALS WHICH WILL SUPPORT THE OVERALL ROAD STRUCTURE, DETERMINE WHAT GEOLGIC PROBLEMS EXIST, AND PRESCRIBE A SOLUTION FOR THESE PROBLEMS. PHOTO-INTERPRETATION AND RECONNAISSANCE FIELD INVESTIGATION BY THE GEOLOGIST PROVES HELPFUL IN THE ADVANCED PLANNING OF THE HIGHWAY ROUTE. LARGE SAVINGS HAVE RESULTED BY AVOIDING ADVERSE GEOLOGICAL CONDITIONS THROUGH THE PROPER CHOICE OF HIGHWAY ALIGNMENT. WITH THE ALIGNMENT ESTABLISHED, GEOLOGICAL FIELD DATA OBTAINED INCLUDE MEASURED STRATIGRAPHIC SECTION, DESCRIPTION OF STRATA, ELEVATION OF STRATA, TEST HOLE DATA AND OTHER INFORMA-
CONSTRUCTION EQUIPMENT AND METHODS

TION. GEOLOGIC DATA ARE GRAPHICALLY PORTRAYED AND
EARTHWORK IS CLASSIFIED AS EITHER ROCK OR COMMON
EXCAVATION ON THE BASIS OF GEOLOGIC CHARACTERIS-
TICS. A TENTATIVE GRADE LINE IS PLOTTED SHOWING ITS
RELATIONSHIP TO THE STRATA PORTRAYED ON THE CROSS
SECTION AND PROFILE IN THE CUT AND FILL SECTION. WORK
OF THE GEOLOGIST IS REVIEWED IN RELATION TO THE
BALANCE FACTOR, OVERRAMPAGE, SUBGRADING, THE
HIGHWAY BACKSLOPE, GROUNDWATER PROBLEMS AND UN-
DERDRAINS, LANDSLIDES, AND SETTLEMENT. BRIDGE FOUN-
DATION STUDIES ARE ALSO MADE ON THE BASIS OF
GEOLOGY. PERSONNEL AND EQUIPMENT NEEDED FOR THESE
OPTICAL INVESTIGATIONS ARE DESCRIBED. PROBLEMS
ENCOUNTERED ARE DISCUSSED WITH THE OBSERVATION
 THAT THE WORK OF THE ENGINEERING GEOLOGIST IS
BECOMING MORE COMPLEX.

Burke, VA  Highw Geology Symposium, Iowa State U  pp 1-13, July 1968

3A 229908

DISCUSSION OF EMBANKMENT POKE PRESSURES DURING
CONSTRUCTION

MR. DE OLIVEIRA CALLS THE AUTHOR'S ATTENTION TO A
PAPER BY GIBSON IN WHICH THE THEORETICAL ANALYSIS OF
THE CONSOLIDATION OF A CLAY LAYER INCREASING IN
THICKNESS WITH TIME IS EXTENDED TO PARTIALLY SATU-
RATED SOILS BY INTRODUCING SKEMPTON'S PORE PRESSURE
PARAMETER. THIS METHOD TAKES INTO ACCOUNT THE
RATE OF CONSTRUCTION AND ALSO ALLOWS THE PREDICTION
OF THE DISSIPATION OF PORE PRESSURES DURING
CONSTRUCTION AND THE POSSIBILITIES OF SHUTDOWNS. HE ALSO POINTS OUT THAT THE AVAILABLE
METHODS DO NOT CONSIDER THE NEGATIVE PORE PRES-
SUES ALWAYS PRESENT IN COMPACTED COHESIVE SOILS.
MR. RAO CONGRATULATES THE AUTHORS ON THEIR EXCEL-
LENT REVIEW WORK ON THE DEVELOPMENT OF POKE PRES-
SURE DURING THE CONSTRUCTION OF EARTH DAMS. WHILE
MENTIONING THE VARIOUS FACTORS THAT INFLUENCE THE
MAGNITUDE OF THE PORE-PRESSURE RATIO AT THE END OF
CONSTRUCTION, THE AUTHORS HAVE INDICATED UNDER
THE SUBHEADING COMPACTION EFFECT, THAT WATER
CONTENT HAS A GREATER EFFECT ON THE DEVELOPMENT OF
PORE PRESSURES, EVEN WHEN COMPACTION EFFORT IS
RELATIVELY HIGH. MR. RAO FEELS THAT THE DEVELOPMENT OF
PORE PRESSURES WILL ALWAYS BE GREATER WHEN COM-
PACTION EffORT IS HIGH. HE ALSO POINTS OUT OBSERVED
CORRELATIONS BETWEEN SOIL TYPE AND PORE PRESSURE
RATIO. THE TYPE OF EQUIPMENT USED FOR HAULING AND
COMPACTING FILL MATERIAL ALONG WITH THEIR DYNAMIC
EFECT PLAY A LEADING ROLE IN DEVELOPING CONSTRUC-
TION PORE PRESSURES. MR. LITTLE POINTS OUT TWO ERRORS
IN THE PAPER. THE DRAINAGE BLANKETS AT USK WERE
PLACED IN THE SHOULDERS AND NOT IN THE IMPERVIOUS
CORE WHICH WAS OF THE OLD FASHIONED PUDGLEY CLAY
VARIETY. ALTHOUGH PORE PRESSURES IN THE CORE WERE
NOT MEASURED DIRECTLY, IT WAS INFERRRED THAT THEY
WERE HIGH. A GRAPH IS PRESENTED OF TYPICAL PORE
PRESSURES IN THE CORE AT DIDDINGTON DAM, MAGNLA
DAM AND AYER 17AM DAM. MR. LITTLE AGREES WITH MOST
OF THE DATA BUT HAS NOT SO FAR MET HIGH PORE PRESSURES IN A FILL OF HEAVILY OVERCON-
SOLIDATED CLAY NOR WITH THE TYPE OF FILL USED AT
SHEK PIK DAM, EVEN AT WATER CONTENTS APPRECIABLY
ABOVE optimum. REFERENCES: EMBANKMENT PORE PRES-
SURE DURING CONSTRUCTION, WALTER C. SHERMAN, GE-

De OLIVIERA HG  Rao, KK  Little, AL  Am Soc Civil Engr J Soil Mech Div

3A 229762

CONQUEST OF THE DARIEN
A MEOAN OF UNITING THE AMERICAS BY LAND COMMUNICA-
TION HAS BEEN FRUSTRATED BY THE INACCESSIBILITY OF
THE VAST JUNGLE ADJOINING THE REPUBLICS OF
PANAMA AND COLOMBIA IN THE REGION KNOWN AS THE
DARIEN GAP. THE BUREAU OF PUBLIC ROADS NEGOTIATED
AN AGREEMENT WITH THE COLOMBIAN MINISTER OF PUB-
LIC WORKS PERMITTING RECONNAISSANCE SURVEYS IN 1964
OF CONSTRUCTION SWIMPS. THESE STUDIES AND SUBSE-
QUENT DETAILED GEOPHYSICAL SURVEYS CONDUCTED ARE
DESCRIBED. THE ATRATO RIVER SWAMPS ARE APPROX-
IMATELY 67 TO 100 K Wide AND MORE THAN 250 K LONG. ALL
SOURCES OF AERIAL PHOTOGRAPHY, AND PARTIAL PHOTO-
GRAPHIC COVERAGE OF THE AREA WERE ASSEMBLED AND
STEREOSCOPIC EXAMINATION AND PHOTOGRAPHIC INTER-
PRETATION MADE OF THESE UNCONTROLLED EARLY PHO-
TOGRAPHS. INFORMATION FROM THESE PHOTOGRAPHS LED
TO THE SELECTION OF FIVE POSSIBLE ROUTE LOCATIONS
THAT MET THE CRITERIA ESTABLISHED FOR THE LEAST
DIFFICULT CROSSINGS OF THE SWAMP. THE FIVE SELECTED
ROUTES WERE DELINEATED ON THE UNCONTROLLED
PHOTOMOSAIC AND COMPARATIVE INTERPRETATION OF
THE SOFTER SUBSURFACE MATERIAL AND REPLACEMENT
WITH FILL MATERIAL OBTAINED FORM THE LOMAS LAS
AILADAS. AND (3) USE OF TRESTLE CONSTRUCTION ACROSS
THE ENIRE SWAMP.

Ghiglione, AF  Highway Research Record, Hwy Res Board

3A 229921

VIBRATION STUDIES
OWNERS OF HOMES AND OTHER STRUCTURES FREQUENTLY
COMPLAIN OF DAMAGE CAUSED BY BLASTING, RUBBER
TIRED VEHICLES, AND CONSTRUCTION EQUIPMENT, USU-
ALLY IN ASSOCIATION WITH A LOUD AND/OR UNEXPECTED
NOISE. THE CORRELATION OF NOISE WITH VIBRATION AND
OF CONSTRUCTION WITH STRUCTURAL DAMAGE HAS LED
THE VIRGINIA DEPARTMENT OF HIGHWAYS TO INVEST IN A
SEISMOGRAPH AND TO PERFORM AN ANALYSIS OF THE
CAUSES OF STRUCTURAL DAMAGE, THEREBY STRENGTHEN-
ING ITS HAND IN DEALING WITH COMPLAINTS AND PERMIT-
TING IT TO ASSESS MORE REALISTICALLY THE ACTUAL
DAMAGE THAT CAN BE ANTICIPATED FROM ITS ACTIVITIES
A DETAILED PRESENTATION IS GIVEN OF TYPES OF STRUC-
TURAL DAMAGE CAUSED BY DEFICIENCIES IN THE STRUC-
TURE ITSELF BUT OFTEN ATTRIBUTED TO HIGHWAY
CONSTRUCTION.

Meadors, GS  Southeast Assoc St Hwy Officials Proc  pp 117-120, Oct. 1968

3A 230054

STEPS IN THE STAIRS TO GREENER HIGHWAY CUT SLOPES
DEVELOPING PRACTICE IN THE DESIGN, CONSTRUCTION,
AND STABILIZATION OF HIGHWAY SLOPES COMPOSED OF
SOIL AND ROCK IS TRACED AS A MEANS OF DESCRIBING THE
3A CONSTRUCTION EQUIPMENT AND METHODS

3A 230837


Engineering News-record

ACKNOWLEDGMENT: Road Research Laboratory /UK/.

3A 230859

BIBLIOGRAPHY ON BITUMINOUS STABILIZATION OF SOILS THE VERY RAPID EXPANSION OF VEHICLE OWNERSHIP IN DEVELOPING COUNTRIES HAS NECESSITATED DRAMATIC IMPROVEMENTS TO THE EXISTING ROAD SYSTEMS. THE USE OF BITUMINOUS BINDERS HAS PLAYED A LARGE PART IN IMPROVEMENTS BOTH IN CONVENTIONAL SURFACINGS AND IN STABILIZING LOCALLY OCCURRING MATERIALS TO PROVIDE BASES AND SURFACINGS. STABILIZATION HAS NOW BEEN USED FOR A PERIOD OF 30 YEARS AND A GREAT DEAL OF PUBLISHED WORK EXISTS COVERING CONSTRUCTION AND EXPERIMENTAL RESULTS, NOTABLY IN THE UNITED STATES OF AMERICA. THIS SELECTED BIBLIOGRAPHY PROVIDES, AS FAR AS POSSIBLE, A COMPREHENSIVE RANGE OF RECORDED WORK WITHOUT UNDUE REPETITION. REFERENCES HAVE BEEN CLASSIFIED UNDER THREE HEADINGS: I. RESEARCH, II. DESIGN AND CONTROL, III. CONSTRUCTION PRACTICE. THE BASIS OF THIS CLASSIFICATION IS SPECIAL RELEVANCE TO A GIVEN SECTION ALTHOUGH, OBVIOUSLY, EXAMPLES WILL BE FOUND WHERE THERE IS RELEVANCE TO MORE THAN ONE SECTION. /RRL/A.

Hitch, LS Road Research Laboratory Lib Bib /UK/.

3A 230921

ALBERTA MAKES A FRIEND OUT OF MUSKEG ROAD CONSTRUCTION THROUGH MUSKEG IS ALWAYS DIFFICULT, BUT THIS NEW TECHNIQUE UTILIZES THE PARTICULAR PROPERTIES OF MUSKEG TO AID IN CONSTRUCTION. BY COMPACTING AND PLACING FILL DURING WINTER WHEN THE GROUND IS FROZEN, AND WORKING 24 HOURS A DAY IN A RACE AGAINST FROST, ALBERTA WAS ABLE TO HEAT ITS SCHEDULE BY 6 MONTHS. /CG/.

Hayter, R Heavy Construction News/canada/.

3A 230924

50-FT CAISSONS PROVE UNUSUALLY HARD TO SINK CAISSONS FOR A NEW BRIDGE ASSOCIATED WITH THE MAC­DONALD- CARTIER FREEWAY WIDENING PROJECT NEAR TORONTO WERE USUALLY DIFFICULT TO SINK. THE WORK INVOLVES THE CONSTRUCTION OF A 12-LANE STEEL AND CONCRETE OVERPASS. UNSTABLE SOILS COMPOSED OF BOUL­BERS, GLACIAL DEPOSITS, CLAY AND SILTY GRAVELS COM­POUNDED THE USUAL PROBLEMS WHILE SINKING DRILL HOLES IN AN RANDOM MANNER. NECESSITATED ABANDONMENT OF SOME DRILL HOLES AND OTHERS, THE FILLING WITH TRENIE CONCRETE. THE DRILL HOLES WERE SUPPLIED WITH LINERS DUE TO THE HIGH SOIL PRESSURE AND THEIR INSIDES CLEANED OUT WITH A SMALL AUGER. DIFFICULTIES ENCOUNTERED IN REMOVING THE LINERS REQUIRED HEAVIER EQUIPMENT THAN WAS THOUGHT NECESSARY. /CG/.

Salmins, G Engineering and Contract Record /Can/.

3A 230925

SURCHARGE DISPLACES 20 FT BOG THE PROBLEM WAS TO BUILD A HIGHWAY OVER AN OLD LAKEBED OF UNSTABLE MARL TO CONSTRUCT A STABLE FOUNDATION, THE MUCK WAS DISPLACED BY A ROLLING SURCHARGE OF SAND. THE WORK HAD TO BE CARRIED OUT DURING THE WINTER AND COMPLETED BEFORE THE SPRING THAW TO PREVENT THE MACHINERY FROM GETTING BOGGED DOWN. /CGR/.

Salmins, G Engineering and Contract Record /Can/.

3A 230928

EFFECT OF SANDWICH LAYER SYSTEM OF PAVEMENT FOR SUBGRADES OF LOW BEARING CAPACITY BY MEANS OF SOIL CEMENT THE AUTHOR DESCRIBES THE SANDWICH LAYER SYSTEM, WHICH INVOLVES INCREASING THE RIGIDITY OF A PAVE­MENT ON A SUBGRADE OF LOW BEARING CAPACITY BY PLACING A RELATIVELY RIGID LAYER DIRECTLY ON THE SUBGRADE. THE AUTHOR HAS FOUND SOIL CEMENT TO BE BEST SUITED FOR THE LOWER RIGID LAYER. IN THIS PAPER, THE AUTHOR IS CONCERNED WITH PAVEMENT DESIGN ON VULCANIC ASH SOILS OF LOW BEARING CAPACITY. THE STUDY CONSISTS OF COMPARATIVE ELASTIC APPROXIMA­TIONS AND MODEL EXPERIMENTS OF BOTH STATIC AND DYNAMIC REPEATED LOADING ON BOTH THE CONVEN­TIONAL PROGRESSIVE LAYER SYSTEM AND THE SANDWICH LAYER SYSTEM. /AUTH/.

Yamanouchi, T Int'l Conf Soil Mech & Flm Eng Proc.

Acknowledgment: Canadian Good Roads Association

3A 230940


Lee, RL Canadian Good Roads Association Proc.

Acknowledgment: Canadian Good Roads Association

3A 230952

PERFORMANCE MONITORING OF A DEEP COFFERDAM IN SENSITIVE CLAY A DEEP STEEL SHEET PILED, FIGURE-EIGHT COFFERDAM WITH CIRCULAR STEEL WELDS WAS INSTALLED AS A TEMPO­
CONSTRUCTION EQUIPMENT AND METHODS

3A 23097
CONSTRUCTION METHOD AND STABILITY OF EMBANKMENTS ON MUSKEG

A method for the design and construction of relatively thick highway embankments across muskeg deposits is described. Using theoretical soil mechanics concepts, it is predicted that the long term stability of the muskeg necessitates the use of berms and the compaction of all entrained strength analysis based on in-situ vane tests may predict a reasonable factor of safety. Consideration of both theoretical soil mechanics concepts and practical considerations suggested that the interaction between the soil and the berm dictates that berm construction should be from the outer limits towards the centre and should be placed prior to the central fill. Several case records are presented to support the conclusions drawn and further suggest the width of the berm should be 1 1/2 to 2 times the thickness of the muskeg (peat plus lake marl). /CGRA/

Raymond, GP Canadian Geotechnical Journal

Acknowledgment: Canadian Good Roads Association

3A 230957
CURRENT SPECIFICATIONS, FIELD PRACTICES AND PROBLEMS IN COMPACTION FOR HIGHWAY PURPOSES

The current status of highway specifications and field practices for compaction of embankments, subgrades and granular bases is summarized. The information has been obtained from the published standard specifications of the 50 states and from an extensive interview program with state highway engineers. Construction specifications and procedures as other subgrades and granular bases are summarized and followed by discussions of the problems related to the practical application of the specifications to field construction. Quality control procedures and related problems are also discussed. The review indicates that the majority of embankment and subgrade compaction is accomplished by controlling lift thickness and moisture conditions and by specifying minimum density requirements, usually as a percent of the maximum density determined from the AASHO T-99 test. The major problems are encountered in silts, very wet clays of high plasticity and expansive clays. Construction practices to overcome these problems are noted. Control of compounding of soils include the time required for conventional field density measurements and the difficulty in estimating the proper AASHO T-99 maximum density for heterogeneous field materials. The role of statistical quality control techniques is discussed. The relation of engineering judgment to statistical procedures is presented. A summary of the major compaction problems as determined from interviews with many highway engineers is also included. /Author/

Wahls, HE Highway Research Record, Hwy Res Board

ACKNOWLEDGMENT: Canadian Good Roads Association

3A 230108
ASPHALTIC COLD-MIX STABILIZATION

A prospective is presented of some of the trends and developments since the second world war in the field of stabilization of sands and soils by means of asphaltic cutbacks and emulsions. A trend toward more conservative practice regarding gradation and plasticity requirements is traced from 1946 to the present. It is pointed out that in many cases the finer-grained and more plastic soils which have been disqualified for asphalt stabilization by this gradual tightening of requirements may be stabilized easily and economically by lime. Laboratory testing procedures have been developed to measure the effects of water absorption, a moisture vapor susceptibility test, which offers advantages over the CBR and Hubbard-field procedures. The unconfined compression test was adapted to the design of soil-asphalt mixtures, and it is proposed that the construction control of these mixes be expedited by means of small specimens which could be tested for unconfined strength after brief periods of drying and absorption. The construction technique of spreading in thin layers and compacting by pneumatic rollers is urged for wider use, especially for emulsion stabilization. The advantages of recently developed cationic emulsions are presented.

Parsonson, PS North Carolina State University

Acknowledgment: Highway Res Abstracts Hwy Res Board

3A 230107
SYMPOSIUM ON ROADING EARTHWORMS

A symposium sponsored by the New Zealand Roads Board, was convened to discuss the problems of road foundations, and provide a better understanding of the subject of soil mechanics so that ways of extending or applying current knowledge might be improved. Papers were presented on prospecting, design of foundations, and soil compaction. The seminars on classification, design and specification of foundations, soil compaction, and road building equipment.

National Roads Board (New Zealand)

Acknowledgment: Highway Res Abstracts Hwy Res Board

3A 230105
CONSTRUCTION IN MUSKEG: A SUMMARY AND COMPILATION OF CURRENT PRACTICE

The basic approaches to construction in muskeg areas are to /1/ avoid muskeg, /2/ remove the peat, or /3/ design for and utilize the muskeg. The complete removal of peat and its replacement by good fill to provide a solid foundation is usually employed for roads crossing shallow deposits or main highways carrying heavy traffic. Current practice in Canada and in the northern U. S. appears to favor mechanical excavation, although deep peat deposits are troublesome. In undisplaceable soils, methods of excavation, and partial excavation, are often used. Explosives are used less now than prior to world war II, due to the unpredictable results. The use of hydraulic stabilization or jetting is almost confined to the state of Minnesota, although the method has considerable potential where large amounts of granular fill and water are available. Stabilization, settlement, and frost action must be considered when building on peat. With flotation methods the bearing capacity is utilized and continued settlements are accepted. The sand-drain technique has been applied to stabilize...
CONSTRUCTION EQUIPMENT AND METHODS

SOFT DEPOSITS BUT IT IS NOW QUESTIONABLE, PILE FOUNDATIONS ARE THE LEAST AFFECTED BY PEAT PROPERTIES. DRAINAGE OF A MUSKEG AREA IS USUALLY EXTREMELY DIFFICULT AND OFTEN IMPOSSIBLE. EXTRACTS OF SELECTED REFERENCES ON MUSKEG AND PEAT HAVE BEEN GROUPED IN THE APPENDIXES. /AUTHOR/

Pihlmanen, JA Crel Technical Reports, Army Dept /US/

ACKNOWLEDGMENT: Highway Res Abstracts Hwy Res Board

3A 231098

A DECADE OF PREFABRICATED FOUNDATION CONSTRUCTION

Efremov, MG Soil Mechanics & Foundation Engineering

ACKNOWLEDGMENT: Transportation Curr Literature Dot Lib

3A 231115

ASPHALT-STABILIZED BASE


Grosvender, CG

New Mexico University

3A 231121

THE CONSTRUCTION OF EMBANKMENTS ON COMRESSIBLE SOILS

AFTER EXPLAINING THE PROBLEM OF THE CONSTRUCTION OF EMBANKMENTS ON POOR QUALITY SOILS, THE AUTHORS GIVE AN ACCOUNT OF WORK UNDERTAKEN ON THIS SUBJECT IN THE PONTS ET CHAUSSEES LABORATORIES. THESE STUDIES, CARRIED OUT WITH A VIEW TO BOTH SHORT TERM AND MEDIUM TERM EFFICIENCY, WERE CONDUCTED IN SEVERAL STAGES, STARTING FROM MOST FAVOURABLE OBSERVATIONS ON THE BEHAVIOUR OF SOME EMBANKMENTS ON SOFT SOILS/PEAT IN PARTICULAR/ SOME IDEAS WERE FORMED WHICH GUIDED SUBSEQUENT INVESTIGATIONS. THE CONCLUSION WAS GRAVELY REACHED THAT ONLY SYSTEMATIC EXPERIMENTS ON EXPERIMENTAL EMBANKMENTS COULD PROVIDE REAL SOLUIONS TO THE PROBLEMS POSED. SUCH EMBANKMENTS WERE BUILT ON THREE DIFFERENT SITES. AT THE SAME TIME, A STUDY GROUP WAS FORMED TO WIDEN THE SCOPE OF THE RESEARCH AND TO MAKE FULL USE OF THE RESULTS OBTAINED FROM THE EXPERIMENTAL EMBANKMENTS. THIS STUDY GROUP /CALLED GERSC/ HAS BEEN OPERATING SINCE JUNE 1963 AND CONSISTS OF SEVEN ENGINEERS FROM THE LABORATOIRE DES PONTS ET CHAUSSEES. THE SUBJECTS COVERED RELATE TO SOIL RECOGNIZANCE, LABORATORY STUDIES, METHODS OF CALCULATION /SETTLEMENT AND STABILITY/, MEASURING APPARATUS, METHODS OF CONSTRUCTION, ETC. THE FOLLOWING METHODS OF STUDY ARE ENVISAGED: /1/ A COMPLETE BIBLIOGRAPHY ON THE SUBJECT, AND /2/ THE EXPLOITATION OF MEASUREMENTS MADE ON THE THREE EXPERIMENTAL EMBANKMENTS AND ON OTHER EMBANKMENTS BUILT ON SOFT SOIL. THIS EXPLOITATION MAY LEAD TO CERTAIN LINES OF RESEARCH NECESSARY FOR THE INTERPRETATION OF THESE MEASUREMENTS.

Karst, H Bourges, F Bull Liaison Labs Routien /France/

3A 231181

SLOPE STABILITY AND FOUNDATION INVESTIGATION

THESE NOTES HAVE BEEN PREPARED FOR THE SHORT COURSE ON SLOPE STABILITY AND FOUNDATION INVESTIGATION, PRESENTED BY THE INSTITUTE OF TRANSPORTATION AND TRAFFIC ENGINEERING AND UNIVERSITY OF CALIFORNIA EXTENSION. THEY ARE INTENDED TO ACQUAINT PRACTICING HIGHWAY ENGINEERS WITH CURRENT METHODS OF CONSTRUCTION, DESIGN, AND MAINTENANCE OF STABLE CUT SLOPES. IT IS HOPED THAT THEY MAY ALSO CONSTITUTE A SORT OF HIGHWAY FOUNDATION MANUAL WHICH WILL ASSIST THE PRACTICING ENGINEERING IN APPLYING RATIONAL METHODS TO SOIL MECHANICS PROBLEMS WITHIN THE SUBJECT AREA. /AUTHOR/

Itte, California University

3A 231195

PILE AND CAISSON FOUNDATIONS

AN EXPLANATION IS PRESENTED OF THE USEFUL DETAILS OF PILES AND CYLINDRICAL CAISSON FOUNDATIONS AS PRESENTLY UTILIZED IN THE UNITED STATES TO RESIST AXIAL LOADS, AND TO A GENERAL DESCRIPTION OF THE CONSTRUCTION EQUIPMENT AND PROCEDURES USED TO INSTALL THESE UNITS AND THE BASES OF PAYMENT. A LOGICAL APPROACH IS PRESENTED TO SELECT A PROPER METHOD OF FOUNDATION BASED ON THE FOLLOWING: /1/ RELIABLE SURFACE INFORMATION, INCLUDING ACCEPTABLE SOIL SAMPLES, /2/ KNOWLEDGE OF THE FORCES TO BE RESISTED AT A FIXED ELEVATION, AND /3/ KNOWLEDGE OF COSTS OF COMPETITIVE TYPES OF FOUNDATIONS, OR A RELIABLE SOURCE OR SOURCES FOR THESE COSTS. PILES CONSIDERED HAVE UNIFORM CROSS SECTION AND THE BASES OF PAYMENT ARE ARRANGED IN THREE SECTIONS: /1/ GENERAL, /2/ RESEARCH, TESTS AND DESIGN, AND /3/ CONSTRUCTION PROCEDURES AND EQUIPMENT.

Mohr, HA Boston Society Civil Engineers Journal

3A 231227

CEMENT-TREATED SOIL MIXTURES 1931-1961 (ANNOTATED)

A SELECTIVE BIBLIOGRAPHY IS PRESENTED ON THE STABILIZATION OF SOILS WITH PORTLAND CEMENT FOR ROADS, STREETS, AIRPORT AND PARKING AREAS. THE REFERENCES ARE ARRANGED IN THREE SECTIONS: /1/ GENERAL, /2/ RESEARCH, TESTS AND DESIGN, AND /3/ CONSTRUCTION PROCEDURES AND EQUIPMENT.

Highway Research Board Bibliography

3A 231239

PLANNING OF PROJECTS-EARTHWORKS-FRANCE

THE EXPERIENCE OF SOME 100 MILLION CUBIC METERS OF HIGHWAY AND HIGHWAY EARTHWORKS IN FRANCE INDICATE TWO FUNDAMENTAL FACTORS: /1/ RELATIVE TO THE ESTABLISHMENT OF PROJECTS, CONTROL WILL BE HENCEFOR ExERCISED BY AN ELECTRONIC COMPUTER ASSOCIATED WITH AUTOMATIC DESIGN, AND /2/ THE PLANNING AND EXECUTION OF EARTHWORKS ARE CONTROLLED NOW BY A REGULATION OF THE STANDARD BOOK OF SPECIFICATIONS STANDARDIZATION OF THE PROJECTS AND IMPROVEMENT OF THE QUALITY OF CONTRACTS ARE DISCUSSED. SOIL AND CUT CLASSIFICATIONS IN THE CATEGORIES RELATED TO USE OR NECESSARY EQUIPMENT ARE DISCUSSED. PROBLEMS ON THE COMPACTION OF FILLS, THE STABILITY OF SLOPES TOLERANCES AND CONTROL ON THE WORKS ARE DISCUSSED. AN EXAMPLE IS GIVEN OF MOTORWAY EARTHWORKS IN DIFFICULT TERRAIN IN DEEP CUT. SELECTED FILI
CONSTRUCTION EQUIPMENT AND METHODS

IS CONSIDERED AS A DESIRABLE ELEMENT IN THE UPPER PART OF EARTHWORKS SO AS TO FACILITATE THE CONSTRUCTION OF THE HIGHWAYS.

3A 2312340
PLANNING OF PROJECTS-EARTHWORKS-GERMANY


Siedek, P  Perm Intl Assoc Road Congresses Proc

3A 2312350
PLANNING OF PROJECTS-EARTHWORKS-RHODESIA


Holden, A Burgers, A Perm Intl Assoc Road Congresses Proc  No II-17  1967

Marinesco, C Avadencu, C Albeau, D Proc Intl Assoc Road Congresses

3A 231285
EMBANKMENT PORE PRESSURE DURING CONSTRUCTION THEORETICAL METHODS FOR PREDICTING PORE PRESSURES IN EARTH DAMS ARE REVIEWED, AND OBSERVED PORE PRESSURE DATA FROM SELECTED DAMS CONSTRUCTED BY THE CO-OPERATION OF ENGINES (CE) AND OTHER AGENCIES ARE SUMMARIZED TO INDICATE THE DEVELOPMENT AND MAGNITUDES OF CONSTRUCTION PORE WATER PRESSURES IN EARTH DAMS. CONSTRUCTION CHARACTERISTICS AND PORE PRESSURE DATA FROM 10 CE DAMS, 24 USBR DAMS, AND 9 FOREIGN DAMS ARE SUMMARIZED AND COMPARED. THE STUDY DETERMINED THAT BECAUSE OF THE NUMBEROUS FACTORS WHICH INFLUENCE PORE PRESSURE BUILDUP, BROAD CONCLUSIONS FOR EARTH DAMS ARE DIFFICULT TO MAKE AND EACH DAM MUST BE TREATED INDIVIDUALLY WITH RESPECT TO PREDICTING CONSTRUCTION PORE PRESSURES. IT IS CONCLUDED THAT: (1) PROVISIONS FOR INTERNAL DRAINAGE EFFECTIVELY RELIEVE CONSTRUCTION PORE PRESSURES IN EARTH EMBANKMENTS, (2) PORE-PRESSURE RATIOS IN EMBANKMENT MATERIALS INCREASE RAPIDLY AS PLACEMENT-WATER CONTENT INCREASES, ESPECIALLY ABOVE OPTIMUM WATER CONTENT, AND (3) PORE PRESSURES INCREASE WITH INCREASING DAM HEIGHT, BUT EVEN LOW DAMS (LESS THAN 100-FT HIGH) CAN DEVELOP LARGE PORE PRESSURES.

Sherman, WC Clough, GW Proc Soc Civil Engr J Soil Mech Div

3A 231365
SOIL STABILIZATION WITH PORTLAND CEMENT THIS REPORT SURVEYS THE AVAILABLE INFORMATION ON MIXTURES OF SOIL AND CEMENT. INCLUDED ARE DATA ON (1) PROPERTIES OF CEMENT-TREATED SOIL, (2) FACTORS INFLUENCING PROPERTIES OF CEMENT-TREATED SOIL, (3) USES OF CEMENT-TREATED SOIL AND BITUMINOUS SURFACING REQUIREMENTS, (4) PRELIMINARY SURVEYING, SAMPLING, TESTING AND MIX DESIGN FOR CEMENT-TREATED SOIL CONSTRUCTION, (5) STRUCTURAL DESIGN OF SOIL-CEMENT BASES, (6) CEMENT-TREATED SOIL CONSTRUCTION, (7) ENGINEERING CONTROL OF CONSTRUCTION, AND (8) FIELD PERFORMANCE OF SOIL-CEMENT BASE COURSES.

Highway Research Board Bulletin

3A 231371
FOUNDAIONS OF BRIDGES AND OTHER STRUCTURES THESE REFERENCES ON FOUNDATIONS OF BRIDGES AND OTHER STRUCTURES INCLUDE SELECTIONS ON APPLICATION OF ELASTICITY AND PLASTICITY THEORIES TO FOUNDATION PROBLEMS, SOIL MECHANICS AND FOUNDATION ENGINEERING, CEMENT GROUTING OF FOUNDATIONS, STRAIN GAGE OPERATIONS UNDER WATER, EARTH PRESSURE MEASUREMENTS, BEARING CAPACITY OF FOUNDATIONS, FOUNDATIONS WITH ALLOWABLE SHEARCAPS FOR BEAMS ON ELASTIC FOUNDATIONS, STRESSES UNDER A FOUNDATION, FOUNDATION MOVEMENTS, PILE FOUNDATIONS AND PILE STRUCTURES, EFFICIENCIES OF PILE GROUPS, BEARING CAPACITY OF PILES, PILE LOAD TESTS, PREDETERMINING PILE LENGTHS, PRESSURE DISTRIBUTION ALONG FRICITION PILES, SKIN FRICTION OF FOUNDATION PILE, PILE DRIVING BY ELECTROOSMOSIS AND BY VIBRATION STRESSES IN PILES DURING DRIVING, DRIVING CHARACTERISTICS OF PILES IN SOIL, EXPERIENCES WITH PRESTRESSED CONCRETE PILES, STEEL H-B PILES, SHEET STEEL PILES, TIMBER PILES, SOIL MODULUS FOR LATERALLY LOADED PILES, STABILITY OF FOUNDATION PILE AGAINST BUCKLING UNDER AXIAL LOAD, PILE HEAVE AND REDRIVING, FREEZING FACILITIES FOR SHAFT SINKING, DEFLECTION AND STRENGTH OF ANCHORED BULKHEADS, SEALING A COFFERDAM, CAISSON FOUNDATIONS BONDED CAISSONS ANCHOR WALLS, BRIDGE PIERS BUILT IN CELLULAR COFFERDAMS, ENGINEERING SEISMOLOGY, LATERAL FORCES OF EARTHQUAKE AND WIND, SCOUR AT BRIDGES, SLSOIL CORROSION OF STEEL, SOIL CONDITIONS AND SAMPLING, TESTS OF CYLINDRICAL SHELLS, SUBWAY CONSTRUCTION, SOIL COMPACTION BY VIBRATING AND BY EXPLOSIVES, BUILDING CODE REQUIREMENTS FOR FOUNDATIONS, SHORING AND SETTLEMENT OF STRUCTURES, CONSTRUCTION OF CUT-OFF WALLS, UNDERWATER CONCRETING, AND SETTLEMENT OF STRUCTURES.

Highway Research Information Service

3A 231376
FOUNDATION ENGINEERING CONTENTS: PROPERTIES OF SUBSURFACE MATERIALS IDENTIFICATION OF SOILS AND ROCKS PHYSICAL PROPERTIES OF SOIL AND ROCK TECHNIQUES OF SUBSURFACE INVESTIGATION CHARACTER OF NATURAL DEPOSITS PROGRAM OF SUBSURFACE EXPLORATION TYPES OF FOUNDATIONS AND METHODS OF CONSTRUCTION EXCAVATING AND BRACING DRAINAGE AND STABILIZATION FOOTING AND RAFT FOUNDATIONS PILE FOUNDATIONS PIER FOUNDATIONS PIER SHAFTS, RETAINING WALLS, AND ABUTMENTS SHORING AND UNDERPINNING SELECTION OF FOUNDATION TYPE AND BASIS FOR DESIGN FACTORS DETERMINING TYPE OF FOUNDATION FOUNDATIONS ON SAND FOUNDATIONS ON CLAY FOUNDATIONS ON SILT AND LOESS FOUNDATIONS ON NONUNIFORM SOILS DAMAGE DUE TO CONSTRUCTION OPERATIONS STRUCTURAL DESIGN OF FOUNDATION ELEMENTS INDIVIDUAL COLUMN AND WALL FOOTINGS FOOTINGS SUBJECTED TO MOMENT COMBINED FOOTINGS AND RAFTS RETAINING WALLS AND ABUTMENTS PROBLEMS.

Peck, RB Hansen, WE Thornburn, TH Wiley, John & Sons, Inc

3A 231417
STUDIES OF FILL CONSTRUCTION OVER MUDD FLATS INCLUDING A DESCRIPTION OF EXPERIMENTAL CONSTRUCTION USING VERTICAL SAND DRAINS TO HASTEN STABILIZATION STUDIES WERE CONDUCTED OF FILL CONSTRUCTION OVER MARSH LANDS IN CALIFORNIA TO DETERMINE: (1) METHOD OF CONSTRUCTION THE FILL WITH MINIMUM SLIPAGE, (2) REQUIRED YARDAGE OF FILL MATERIAL, INCLUDING YARDAGE NECESSARY TO COMPENSATE FOR UNAVOIDABLE LATERAL DISPLACEMENT AND LOSS BETWEEN DREDGER CUT AND FILL, AND (3) PROBABLY RATE OF SUBSIDENCE AND TOTAL SETTLEMENT SUBSEQUENT TO INITIAL CONSTRUCTION DUE TO SLOW DEHYDRATION AND CONSOLIDATION OF THE MUD STRATA. THE DATA FROM DEEP BORINGS, STUDIES OF THE FOUNDATION PRESSURE, AND LABORATORY ANALY-
CONSTRUCTION EQUIPMENT AND METHODS

3A 231439
CALCIUM CHLORIDE SURFACE-CONSOLIDATED ROADS
A DESCRIPTION IS PRESENTED OF THE CONSTRUCTION AND MAINTENANCE METHODS NECESSARY TO OBTAIN A SURFACE CONSOLIDATED ROAD. THE SURFACE STABILIZATION ROAD IS DENOTED BY MANY DIFFERENT TERMS INCLUDING PARTIAL STABILIZATION, SEMI-STABILIZATION, ACCELERATED TRAFFIC BOUND, MAINTENANCE WITH CALCIUM CHLORIDE, SURFACE COMPACTION, AND SURFACE CONSOILIATION. NECESSARY CONSTRUCTION OPERATIONS ARE DESCRIBED WHEN ROADS LACK BINDER, AGGREGATE, MOISTURE, NEW ROADS, AND DRAINAGE AND CROWN. THE ADVANTAGES OF THIS TYPE OF SURFACE CONSOLICATION ARE: (1) A VARIETY OF LOCAL SURFACING MATERIALS AVAILABLE IN MOST REGIONS CAN BE UTILIZED, (2) SPECIAL TECHNICAL KNOWLEDGE IS NOT REQUIRED IN THE SELECTION OF MATERIALS, (3) THE COST IS LOW, AND (4) THIS ROAD TYPE FITS WELL INTO A STAGE CONSTRUCTION PROGRAM. /AUTHOR/

3A 231453
DESIGN AND CONSTRUCTION OF AGGREGATE BASE COURSES WITH CALCIUM CHLORIDE
AGGREGATE BASE COURSES ARE DEFINED AS THE USE OF WELL GRADED, SOUND AND DURABLE CRUSHED STONE, GRAVEL OR OTHER SUITABLE AGGREGATES AS FOUNDATION COURSES FOR BITUMINOUS PAVEMENTS. FINAL PERFORMANCE DEPENDS UPON DESIGN, MATERIALS AND CONSTRUCTION. THE DESIGN TREND NOW IS TOWARD THE USE OF EQUATIONS OR FORMULAS BASED ON RELATIONSHIPS BETWEEN TRAFFIC AND VARIOUS PAVEMENT DESIGNS. BETTER CONSTRUCTION TOOLS AND PRACTICES ARE ADVOCATED TO HELP ATTAIN MAXIMUM PERFORMANCE OF THE NATURAL SUBGRADE, SUBBASE AND BASE COURSE MATERIALS AND THUS IMPROVE PAVEMENT PERFORMANCE. SEVEN EXAMPLES ARE OUTLINED OF POOR CONSTRUCTION PRACTICES OFTEN ASSOCIATED WITH AGGREGATE BASE COURSE CONSTRUCTION. IT IS POINTED OUT THAT THE USE OF CALCIUM CHLORIDE IN BASE CONSTRUCTION, WITH THE RIGHT DENSITY, UNIVERSAL DRAINAGE AND PROPER GRADE WILL PROVIDE THE FOLLOWING BENEFITS: (1) IT AIDS COMPACTION AND INCREASES DENSITY, (2) IT REDUCES OR ELIMINATES THE NEED FOR SURFACE APPLICATIONS OF WATER (3) IT PERMITS CARRYING OF TRAFFIC WITHOUT RAVELLING OR DUST, (4) IT PROVIDES A MORE STABLE PLATFORM FOR PLACING EQUIPMENT, (5) IT PERMITS USE OF MINIMUM FINES OR BINDER, AND (6) IT ACTS AS A QUALITY CONTROL INGREDIENT TO HELP INSURE DESIRED RESULTS. IT IS CONCLUDED THAT HIGH QUALITY GRADED AGGREGATE BASE COURSES HAVE A DEFINITE PLACE IN BALANCED DESIGN OF MODERN FLEXIBLE PAVEMENTS BASED ON YEARS OF ACCUMULATED PERFORMANCE, THE AASHO ROAD TEST AND LATEST RESEARCH. THE PROPER USE OF CALCIUM CHLORIDE IN AGGREGATE BASE COURSES INSURES AN EFFECTIVE METHOD OF ACHIEVING MAXIMUM PERFORMANCE FROM QUALITY MATERIALS.

Ellerman, JH Halbfass, FPG DISCUSSER Van, AUKEN WT DISCUSSER Highway Research Board Proceedings

3A 231457
SOIL-PORTLAND CEMENT STABILIZATION

Acknowlegdement: Calcium Chloride Institute

3A 231461
ACIDIFIED CEMENT MIXTURES FOR ROADS
BRIEFLY REVIEWED ARE THE LABORATORY TESTS (DENSITY, MOISTURE CONTENT, AND DURABILITY TO FREEZING AND...
CONSTRUCTION EQUIPMENT AND METHODS

THAWING AND WETTING AND DRYING) USED IN CONTROL OF SOIL-CEMENT MIXTURES AND WITH OUTLINES ON THE GENERAL CONSTRUCTION PROCEDURES WHICH THE VARIOUS STATE REPORTS HAVE SHOWN TO BE SUCCESSFUL.

Catton, MD  Highway Research Board Proceedings

3A 231462
PROGRESS IN SOIL-CEMENT CONSTRUCTION
A SYMPOSIUM OF PAPERS FROM SIX HIGHWAY DEPARTMENTS (SOUTH CAROLINA, NORTH CAROLINA, MISSISSIPPI, OHIO, MARYLAND, AND OKLAHOMA) COVERS CONSTRUCTION PROCEDURES, SOIL SAMPLING, SOIL CLASSIFICATION, COMPACTION CONTROL, SUBGRADE CONTROL AND COSTS OF SOIL-CEMENT:

Highway Research Board Proceedings

3A 231464
CONDITION SURVEY OF SOIL-CEMENT ROADS-REPORT OF SUBCOMMITTEE ON USE OF PORTLAND CEMENT IN SOIL STABILIZATION
A QUESTIONNAIRE DESIGNED TO YIELD INFORMATION ON THE DESIGN, CONSTRUCTION, MAINTENANCE AND SERVICEABILITY OF SOIL-CEMENT BASE COURSES WITH BITUMINOUS WEARING SURFACES WAS CIRCULATED TO ALL STATE HIGHWAY DEPARTMENTS. SPECIAL ATTENTION WAS GIVEN TO THE FOLLOWING ITEMS: (1) CLIMATIC CONDITIONS, (2) DESIGN OF ROADWAY, (3) TYPES OF SOIL IN BASE AND SUBGRADE, (4) CEMENT CONTENT, (5) CONSTRUCTION METHODS, (6) WEATHER CONDITION DURING CONSTRUCTION, (7) TYPE AND CONDITION OF WEARING SURFACE, AND (8) TRAFFIC AND MAINTENANCE. CEMENT QUANTITIES VARIED BETWEEN 3.5 AND 14%, DEPENDING ON THE TYPE OF SOIL. THE BEST SOILS REQUIRED LOW CEMENT FACTORS, ALTHOUGH THIS FACTOR INCREASED WITH INCREASING CLAY CONTENT.

Mills, WH  Highway Research Board Proceedings

3A 231466
USE OF SOIL-CEMENT MIXTURES FOR BASE COURSE
THE LATEST INFORMATION IS AVAILABLE ON THE MATERIALS AND CONSTRUCTION METHODS IN USE FOR BUILDING SOIL-CEMENT BASE COURSES FOR PAVEMENTS. THE TYPES OF SOIL-CEMENT CONSTRUCTION DESCRIBED COVER THE INCORPORATION OF CEMENT WITH SUBGRADE SOILS, BORROW SOILS, PIT-RUN MATERIALS AND COMBINATIONS OF THESE MATERIALS BY MIXED-IN-PLACE, TRAVELING AND STATIONARY PLANT METHODS.

Highway Res Board Current Road Problems

ACKNOWLEDGMENT: Highway Research Board Bibliography

3A 231470
STABILIZATION OF DISINTEGRATED GRANITE FOR BASE COURSES OF HIGHWAYS EXPOSED TO SEVERE FROST CONDITIONS
A DESCRIPTION IS PROVIDED OF HOW MATERIALS SUSCEPTIBLE TO FROST HEAVE WERE STABILIZED FOR BASE COURSES OF ROADS. IMPORTANCE IS ATTACHED TO MAKING LABORATORY TESTS BEFORE STARTING THE FIELD WORK AND OF CONDUCTING FREEZING TESTS, BY ADDING ONLY A SMALL PERCENTAGE OF STABILIZING AGENTS, SUCH AS PORTLAND CEMENT, TAR OR SULFITE SOLUTION, IT IS POSSIBLE TO REDUCE THE FROST HEAVE OF THE MATERIAL CONSIDERABLY OR TO RENDER IT COMPLETELY FROSTPROOF. THE CONSTRUCTION METHODS ARE DESCRIBED IN DETAIL.

Aichborn, W Steinbrenner, W  Intl Conf Soil Mech & Fdn Eng Proc

ACKNOWLEDGMENT: Highway Research Board Bibliography

3A 231658
CONSTRUCTION OF EXPERIMENTAL STABILIZED SOIL-CEMENT HIGHWAY
A DETAILED DISCUSSION IS PRESENTED OF EQUIPMENT AND PROCEDURE IN CONSTRUCTING FIRST STABILIZED SOIL-CEMENT HIGHWAY IN ILLINOIS IN WINNEBAGO COUNTY, SEPTEMBER 1936.

Erickson, RO  Illinois Univ Eng Exp Sta Circulars, Engineering Index

ACKNOWLEDGMENT: Highway Research Board Bibliography

3A 231660
ROAD STABILIZED WITH DRY CEMENT
DETAILS OF CONSTRUCTION PROCEDURES FOR 3.3-MI CEMENT-STABILIZED EXPERIMENTAL SECTION IN ADAMS COUNTY, WISC., ARE DESCRIBED.

Larson, GH  Contractors & Engineers

ACKNOWLEDGMENT: Highway Research Board Bibliography

3A 231661
SOIL-CEMENT STABILIZATION IN MISSOURI
THE FIRST EXPERIMENTAL SOIL-CEMENT-STABILIZED SECTION BUILT IN MISSOURI DURING 1936-1937 IS DESCRIBED. SOIL CONSTANTS AND AMOUNT OF CEMENT FOR DIFFERENT SOILS ENCOUNTERED, WEATHER CONDITIONS, COST DATA AND CONSTRUCTION METHODS ARE GIVEN.

Reagel, FV  Highway Research Board Proceedings

3A 231666
SINGLE MACHINE METHODS AND CONTROL OPERATIONS CONSTRUCTION PROCEDURES USED IN 1939 ON THE FIRST SOIL-CEMENT ROAD BUILT BY THE OHIO DEPARTMENT OF HIGHWAYS ARE DESCRIBED. A 'SINGLE PASS' MIXING MACHINE WAS USED.

Litchiser, RR Brooks, HE  Highway Research Board Proceedings

3A 231672
SOIL STABILIZATION METHODS AT MARCH FIELD NEARLY A HALF MILLION SQUARE YARDS OF SOIL WERE STABILIZED BY THE ADDITION OF 12% PORTLAND CEMENT. A TOPPING MIXTURE CONSISTING OF A THIN LAYER OF CEMENT WAS SPREAD.

Excavating Engineer

ACKNOWLEDGMENT: Highway Research Board Bibliography

3A 231675
SOIL-CEMENT STABILIZED SHOULDERS IN TEXAS AN ILLUSTRATED ACCOUNT IS GIVEN OF METHOD OF CONSTRUCTION AS WELL AS THE DETAILS AND COSTS OF STATE WORK IN LAMAR COUNTY.

Pirie, JE Ward, JR  Roads and Streets, Engineering Index

ACKNOWLEDGMENT: Highway Research Board Bibliography

3A 231678
SOIL-CEMENT PAVING COSTS REDUCED BY USE OF CLAY MARL EQUIPMENT, CONSTRUCTION METHODS AND SOILS USED FOR SOIL-CEMENT SURFACING ON AN AIRBASE IN FLORIDA ARE REPORTED. ELIMINATION OF SIDE FORMS WHEN PROCESSING THE INDIVIDUAL LANES WAS MADE POSSIBLE BY MINOR MODIFICATION OF PAVING PROCEDURE. COST OF CONSTRUCTION IS GIVEN. CEMENT CONTENT WAS REDUCED FROM 16 TO 9% BY USING A CLAY MARL BORROW.

Friday, CB  Engineering News-record

ACKNOWLEDGMENT: Highway Research Board Bibliography
CONSTRUCTION EQUIPMENT AND METHODS

ACKNOWLEDGMENT: Highway Research Board Bibliography

3A 231690
SOIL-CEMENT STABILIZATION AS PRACTICED IN COLUMBUS, GEORGIA
A STEP-BY-STEP REPORT IS GIVEN OF HOW COLUMBUS DECIDED TO USE SOIL-CEMENT FOR PAYING ITS STREETS. THE CONSTRUCTION PROCEDURES FOLLOWED, AND THE RESULTS OBTAINED.
Graddy, J.M. American Road Builders Assoc. Tech Bull
ACKNOWLEDGMENT: Highway Research Board Bibliography

3A 231704
SPECIFICATIONS FOR THE CONSTRUCTION OF HOUSING ESTATE ROADS USING SOIL-CEMENT TWO SPECIFICATIONS ARE INCLUDED TO COVER THE PREPARATION OF SOIL-CEMENT ROAD BASES BY (1) THE MIX-IN-PLACE METHOD AND (2) THE USE OF STATIONARY MIXERS. THEY DEAL WITH MATERIALS (CEMENT, HYDRATED LIME, CALCIUM CHLORIDE, WATER, SOIL, CURING MATERIALS), SPREADING, WATERING, SHAPING AND COMPACTION, AND METHODS OF CONSTRUCTION.
Road Abstracts /UK/, Road Research Lab Road Notes /UK/
ACKNOWLEDGMENT: Highway Research Board Bibliography

3A 231713
SOIL-CEMENT ROAD FOUNDATIONS BY CONTRACT AT CASTLEFORD THE CONSTRUCTION TECHNIQUE USED AT FERRY FRYSTON HOUSING ESTATE IS DISCUSSED. INCLUDED IN THE REPORT ARE: DESIGN AND PREPARATION OF CONTRACT DOCUMENTS FOR SOIL-CEMENT, ROAD FOUNDATIONS, INVESTIGATIONS ON SITE AND IN LABORATORIES, COMPACTION TESTS, AND COST DATA.
Mellar, E. Surveyor and Municipal Engineer /UK/, Engineering Index
ACKNOWLEDGMENT: Highway Research Board Bibliography

3A 231722
Carri, V. Portland Cement Institute /Argentina/
ACKNOWLEDGMENT: Highway Research Board Bibliography

3A 231724
IDEAS ABOUT THE DESIGN OF BASES OF THE SOIL-CEMENT TYPE FOR NATIONAL HIGHWAYS (IN SPANISH) A STUDY ON THE BEHAVIOR OF THE PAVEMENT SECTION CANO- ROJAS, ROUTE 188, 15 KM. LONG, BUILT DURING 1942 FOR THE NATIONAL ROAD DEPARTMENT IS REPORTED. THE PAVEMENT CONSISTED OF A SUBBASE OF SELECTED SOIL 0.30 M. THICK, OF A SOIL-CEMENT BASE 0.12 M. THICK AND A BITUMINOUS TREATMENT OF THE 'SANDWICH' TYPE. THE AUTHOR RECORDS THAT THE SOIL-CEMENT BASE HAS SATISFACTORYLY WITHSTOOD HEAVY TRAFFIC.
Lanne, A. Portland Cement Institute /Argentina/
ACKNOWLEDGMENT: Portland Cement Association

3A 231728
SOIL-CEMENT CONSTRUCTION HANDBOOK THE HANDBOOK PRESENTS IN PRACTICAL FORM THE COMPLETE PROCEDURES FOR BUILDING SOIL-CEMENT ROADS, STREETS, AIRPORTS, PARKING, AND STORAGE AREAS AND SHOULDER. PROCEDURES FOR SOIL SAMPLING AND FOR INSPECTION AND FIELD CONTROL ARE INCLUDED.
Portland Cement Association
ACKNOWLEDGMENT: Highway Research Board Bibliography

3A 231733
SOIL-CEMENT ROADS AND ROAD BASES IN HOLLAND KINDS OF SOIL, METHODS OF CONSTRUCTION, SUMMER 'BLOW-UPS', AND COST FACTORS ARE PRESENTED. THE MIX-IN-PLACE, SINGLE PASS METHOD WAS ADOPTED. BLAST FURNACE SLAG CEMENT WAS USED.
Sluis, F.A. Surveyor and Municipal Engineer /UK/, Engineering Index
ACKNOWLEDGMENT: Highway Research Board Bibliography

3A 231759
Concrete Association /India/ 88 pp. 1962
ACKNOWLEDGMENT: Portland Cement Association

3A 231769
SOIL-CEMENT IN COLD WEATHER THE MOST OBVIOUS FEATURE OF SOIL-CEMENT CONSTRUCTION IN COLD WEATHER AREAS IS THAT IT NEEDS NO SPECIAL PRECAUTIONS OTHER THAN THOSE NORMALLY TAKEN TO ENSURE PROTECTION AGAINST FREEZING DURING AND IMMEDIATELY AFTER CONSTRUCTION. ONCE THE SOIL-CEMENT HAS HARDENED, EXTREMELY LOW TEMPERATURES WILL HAVE LITTLE EFFECT ON THE FINISHED PAVEMENT. SOIL-CEMENT IS NO CURE-ALL FOR FROST CONDITIONS, HOWEVER. WHEN BUILT ON A SOFT OR WET SUBGRADE, SOME TYPICAL NORTHERN SOIL-CEMENT PAVEMENTS ILLUSTRATE BEHAVIOR.
Soil-cement News, Pra
ACKNOWLEDGMENT: Portland Cement Association

3A 231803
LEAN CONCRETE ROAD BASES MATERIALS, CONSTRUCTION TECHNIQUES, AND DESIGNS OF LEAN CONCRETE BASES COMMONLY USED IN GREAT BRITAIN, AND THE GENERAL PERFORMANCE OF THE BASES ARE REVIEWED.
3A CONSTRUCTION EQUIPMENT AND METHODS

Wright, PJ Norsk Vegidskrift /Norway/, Road Abstracts /UK/
ACKNOWLEDGMENT: Portland Cement Association

3A 231806
CONTROL OF CEMENT-STABILIZED BASES
METHODS USED IN VARIOUS COUNTRIES FOR CONTROLLING SOILS AND CONSTRUCTION MATERIAL BEFORE, DURING, AND AFTER CONSTRUCTION ARE REVIEWED.
Kirk, JM Norsk Vegidskrift /Norway/, Road Abstracts /UK/
ACKNOWLEDGMENT: Portland Cement Association

3A 231858
BASE CONSTRUCTION OF SOIL/SAND EMULSION USING A SINGLE ACTION STABILISING MACHINE: PROVINCIAL ROUTE NO. 13- SECTION LAS ROSAS, K. 40.8 (PROVINCE OF SANTA FE) /IN SPANISH/
THE SOIL WAS CLAY AND MUD WITH A LIQUID CONTENT OF LESS THAN 32% AND WAS BROUGHT A DISTANCE OF 5 KM. THE SAND WAS TAKEN FROM THE PARANA RIVER. THE DRYING OF THE MIXTURE WITH EMULSION WAS DONE WITH A ROTARY MIXER AND THE CONSOLIDATION WITH CROWBAR ROLLERS, PNEUMATICALLY VIBRATED, IN THICKNESSES OF 12 TO 15 CM. ON THIS BASE A TRIPLE BITUMINOUS TREATMENT WAS PLACED ON A PRIMER OF 1.4 LITERS PER SQUARE METER. THE MACHINE USED IS DESCRIBED, THE PERSONNEL AND YIELDS OBTAINED. SIMULTANEOUS LABORATORY TESTS WERE MADE TO OBTAIN THE CBR OF THIS BASE /LTE/LCPC/RRL/
Marini, AH Permanent Asphalt Comm Proc /Argentina/
ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 231871
SOIL STABILIZATION WITH CEMENT OR LIME /IN FRENCH/
BASIC PRINCIPLES OF SOIL STABILIZATION ARE REVIEWED INCLUDING NEED FOR SCIENTIFIC PRELIMINARY TESTS TO DETERMINE THE NECESSARY CRITERIA, METHODICAL CONTROL DURING THE EXECUTION OF THE WORKS, AND RATIONAL ORGANIZATIONS OF THE SITE AND EQUIPMENT. DATA ARE GIVEN ON GRAVEL, SAND DEPOSITS, CONSTRUCTION METHODS AND NEW ROAD NETWORKS UNDER CONSTRUCTION IN SWITZERLAND. THE ECONOMIC IMPORTANCE OF CEMENT-STABILIZED GRAVEL FOR THE CONSTRUCTION OF HIGH-QUALITY SUBBASES IMPERVIOUS TO FROST AND WITH A HIGH BEARING CAPACITY, IS DISCUSSED. /LCPC/RRL/
Vogt, K La Route En Beton /Switzerland/
ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 231896
HIGHWAY ENGINEERING, CHAPTER 9: EARTHWORK FORMATION
AFTER AN INTRODUCTION INTO STABILITY AND SETTLEMENT PROBLEMS THIS CHAPTER DEALS WITH SUBSOIL DRAINAGE, COMPACTION OF SOIL, FROST DAMAGE TO SUBGRADE AND CONSTRUCTIONAL METHODS. /RRL/
Ashworth, R Heinemann Educational Books Ltd
ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 231873
THE MIXING OF STABILIZERS WITH SOIL
BASIC REQUIREMENTS AND AVAILABLE METHODS FOR MIXING ADDITIVES WITH SOIL ARE EXAMINED BOTH PRACTICALLY AND THEORETICALLY. THE EFFECT OF VARIOUS IMPORTANT FACTORS ON STRENGTH DEVELOPMENT IN STABILIZED SOILS IS STUDIED, FOLLOWING AN ASSESSMENT OF THE PRACTICAL AND ECONOMIC SIGNIFICANCE OF THESE EFFECTS. RECOMMENDATIONS ARE MADE FOR POSSIBLE IMPROVEMENTS IN SOIL STABILIZATION CONSTRUCTION PRACTICE. /RRL/A/
Ingles, OG Metcall, JB Frydman, S Inst Engrs Civil Eng Trans /Australia/
ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 231921
SOIL STABILIZATION WITH BASIC BROWN COAL-FLY ASH /IN HUNGARIAN/
A DISCUSSION AND EVALUATION OF LABORATORY TESTS AND EXPERIENCES ON TEST ROADS IS PRESENTED. THESE INCLUDE QUALIFICATION TESTS, FOR EXAMPLE FINENESS, BULKING, BINDING TIME AND RADIO ACTIVITY OF THE FLY-ASH; COMPRESSION TESTS WITH VARYING FLY-ASH CONTENT; AND INFLUENCE OF AN ADMIXTURE OF CEMENT OF DIFFERENT SOILS. THE RESULTS OF THE FIELD TESTS SHOWED THAT THE CONSTRUCTION METHODS ARE IDENTICAL TO THE METHODS USED IN CEMENT STABILIZATION MEASURES TO PROTECT INDUSTRIAL HEALTH MUST ALSO BE CONSIDERED. THE DISADVANTAGE IS THAT THE QUALITY OF THE ASH VARIES A GREAT DEAL, THEREBY RENDERING CONSTANT CONTROL NECESSARY. CONSIDERABLE SAVINGS IN COSTS CAN BE ACHIEVED. /FG/RRL/
Fulop, I Melepitesudomanyi Szemle /Hungary/
ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 231925
SOIL STABILIZATION WITH LIME IN EARTHWORKS AND ROAD CONSTRUCTION /IN GERMAN/
THIS BOOK CONTAINS THE FOLLOWING REPORTS, WHICH ARE MAINLY REPRINTS FROM VARIOUS JOURNALS: KUONEN, V., AND R. HIRT, RESULTS OF RESEARCH INTO THE EFFECT OF LIME IN SOIL STABILIZATION; BRAND, W., POSSIBILITIES AND LIMITS OF USING LIME TO STABILIZE COHESIVE SOILS; KLEMPERT, B., CODES OF PRACTICE AND THEIR APPLICATION IN RURAL ROAD CONSTRUCTION IN NORDHEIN-WESTFALEN, BAVARIA AND HAMBURG; OBSERVATIONS ON THE VARIOUS CONTENT IN THE SUBGRADE AND SUBSOIL OF A MOTORWAY; AND KNOBB, B., AND F. STEINMANN, SOIL STABILIZATION WITH LIME IN EARTHWORKS-A NEW, PARTICULARLY EFFICIENT METHOD. THE DEPARTMENT OF FOUNDATIONS OF THE BUNDESANSTALT FUR STRASSENWESEN REFERS TO THE IMPROVEMENT AND STABILIZATION OF COHESIVE SOILS WITH LIME IN EARTHWORKS FOR ROAD CONSTRUCTION. THERE IS A BIBLI-
CONSTRUCTION EQUIPMENT AND METHODS

OGRAFY ON GENERAL PRINCIPLES, THEIR PRACTICAL APPLICATION IN ROAD AND RAIL CONSTRUCTION AND EARTHWORKS, AND THE VALID CODES OF PRACTICE AND SPECIFICATIONS. TWO INDEXED RECORDS OF SOIL STABILIZATION AND IMPROVEMENT OF COHESIVE SOILS WITH LIME CONCLUDE THE BOOK. /FG/RRL/

Bundesverband Kalkindustrie /Germany/ 24 pp, 1966
ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 231944
SOIL STABILIZATION IN THEORY AND PRACTICE (IN GERMAN)
THIS INSTRUCTION MANUAL CONTAINS: MODIFICATION OF THE NATURAL PROPERTIES OF SOIL; TERMINOLOGY; METHODS OF SOIL STABILIZATION AND ITS ECONOMICS AND AREAS OF USE; PRINCIPLES OF MECHANICAL STABILIZATION METHODS; SITE TESTS, MAINTENANCE OF MECHANICALLY STABILIZED WEARING COURSES; INSTRUCTORS, SPECIFICATIONS AND TEST METHODS FOR SOIL STABILIZATION WITH CEMENT; LIME STABILIZATION OF COHESIVE SOILS, ECONOMIC SIGNIFICANCE, LIME AS A STABILIZER, SUITABILITY TESTS; SOIL STABILIZATION WITH BITUMINOUS BINDERS: AREAS OF USE AND CONSTRUCTION METHODS; SOIL STABILIZATION WITH CHEMICALS: POSSIBILITIES AND EXAMPLES OF APPLICATION; USE OF MACHINES IN GRADING OPERATIONS, WORKING ON BINDER AND WATER, MIXING, COMPACITION AND CURING; CONSTRUCTION OF LOW-COST ROADS THROUGH SOIL STABILIZATION; EARTHWORKS-LOADING, TRANSPORTING AND DISTRIBUTING; AND SURFACING AND CONSTRUCTION OF STABILIZED ROADS. /RRL/

Lindemann, K Bauwesen, Berlin /Germany/
ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 231947
PRINCIPLES AND APPLICATION OF SOIL STABILIZATION /GERMAN/
AFTER AN HISTORICAL SURVEY OF SOIL STABILIZATION METHODS, THE MECHANICAL STABILIZATION OF SOIL WITH CEMENT, LIME, BITUMINOUS MATERIALS AND CHEMICALS IS DISCUSSED. SOIL PROPERTIES, BINDER PROPERTIES AND THEIR REACTION WITH SOIL ARE ALSO OUTLINED, TOGETHER WITH SUITABILITY TESTS FOR SOIL STABILIZATION WITH LIME AND CEMENT. THE INFLUENCE OF SOIL STABILIZATION ON THE DESIGN OF THE ROAD STRUCTURE, AND WORKING PROCESSES AND EQUIPMENT INVOLVED IN CONSTRUCTION ARE DESCRIBED /FG/RRL/

Jessberger, HL Vd Zietschrift /Germany/
ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 231959
SUBMERGED TUNNELS, UNDERWATER SETTING OF TUNNEL SECTIONS /FRENCH/
THE CONSTRUCTION OF SEVERAL UNDERWATER TUNNELS IS REVIEWED AND METHODS OF SINKING CONNECTIONS AND FOUNDATIONS FOR TUNNEL SECTIONS ARE DISCUSSED. /CRIC/FEsr/LCPC/RRL/

Havvo, K Ingenieursblad, Antwerp /Belgium/
ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 231961
CONSTRUCTION OF EMBANKMENTS ON MARSHY GROUND USING A HYDRAULIC METHOD WITHOUT PRELIMINARY HEAT BLASTING /IN RUSSIAN/
DETAILS ARE GIVEN OF A NEW HYDRAULIC METHOD OF CONSTRUCTING EMBANKMENTS ON MARSHY GROUND. IT CONSISTS IN INJECTING INTO THE PEAT A MIXTURE OF MUD AND SAND THROUGH A VERTICAL TUBE. THIS MIXTURE PARTIALLY LIQUEFIES THE PEAT AND DISPOSES OF IT BY FORMING A CONE IN WHICH THE HEAVIER SAND PARTICLES SETTLE THUS REPLACING THE PEAT BY SAND. CONSTRUCTION COSTS ARE APPROXIMATELY 50% LOWER THAN THOSE OF STANDARD CONSTRUCTION METHODS. /LCPC/RRL/

Dmitrienko, YD Levchenko, IM Nazarov, PA Gavrilov, RN Automobil Nye Dorogi /Ussr/
ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 231965
REINFORCED SOIL-CEMENT (IN RUSSIAN)
AN INVESTIGATION INTO THE PROPERTIES OF REINFORCED SOIL-CEMENT SUBJECTED TO SHORT-TERM LOADING, AND ITS APPLICATION TO ROAD CONSTRUCTION IS PRESENTED. THE EFFICIENCY OF THE REINFORCEMENT WAS TESTED ON SOIL-CEMENT SAMPLES MADE WITH LOESS SILTS FROM THE REGION OF VOLGOGRAD, WHICH HAD A LIQUID LIMIT EQUAL TO 31.8 AND 18.1 PER CENT. THE TESTS SHOW THAT, EVEN WITH A LOW PERCENTAGE OF REINFORCEMENT, THE BEARING CAPACITY OF SOIL-CEMENT CAN BE DOUBLED. BECAUSE SOIL-CEMENT HAS A HIGH RESISTANCE TO CRACKING, ITS IMPORTANCE IN THE DISTRIBUTION OF THERMAL STRESSES IN THE PAVEMENT LAYERS TREATED IS EMPHASIZED. THIS CONSTRUCTION METHOD SHOULD PROVE ECONOMICAL FOR THE CONSTRUCTION OF BASE COURSES AS IT ENABLES THE QUANTITY OF SOIL-CEMENT USED TO BE REDUCED; THE COST OF A CUBIC METER OF REINFORCED SOIL-CEMENT IS QUOTED. /LCPC/RRL/

Dobrinskii, LK Stroitel' Stvoi Arkhitektura /Ussr/
ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 231968
OPTICAL CONTROL OF EARTHWORKS MACHINERY (IN RUSSIAN)
AN OPTICAL DEVICE IS DESCRIBED WHICH FACILITATES THE REMOTE CONTROL OF EARTHWORKS MACHINERY. IT CONSISTS OF (1) A LIGHT RAY TRANSMITTER PUL3, AND (2) A RECEIVING DEVICE WHICH CONTAINS A PHOTORECEIVER ATTACHED TO THE WORKING PART OF THE MACHINE, AND AN AMPLIFIER AND CONTROL PANEL IN THE DRIVER'S CAB. THIS DEVICE WAS SUCCESSFULLY USED DURING THE CONSTRUCTION OF STRAIGHT AND CURVED STRETCHES OF ROAD. /LCPC/RRL/

Kardac, MV Malayar, VS Mekh Stroitel' Stva /Ussr/
ACKNOWLEDGMENT: Road Research Laboratory /UK/
CONSTRUCTION EQUIPMENT AND METHODS

**3A 232004**

**GENERAL REPORTS PRESENTED BY THE USSR AT THE SECOND CONFERENCE ON ROAD CONSTRUCTION PROBLEMS HELD BY SOCIALIST COUNTRIES IN WARSAW, IN 1966 (IN RUSSIAN)**

This publication contains the following reports: (1) METHODS OF SOIL STABILIZATION BY THE COMBINED ACTION OF BINDERS AND CHEMICAL ACTIVATORS, (2) CONSTRUCTION METHODS FOR ASPHALTIC CONCRETE SURFACINGS AND WORK MECHANIZATION, (3) CONSTRUCTION OF ROADS WITH ROUGH SURFACINGS AND COMPOSITION OF NON-SKID LAYERS APPLIED DURING ROAD MAINTENANCE, AND (4) CONSTRUCTION TECHNOLOGY FOR PRECASTED CONCRETE SURFACINGS. /LCPC/RRL/

**ACKNOWLEDGMENT:** Road Research Laboratory /UK/

**3A 232014**

**TESTING D-357 OF SCRAPERS (IN RUSSIAN)**

A BRIEF DESCRIPTION IS GIVEN OF A SCRAPER CAPABLE OF PERFORMING EARTHWORK OPERATIONS IN WINTER ON FROZEN SOIL. /LCPC/RRL/

**Tatarov, EN Kemarskii, BA Sprokel Nyw I Dorohyne Mashiny** /USSR/

**ACKNOWLEDGMENT:** Road Research Laboratory /UK/

**3A 232039**

**TRAIL PAVEMENTS OF LATERITE BASE COURSE**

A DESCRIPTION IS GIVEN OF TWO ROAD TEST SECTIONS-CATOFE AND QUIZENGA-WHICH WERE USED TO INVESTIGATE THE INFLUENCE OF VARIOUS PARAMETERS ON THE BEHAVIOR OF LATERITE PAVEMENT RELATIVE TO THE CONSTRUCTION METHODS, QUALITY OF THE LATERITE AND TYPES OF SURFACING. THE RESULTS HAVE CONFIRMED THE EXISTING OPINION THAT IT IS POSSIBLE TO USE LATERITIC SOILS OF HIGH PLASTICITY, AND THAT STRICT CONTROL OF CONSTRUCTION IS NECESSARY, IN PARTICULAR, FOR THE COMPACTION AS THE IMPERMEABILITY OF THE SURFACING WOULD APPEAR TO BE IMPORTANT. /RRL/A/

**Meireles, JM Soil Mech & Fdn Eng Proc /South Africa/**

**ACKNOWLEDGMENT:** Road Research Laboratory /UK/

**3A 2321071**

**CONSTRUCTION OF THE ELANSKER BOG EMBANKMENT WHICH FORMS PART OF THE TUNG-MEN-SURGIT RAILWAY (IN RUSSIAN)**


**Glyzin, AP Transport'noe Stroitel'stvo /USSR/**

**ACKNOWLEDGMENT:** Road Research Laboratory /UK/

**3A 232082**

**SOIL STABILIZATION IN THE FEDERAL REPUBLIC OF GERMANY (IN GERMAN)**

AN OUTLINE IS GIVEN OF THE DEVELOPMENT OF SOIL STABILIZATION SINCE THE 1930'S AND THE SUCCESSFUL APPLICATION OF THE MEASURE IN ROAD AND AIRFIELD CONSTRUCTION. PARTICULAR REFERENCE IS MADE TO THE STANDARD USE IN GERMANY OF TAR-STABILIZED SOILS UNDER RIGID PAVEMENTS AND CEMENT-STABILIZED SOILS UNDER FLEXIBLE PAVEMENTS. CONSTRUCTION METHODS BOTH IN AND OUTSIDE EUROPE ARE COMPARED TO ILLUSTRATE THE VERSATILITY OF SOIL STABILIZATION. /FG/RRL/

**Buchholz, H Strasse, Bruecke, Tunnel /Germany/**

**ACKNOWLEDGMENT:** Road Research Laboratory /UK/

**3A 232085**

**SOIL STABILIZATION WITH BITUMEN (IN GERMAN)**

AN EXPLANATION IS GIVEN OF THE STANDARD LEAFLET SNV 640 506 "SOIL STABILIZATION WITH BITUMINOUS BINDERS" IN RELATION TO THE PERTINENT SECTIONS OF THE BASIC STANDARD SNV 640 500 "SOIL STABILIZATION-GENERAL." BITUMEN STABILIZATION UNDERTAKEN IN SWITZERLAND IS SURVEYED AND COMPARED WITH THE HOT MIX METHOD NORMALLY USED FOR SURFACING CONSTRUCTION. SPECIAL REFERENCE IS MADE TO THE VARIOUS TYPES OF SOIL AND BINDER DATA ARE GIVEN ON THE USE OF BITUMEN-STABILIZED SOIL IN ROAD CONSTRUCTION. THE SUITABILITY TESTING OF THE CONSTRUCTION MATERIALS, ESTABLISHMENT OF BINDER CONTENTS, CHOICE OF LAYER THICKNESSES AND WORKING METHODS AND EQUIPMENT ARE DESCRIBED. /VSS/FG/RRL/

**Bissegger, E Strasse Und Verkehr /Switzerland/**

**ACKNOWLEDGMENT:** Road Research Laboratory /UK/

**3A 232101**

**FIELD TRIAL OF THE CONSTRUCTION OF A CEMENT-STABILIZED CHALK SUB-BASE BY THE MIX-IN-PLACE PROCESS**

AN ACCOUNT IS GIVEN OF TRIALS MADE ON A 34 AT TIDBURY RING, HAMPShIRE TO TEST THE FEASIBILITY OF THE MIX-IN-PLACE STABILIZATION PROCESS IN THE CONSTRUCTION OF CEMENT-STABILIZED CHALK SUB-BASES. THE EXPERIMENT SHOWED THAT, WITH THE SPECIAL SINGLE-PASS TYPE OF MACHINE EMPLOYED, A VERY LOW MIXING EFFICIENCY OF ABOUT 40 PER CENT WAS OBTAINED EVEN AFTER THREE PASSES, AS A RESULT THE STRENGTH OF THE MATERIAL WITH 14 PER CENT OF CEMENT WAS MUCH BELOW THE REQUIREMENTS OF THE CURRENT M.O.T. SPECIFICATIONS. IT IS THEREFORE CONCLUDED THAT THE MIX-IN-PLACE PROCESS IS NOT SUITABLE FOR THE CONSTRUCTION OF CEMENT-STABILIZED CHALK SUB-BASES FOR MAJOR ROAD WORKS. /RRL/AUTHOR/

**Poock, RG Ministry of Transport, London /UK/**

**ACKNOWLEDGMENT:** Transport & Road Research Lab /UK/
CONSTRUCTION EQUIPMENT AND METHODS

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 232120

PFA THE EVOLUTION OF A METHOD SPECIFICATION FOR COMPACTION

THE PROPERTIES AND THE TRIALS CARRIED OUT TO DETERMINE A COMPACTION METHOD SPECIFICATION FOR LAGOON ASH, A TYPE OF PULVERIZED FUEL ASH, ARE DESCRIBED. COMPACTION TESTS CARRIED OUT IN THE LABORATORY, TOGETHER WITH FIELD TRIALS NEAR BOSTON DURING CONSTRUCTION OF MOTORWAYS M4 AND M5 ARE DESCRIBED. THE ADVANTAGES AND PROBLEMS OF USING THIS MATERIAL AS A LIGHTWEIGHT FILL ARE DISCUSSED. METHODS OF SOLVING PROBLEMS ENCOUNTERED DURING CONSTRUCTION ARE MENTIONED. THE ARTICLE CONTAINS A BRIEF DESCRIPTION OF THE USE OF THE MATERIAL AT THE ALMONDSBURY INTERCHANGE AND THE TRIAL EMBANKMENT AT AVONMOUTH. A METHOD SPECIFICATION FOR THE COMPACTION OF THIS TYPE OF PULVERISED FUEL ASH HAS NOW BEEN EVOLVED. /RL/ (A)

Eyre, WA Surveyor and Municipal Engineer /UK/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 232152

CAST-IN-SITU WALL TECHNIQUE USED DURING ROAD CONSTRUCTION WORKS IN PARIS /IN FRENCH/


Schneebeli, G Construction, Paris /France/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 232158

THE CONSTRUCTION OF SOIL-CEMENT ROADBASES IN THE NORTHERN PART OF THE LUGANSK PROVINCE /IN RUSSIAN/

DETAILS ARE GIVEN OF SECTIONS OF ROAD WITH A 20 CM THICK SOIL-CEMENT BASE. LACK OF LOCAL ROADSTONE MATERIALS LED TO THE USE OF SOIL-CEMENT RESULTING IN LOW CONSTRUCTION COSTS (TWO AS LOW AS FOR A ROAD-BASE BUILT WITH CRUSHED STONE AGGREGATES). THE CROSS SECTION OF THE PAVEMENT IS DESCRIBED TOGETHER WITH THE CHARACTERISTICS OF THE STABILIZED SOIL, LABORATORY TESTS, AND CONSTRUCTION METHODS. IN-SITU OBSERVATIONS SHOWED THAT THE TREATMENT SHOULD NOT BE INTERRUPTED FOR MORE THAN 50 MINUTES, AND VIBRATORY COMPACTION WAS BETTER THAN ANY OTHER FORM OF COMPACTION. AFTER TWO YEARS THE PERFORMANCE OF THESE SECTIONS IS QUITE SATISFACTORY. /LCPC/RRL/

Mel'man, MA Avtomobil Nye Dorogi /Ussr/

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 232216

UTILIZATION OF LOW COST MATERIALS IN AREAS DEFICIENT IN ROADSTONE

THE POTENTIAL IS DISCUSSED FOR THE USE OF CEMENT IN STABILIZING WASTE OR LOW GRADE MATERIALS TO PRODUCE A DIFFERENT MATERIAL WHICH IS STRONGER AND MORE DURABLE THAN THE ORIGINAL. THE CHARACTERISTICS, DESIGN AND TESTING OF CEMENTED MATERIALS ARE DISCUSSED AND GUIDANCE IS GIVEN ON THE DESIGN OF PAVEMENTS USING THESE MATERIALS. CONSTRUCTION METHODS ARE BRIEFLY ENUMERATED. TREATMENT OF A NUMBER OF RAW MATERIALS USED WITH CEMENT, INCLUDING GRAVELS, SANDS LIMESTONE, CHALK, SHALE, PULVERIZED FUEL ASH, INDUSTRIAL WASTE, AND SOILS ARE INVESTIGATED. /RRL(A)/

Sharp, DR Inst Hwy Engineers Journal, London /UK/

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 232261

GROUTING OF SOIL, VOLUME I: PRINCIPLES AND METHODS /IN FRENCH/

THE DEVELOPMENT OF GROUTING AS A CONSTRUCTION METHOD IS DISCUSSED. THEORETICAL CONSIDERATIONS BASED ON LABORATORY AND IN-SITU OBSERVATIONS ARE PRESENTED TOGETHER WITH A DESCRIPTION OF METHODS AND EQUIPMENT USED. /LCPC/RRL/

Cambeufert, H Eyrolles, Paris /France/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 232282

MANUAL FOR THE HIGHWAY ENGINEER


1965, 723 pp, 371 Fig, 380 Tab, 8 Phot

3A 232284

STUDY OF EMBANKMENTS ON COMPRESSIBLE SOIL. RECOMMENDATIONS FROM THE "LABORATORIE DES PONTS ET CHAUSSEES" /IN FRENCH/

FOLLOWING A DEFINITION OF COMPRESSIBLE SOIL, DETAILS ARE GIVEN OF GEOTECHNICAL SURVEY METHODS AND EQUIPMENT FOR GENERAL AND DETAILED STUDIES OF STABILITY AND SETTLEMENT MEASUREMENTS AND OBSERVATIONS DURING AND AFTER THE CONSTRUCTION OF AN EMBANKMENT ON COMPRESSIBLE SOIL. DIFFERENT CONSTRUCTION METHODS ARE GIVEN FOR EMBANKMENTS ON SOFT SOIL. /TRRL/

Dunod, Paris /France/ 1971, 216 pp, Figs, Tabs, Photos, Refs

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 232337

SOIL ANCHORS

FOLLOWING A NOTE ON THE BACKGROUND TO RECENT INJECTION ANCHOR DEVELOPMENTS IN THE UK, THE MAIN
APPLICATIONS ASSOCIATED WITH PRESTRESSED SOIL ANCHORS ARE DESCRIBED. THE TYPE OF SITE INVESTIGATION AND THE SOIL PROPERTIES REQUIRED TO FACILITATE ANCHORAGE DESIGN AND CHOICE OF CONSTRUCTION TECHNIQUE ARE THEN DISCUSSED. AS A RESULT OF TESTING SOIL ANCHORS TO FAILURE, EMPIRICAL DESIGN RULES ARE PRESENTED WHICH RELATE ULTIMATE LOAD-HOLDING CAPACITY TO LOCAL SOIL PROPERTIES AND ANCHOR DIMENSIONS, FOR COARSE SANDS AND GRAVELS, FINE TO MEDIUM SIZED SANDS, STIFF CLAY, STIFF TO HARD CHALK AND KEUPER MARL. SAFETY FACTORS WHICH ARE APPLIED TO THESE RULES ARE INCLUDED TOGETHER WITH RECOMMENDATIONS FOR THE POST-TENSIONING AND TESTING OF INDIVIDUAL ANCHORS. DATA ON THE LONG-TERM BEHAVIOR OF SOIL ANCHORS IS LIMITED, BUT PRESTRESS LOSSES DUE PRIMARILY TO FIXED ANCHOR DISPLACEMENT ARE LISTED FOR GUIDE PURPOSES WHEN ESTIMATING REALISTIC OVERLOADS. CORROSION PROTECTION IS DISCUSSED IN RELATION TO FULLY RESTRESSABLE CABLES FOR TEMPORARY AND PERMANENT WORKS. FINALLY, THE IMPORTANCE OF PULL-OUT TESTS IS EMPHASIZED TOGETHER WITH FIELD OBSERVATIONS OF MICRO ANCHOR PERFORMANCE, WHERE THESE DATA ARE RELATED TO THE ORIGINAL DESIGN CRITERIA. /RRL(A)/

Littlejohn, GS Inst Civil Engineers Proc, London /UK/

ACKNOWLEDGMENT: Rrl Reports, Road Research Lab /UK/

3A 232339
LATERAL SUPPORT OF DEEP EXCAVATIONS
THE DEVELOPMENT OF CONSTRUCTION METHODS FOR SUPPORTING DEEP EXCAVATIONS IS BRIEFLY REVIEWED. CURRENT DESIGN METHODS ARE DESCRIBED FOR CALCULATING THE EARTH PRESSURE ON SHEETED EXCAVATIONS. THESE PRESSURES DEPEND ON THE TIME OVER WHICH THE EXCAVATION MUST REMAIN OPEN AND IN SUPPORT CONDITION AND THE AMOUNT OF LATERAL YIELDING OF THE SUPPORTS WHICH CAN BE TOLERATED. THE AMOUNT OF YIELDING IS REFLECTED IN THE SETTLEMENT OF THE GROUND SURFACE AROUND THE EXCAVATION. CURRENT CONSTRUCTION PRACTICES, INCLUDING SUPPORT BY SHEET PILING, Timber sheeting, cast in situ diaphragm walling and contiguous bored piles, the efficacy of ground treatment processes including grout injections and groundwater lowering is mentioned. /RRL/

Tomlinson, MJ Inst Civil Engineers Proc, London /UK/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 232340
PRODUCTION, CONSTRUCTION TIME AND CONSTRUCTION COSTS RELATED TO EARTHMOVING OPERATIONS
AN EFFORT WAS MADE TO DETERMINE PRODUCTION CURVES FOR EARTHMOVING EQUIPMENT, I.E. THE PRODUCTION IN CUBIC METERS PER HOUR FOR VARIOUS SOILS AS A FUNCTION OF HAUL DISTANCE AND TO DETERMINE COST CURVES FOR THE SAME EQUIPMENT, REPRESENTING COSTS FOR MOVING ONE CUBIC METER OF VARIOUS SOILS OVER A GIVEN DISTANCE. THESE CURVES SHOULD BE USED AS FOLLOWS: (1) TO EVALUATE THE DIFFERENCE IN EARTHMOVING COSTS FOR ALTERNATIVE LONGITUDINAL PROFILES, (2) TO ESTABLISH THE DURATION OF A GIVEN JOB FOR A GIVEN TYPE OF EQUIPMENT, OR TO ESTIMATE THE EQUIPMENT NECESSARY WHEN CONSTRUCTION TIME IS GIVEN, AND (3) TO ESTIMATE THE TECHNICAL COSTS OF EARTHMOVING AND COMPACTION. /RRL/

Schacke, I Ping Transp Res & Computation Proc /UK/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 232356

Highways and Traffic Engineering /UK/ Vol. 39 No 1736/7, Apr. 1971, pp 18-37, Figs, Photos

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 232377
USE OF LIME STABILIZED MOORUM IN THE SCIENTIFIC CONSTRUCTION OF AN AIRFIELD WITH A VIEW TO EFFECTING ECONOMY
THE CONSTRUCTION OF AN AIRFIELD AT KHAURAGO, ACCORDING TO SPECIFICATIONS PROPOSED BY THE CENTRAL ROAD RESEARCH, NEW DELHI, IS DESCRIBED; LOCALLY AVAILABLE MOORUM, STABILIZED WITH LIME IN THE LOWER LAYERS WAS USED FOR ALMOST 2/3 OF THE PAVEMENT THICKNESS. THIS METHOD OF CONSTRUCTION RESULTED IN CONSIDERABLE SAVINGS IN COST, COMPARED WITH CONVENTIONAL METHODS. /RRL/

Uppal, HL Wason, OP Indian Roads Congress Road Res Bull No. 14, 1970, pp 101-18, 4 Fig, 4 Tab

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 232453
STABILIZATION OF SOILS WITH LIME, LIME-FLYASH, AND OTHER LIME REACTIVE MATERIALS
DESIRABLE TESTING AND CONSTRUCTION TECHNIQUES ARE REPORTED TO BE USED FOR CONSTRUCTION OF SUCCESSFUL LIME STABILIZATION PROJECTS. THE REPORT DISCUSSES THE HISTORY OF THE PROCESS, THE COMPOSITION AND CHARACTERISTICS OF THE LIMES USED, AND THE TYPES OF LIME STABILIZATION GENERALLY USED. A BRIEF DISCUSSION OF SOME OF THE CHEMICAL REACTIONS EXPLAINS WHY AND HOW LIME CHANGES PHYSICAL CHARACTERISTICS OF SOILS. A PORTION OF THE REPORT PERTAINS TO TESTING OF MIXTURES AND TO INTERPRETATION OF TEST RESULTS. DISCUSSION OF CONSTRUCTION PRACTICE COVERS SUCH SUBJECTS AS APPLICATION OF LIME, MIXING, COMPACTING, CURING, AND REWORKING. RECOMMENDATIONS WITH REGARD TO THESE PRACTICES AND THEIR RELATIONSHIP TO CRACKING AND PERMANENCE ARE MADE. A NUMBER OF TESTS TO BE MADE SUBSEQUENT TO CONSTRUCTION ARE SUGGESTED AND THE BENEFITS OF LIME AS A STABILIZER AND OF PROPERLY CONSTRUCTED LIME STABILIZED PROJECTS ARE SUMMARIZED. /AUTHOR/

Medwell, C Highway Research Board Bulletin

3A 232456
FIELD STUDIES TO DETERMINE THE VALUE OF CALCIUM CHLORIDE FOR COMPACTION OF SOILS
FIELD INVESTIGATIONS ARE UNDERWAY IN VIRGINIA AND AT ARROWSMASH TO STUDY PRACTICAL METHODS, DURABILITY, AND PERFORMANCE, AS WELL AS DENSITY, MOISTURE. COMPACTIVE EFFORTS AND STRENGTH OF SAND-CLAY BASE MATERIALS STABILIZED WITH CALCIUM CHLORIDE. TEST SECTIONS WERE CONSTRUCTED WITH A 10-INCH STABILIZED SAND-CLAY BASE AND A TWO COAT ASPHALT WEARING SURFACE. EXPERIMENTAL SECTIONS OF THE BASE MATERIAL WERE BROUGHT UP TO APPROXIMATE GRADE AND PROFILE. THE DESIGNATED AMOUNT OF CALCIUM CHLORIDE WAS THEN SPREAD UNIFORMICALLY OVER THE TWO TREATED SECTIONS. IT WAS THOROUGHLY MIXED WITH THE TOP 5 INCHES.
CONSTRUCTION EQUIPMENT AND METHODS

3A

COMPACTED DEPTH, BY MEANS OF A SCARIFIER AND A SEAMAN PULVIMIXER. COMPACTION FOLLOWED MIXING. EIGHTTEEN DAYS AFTER CONSTRUCTION THE ASPHALT WEARING SURFACE WAS PLACED. DURING THESE 18 DAYS THE ROAD WAS OPEN TO TRAFFIC. MAINTENANCE DURING THIS PERIOD CONSISTED OF A LIGHT BLADING AND THE ADDITION OF WATER TO THE UNTREATED SECTION FOR LAYING DUST. DENSITY MEASUREMENTS WERE MADE AT 1, 5, 7 AND 15 DAYS, FOLLOWING CONSTRUCTION AND ARE NOW BEING MADE EVERY 30 DAYS. TRAFFIC MEASUREMENTS MADE BEFORE SURFACE TREATMENT INCLUDED PH-VALUES OF THE BASE MATERIALS. CALCIUM CHLORIDE CONTENTS OF ROADWAY SAMPLES, SURFACE ROUGHNESS AND STRENGTH MEASUREMENTS. FOR DETERMINING STRENGTHS, THE BURGGRAF SHEAR APPARATUS WAS ADOPTED.

Theuer, AU Highway Research Board Bulletin

3A 232472

SALT FOR ROAD STABILIZATION

METHODS ARE DESCRIBED FOR USING SALT TO STABILIZE ROADWAYS. CASE HISTORIES ARE PRESENTED FROM STATE AND LOCAL AGENCIES THAT HAVE USED SALT TO PROVIDE A FIRM, DENSE ROADBASE PRIOR TO PAVING OR PLACING A SEAL COAT. A COMPANION EIGHT-PAGE SPECIFICATION MANUAL TELLS HOW TO SELECT AGGREGATES, EQUIPMENT, AND CONSTRUCTION METHODS FOR SALT STABILIZATION. GRADATION RECOMMENDATIONS FOR THE GRAVEL, CRUSHED STONE OR SLAG USED IN SALT-STABILIZED BASE OR SHOULDER CONSTRUCTION ARE LISTED. THE MOISTENING, MIXING AND COMPACTING EFFORTS NEEDED FOR OPTIMUM RESULTS ARE DESCRIBED.

Salt Institute

ACKNOWLEDGMENT: Highway Research News, Hwy Res Board

3A 233203

USE OF EMULSIFIED ASPHALT IN BASE STABILIZATION

STABILIZED SANDS ARE BEING USED FOR SUBBASE, BASE COURSE, AND ASPHALT SURFACE COURSE IN COLORADO. MC-AND RC-CUTBACK ASPHALTS, ASPHALT CEMENT OF VARIOUS PENETRATION GRADES, EMULSIFIED ASPHALTS, PORTLAND CEMENT AND HYDRATED LIME ARE BEING USED AS STABILIZING AGENTS. SINCE EMULSIFIED ASPHALT HAS BECOME MORE AVAILABLE TO PLANTS IN COLORADO, THE LARGEST SINGLE USE HAS BEEN FOR STABILIZATION OF DUNE SAND FOR SUBBASE UNDER PORTLAND CEMENT CONCRETE PAVEMENT. FOR THIS PURPOSE, THE STABILIZED MATERIAL MUST NOT ONLY BE CAPABLE OF SERVING AS A SUBBASE UNDER THE COMPLETED PAVEMENT, BUT MUST ALSO BE CAPABLE OF SUPPORTING THE SLIP-FORM PAVER, THE HEAVILY LOADED BATCH TRUCKS, AND OTHER EQUIPMENT USED DURING CONSTRUCTION OPERATIONS. CONSTRUCTION METHODS ARE REVIEWED. IT IS CONCLUDED THAT THE USE OF EMULSIFIED ASPHALT HAS ENABLED ECONOMIC UTILIZATION OF LOCAL SANDS AS BASE COURSE FOR ASPHALT SURFACING, AND AS SUBBASE FOR PORTLAND CEMENT CONCRETE PAVEMENT.

Lowrie, CR
Colorado University

3A 232523

DESIGN AND CONSTRUCTION OF BASE COURSES

BASE COURSES IN FLEXIBLE PAVEMENT STRUCTURES THAT MUST CARRY HEAVY TRAFFIC REQUIRE CERTAIN IMPORTANT CONSIDERATIONS IN THEIR DESIGN AND CONSTRUCTION THAT ARE OFTEN NEGLECTED. THE THICKNESSES OF THESE BASES ARE 8 INCHES TO 16 INCHES, DEPENDING UPON THE TYPE OF SUBGRADE ON WHICH THEY REST, WHICH INTRODUCES A COMPACTION PROBLEM. IF THE BASES ARE NOT SUFFICIENTLY COMPACTED, ROUGH PAVEMENTS OR EVEN FAILURES WILL BE THE RESULT. IT IS ALSO IMPORTANT

THAT DURING THE CONSTRUCTION OF BASE COURSES EACH LAYER BE DENSE IN ORDER THAT WATER FROM RAINS WILL NOT SOFTEN THE SUBGRADE. THIS DENSITY IS DEPENDENT UPON THE GRADING OF THE MATERIAL AND ITS DEGREE OF COMPACTION. THE USE OF CALCIUM CHLORIDE IN THE CONSTRUCTION OF THESE BASES HAS PROVEN VERY ADVANTAGEOUS. CALCIUM CHLORIDE ALSO FUNCTIONS AS AN ANTIFREEZE IN THESE BASE COURSES WHICH IS CONSIDERED AN IMPORTANT ADVANTAGE IN ITS USE. THIS PAPER DEALS WITH THE NORTH CAROLINA EXPERIENCE IN DESIGNING AND CONSTRUCTING BASE COURSES THAT ARE SERVING AS A PART OF HEAVY DUTY PAVEMENTS. THE SELECTION, PREPARATION, AND PLACEMENT OF BASE COURSE MATERIALS ARE DISCUSSED AS WELL AS CERTAIN EQUIPMENT USED IN THEIR COMPACTION. THE ADVANTAGES OF 'STAGE CONSTRUCTION' ARE DISCUSSED AND CERTAIN IMPORTANT CONSIDERATIONS NECESSARY IN USE OF THIS PROCEDURE ARE MENTIONED.

Hicks, LD Highway Research Board Bulletin

3A 232623

ROADBUILDING AROUND THE WORLD

CERTAIN ASPECTS OF ROADBUILDING ARE DESCRIBED IN JAPAN, SCOTLAND, NIGERIA, WEST BERLIN AND WEST GERMANY. JAPAN'S POOR SOIL CONDITIONS REQUIRE SOME KIND OF SOIL REHABILITATION. A COMBINATION OF SAND AND PAPER DRAINS IS BEING USED TO STABILIZE SUB-SOIL FOR A NEW ROADWAY. IN SCOTLAND TWIN DUAL-LANE BRIDGES ACROSS THE RIVER CLYDE IN GLASGOW ARE BUILT AS PRESTRESSED CONCRETE CANTILEVERS. SPECIAL COMPOSITE PILES OF STEEL PIPE FILLED AND TOPPED WITH CONCRETE ARE USED IN NIGERIA AS SUPPORT PIERS FOR THE NEW BRIDGE NOW UNDER CONSTRUCTION IN LAGOS. IN WEST BERLIN MODULAR STEEL OVER-PASS SPANS DROP INTO PLACE FOR A TEMPORARY TRAFFIC-RELIEF STRUCTURE. A NEW LINK IN THE AUTOBAHN SYSTEM IS BEING CONSTRUCTED USING AN ORTHOTROPIC STEEL BRIDGE TO CARRY TRAFFIC OVER THE WATERS OF THE NECKAR.

Construction Methods & Equipment

3A 232633

PRESSURE-INJECTED FOOTINGS CARRY EXPRESSWAY VIADUCT

THE FRANKI SYSTEM DEVELOPED 55 YEARS AGO IN BELGIUM IS A PRESSURE-INJECTION METHOD OF CONSTRUCTING PILE FOOTINGS. THE FRANKI PRESSURE INJECTED FOOTING CONSISTS OF A CYLINDRICAL CONCRETE SHAFT WITH OPEN HORIZONTAL EXTENSIONS BOTH WITHIN THE SHAFT. THE METHOD SERVES BEST IN SAND OR GRAVEL SOIL IN WHICH THE INJECTED FOOTING CAN DEVELOP HIGH RESISTANCE THROUGH COMPACTATION OF THE SOIL. A HEAVY STEEL TUBE IS USED TO REACH THE REQUIRED SHAFT DEPTH. THE TUBE IS PULLED INTO THE GROUND BY BLOWS OF A DROP HAMMER STRIKING A PLUG OF DRY CONCRETE OR GRAVEL IN THE BOTTOM OF THE TUBE. WHEN THE TUBE HAS REACHED THE DESIRED DEPTH, THE PLUG IS EJECTED INTO THE UNDERLYING SOIL BY DROP HAMMER BLOWS WHILE HOLDING THE TUBE FROM FURTHER DESCENT. THE ZERO-SLUMP CONCRETE IS THEN RAMMED INTO THE SOIL WITH HIGH-ENERGY BOLTS CREATING A BELLED-OUT-PRESSURE-INJECTED FOOTING. THIS METHOD WAS USED IN AN EXPRESSWAY VIADUCT PROJECT IN NEW YORK CITY AND FOR 434 PILES UNDER A 300-FOOT ELEVATED SECTION OF QUEENS MIDTOWN EXPRESSWAY. THE FRANKI METHOD HAS GAINED ACCEPTANCE BECAUSE IT DOES NOT WEAKEN THE SOIL BY DEWATERING OR EXCAVATION BUT STRENGTHENS IT BY COMPACTION TO A UNIFORM DEGREE THROUGHOUT A SITE. THE FOOTING IS MADE IN SUCH A WAY THAT IT IS HIGHLY RESISTANT AT POINT OF LOAD APPLICATION WITH RESISTANCES IN ALL DIRECTIONS. IT REACHES THE NATURAL RESISTANCE OF THE SURROUNDING SAND OR GRAVEL.

Roads and Streets
3A 23267 STABILIZATION OF SETTLING AND WEAK CLAYEY SOILS BY THERMAL TREATMENT

A method for the thermal stabilization of settling loess and other soils of porous structure is presented. This method has been successfully applied in practical construction work. It involves burning various fuels in the soil being treated, a process of combustion taking place in sealed bore holes with control of the temperature of the thermal treatment. The temperature of the combustion products, heating of the soil to a temperature high enough to cause the necessary changes in the soil characteristics is achieved mainly by infiltration of the compressed heated air or of the incandescent products of combustion through the pores in the soil. By using the thermal method of consolidation the settling properties of loess soils can be entirely eliminated to a depth of 10-15 meters below the footing base while the load bearing capacity of these soils is greatly increased. Thermal treatment of soils is recommended to: (1) consolidate loess soils in the foundations of important residential and industrial buildings, (2) eliminate the possibility of failures of the existing buildings and subgrades, (3) prevent landslides and many other causes of failures. Thermal-chemical treatment of soils is enabled by means of the hot gaseous products of combustion to which special chemicals are added, if necessary. The use of gaseous fuel is effective for more even heating of soils and the subgrade. The heat transfer from the hot gases in the bore hole to the soil mass is achieved by: filtration of the air and incandescent gaseous products of combustion through the pores of the soil to be consolidated, and by direct transmission of heat due to temperature difference and the contact between the heat source and the soil. Thermal treatment change their physio-mechanical properties by: (1) ability to settle and to be wetted are entirely eliminated, (2) cohesion, compressive and shear strengths are greatly increased, (3) settlement under the applied load when the ground is wet immediately ceases, (4) the pore water of the soil, settling loess soils when subjected to thermal treatment change their physio-mechanical properties by: (1) ability to settle and to be wetted are entirely eliminated, (2) cohesion, compressive and shear strengths are greatly increased, (3) settlement under the applied load when the ground is wet immediately ceases, and (4) color change from the original natural pale yellow to various shades of red. Application of the thermal method of consolidation is described.

Lukinov, IM  Highway Research Board Special Reports

3A 232775 STABILIZATION OF SOILS WITH INORGANIC SALTS AND BASES: A REVIEW OF THE LITERATURE

An annotated bibliography is presented of the important literature on soil and aggregate stabilization with inorganic salts and bases published prior to 1965. In all, approximately 70 references of the 800 to 1,000 available have been reviewed, among which are several bibliographies providing additional references. From the more informative references, the authors have attempted to summarize information on stabilizer properties, mechanisms of stabilization, properties of the stabilized soil, construction methods, field results, and the use of secondary additives. Particular attention is devoted to stabilization with sodium chloride, and sodium hydroxide, which are the only salts and bases that had been evaluated sufficiently to draw meaningful conclusions.

Hrb Nchr Synthesis of Hwy Practice

3A 232777 STABILIZATION OF SOILS WITH SPECIAL MATERIALS AND ROCKS: A REVIEW OF LITERATURE

An annotated bibliography is presented of the important literature on soil and aggregate stabilization with inorganic salts and bases published prior to 1965. In all, approximately 70 references of the 800 to 1,000 available have been reviewed, among which are several bibliographies providing additional references. From the more informative references, the authors have attempted to summarize information on stabilizer properties, mechanisms of stabilization, properties of the stabilized soil, construction methods, field results, and the use of secondary additives. Particular attention is devoted to stabilization with sodium chloride, and sodium hydroxide, which are the only salts and bases that had been evaluated sufficiently to draw meaningful conclusions.

Lund, JW Hendrickson, LG  Eng Geol & Soils Eng Symp Proc, Boise

Thompson, MR  Roads and Streets

3A 232815

DISCUSSION OF FIELD STUDIES OF RESPONSE OF PEAT TO PLATE LOADING


Lopinto, VJ DISCUSSER  Am Soc Civil Engr J Soil Mech Div

HRIS 1062 204540, 1062209546

3A 232819

'MOLE' KEEPS TRAFFIC ON THE MOVE

THE 'MOLE' IS A LARGE-BORE HORIZONTAL DRILLING MACHINE BEING USED ON A DRAINAGE SYSTEM CONSTRUCTION PROJECT IN THE LOS ANGELES, OR, OFTEN CROSSING THE FREEWAY. THE ALTERNATIVE TO USING THE EQUIPMENT WAS TO DIG AN OPEN TRENCH 25 FEET DEEP WHICH WOULD HAVE DESTROYED TREES, DEPOSITED HUGE MOUNDS OF DIRT IN YARDS, BROKEN UP A 22-FOOT-WIDE ROAD, AND BLOCKED THREE OTHER BUSY ROADS AT INTERSECTIONS. IN OVERALL Size, THE DRILL IS 22 FEET LONG, 6 FEET SQUARE, AND WEIGHTS 65,000 POUNDS; THE DRILL FACE HAS 18 CUTTING FACES AND IS 9 1/2 FEET IN DIAMETER. IT IS POWERED BY A 400 HP DIESEL ENGINE. MOVEMENT IS SNAKE-LIKE, I.E., THE INNER FRAME WHICH CARRIES THE DRILL EXTENDS, AND THE OUTER FRAME THEN CREEPS FORWARD ON SUPPORT LEGS TO CATCH UP. THE MACHINE USES LASER BEAMS AND TARGETS TO SET VERTICAL AND HORIZONTAL GUIDES FOR CONCENTRICAL GRADE ALIGNMENT. AS THE UNIT MOVES THROUGH THE GROUND, THE SPOIL FROM THE DRILL HEAD IS CARRIED UP TO A CONVEYOR BELT, MOVED TO THE REAR AND DUMPED INTO CARTS ON A NARROWGAGE RAILROAD. PROBLEMS ENCOUNTERED INCLUDED VEINATION PROBLEMS, GEAR REDUCTION FROM MOTOR TO DRILLHEAD, CAVE-INS IN THE TUNNEL, OVERHEATING, AND NEED TO SHORE UP THE TUNNEL. THE ARMOURING STONE MUST BE PLACED IMMEDIATELY BENEATH THE SEAL. IF IT IS NOT, CRACKING AND MOISTURE INGRESS ARE ELIMINATED. COMPACTION AND HEAVY PRIMING ALONE WILL NOT PREVENT THE FAILURE MECHANISM WHICH COMES WITH CRACKING. THE ALTERNATIVE (ARMOURING) WHICH HAS REDUCED THE LOSS OF SANDSTONE IMMEDIATELY IN CONTACT WITH SEAL, AND ANY MOISTURE INGRESS THROUGH SEAL, APPEARS TO OFFER THE BEST SOLUTION SHORT OF COSTLY MECHANICAL OR ADMIXTURE STABILIZATION. IT APPPEARS THAT THE REDUCTION OF SANDSTONE BY SUBSTANTIAL REPLACEMENT WITH ARMOURING STONE IMMEDIATELY BENEATH THE SEAL IS SUFFICIENT TO PREVENT THE ONSET OF THE FAILURE MECHANISM. ROLLING IN OF THE ARMOURING STONE MUST TAKE PLACE IMMEDIATELY AFTER COMPACTION OF THE SANDSTONE WHILE THE PAVEMENT IS STILL DAMP IN DEPTH. A 20-MILE SECTION OF ROAD IN THE THIRD YEAR OF SERVICE EVIDENCES NO PAVEMENT FAILURE. FURTHER TEST PAVEMENTS ARE UNDER CONSIDERATION IN AN ATTEMPT TO ELIMINATE THE ARMOURING.

Andrews, JH Vlasic, Z Pryor, AJ DISCUSSER Dickinson, EJ DISCUSSER Grant, K DISCUSSER Australian Road Research Board Proc

3A 232852

ASPECTS OF THE DESIGN AND CONSTRUCTION OF RURAL ROADS

A SUMMARY IS PRESENTED OF CONCLUSIONS REACHED FROM A REVIEW OF THE LONG-TERM PERFORMANCE OF MANY ROADS IN VARIOUS PARTS OF AUSTRALIA, AND WHEREVER, IN MANY CASES, VERY MANY OBSERVATIONS OF SUBGRADE MOISTURE CONTENT HAVE RECENTLY BEEN MADE. IT POINTS OUT THE GREAT EFFECT OF TYPE OF CONSTRUCTION AND ENVIRONMENT ON SUBGRADE EQUILIBRIUM MOISTURE CONTENT. THIS PARAMETER IS OF PARAMOUNT IMPORTANCE IN DETERMINING THE PAVEMENT THICKNESS REQUIRED AND THE CONCLUSION IS REACHED THAT IT IS IMPOSSIBLE AT PRESENT TO DETERMINE IT IN ADVANCE WITH ANY REASONABLE ACCURACY, PARTICULARLY IN THE AREAS INLAND OF THE COASTAL RANGES; UNLESS, OF COURSE, ADJOINING OLD ROADS ON SIMILAR ROADS ARE GIVEN INVOLVING THE TRIAL AND OBSERVATION APPROACH OF STAGE CONSTRUCTION FOR 'TAILORING' THE PAVEMENT THICKNESS TO THE ACTUAL SUBGRADE CONDITIONS. AN IMPORTANT SECTION OF THE REPORT DEALS WITH A WIDE VARIETY OF PAVEMENT MATERIALS WHICH HAVE BEEN SATISFACTORY USED FOR ROAD PAVEMENTS, OFTEN UNDER HEAVY TRAFFIC. ALTHOUGH MANY ARE UNUSUAL AND FALL OUTSIDE STANDARD SPECIFICATIONS.

Loder, LF Australian Road Research Board Bulletin Mar. 1970
AN EXPERIMENTAL SOIL-CEMENT ROAD IN ILLINOIS
THE FIRST SOIL-CEMENT ROAD TO BE CONSTRUCTED IN ILLINOIS WAS IN 1936 AND WAS ENTIRELY EXPERIMENTAL. PRELIMINARY SOIL SAMPLES WERE TAKEN BEFORE THE GRADING WORK WAS COMPLETED. DATA WAS GATHERED ON THE LABORATORY SOIL TESTS WHICH INCLUDED PHYSICAL TEST CONSTANTS AND GRAIN SIZE, MOISTURE-DENSITY TESTS, MOISTURE-PENETRATION TESTS, DURABILITY TESTS, WETTING AND DRYING TESTS, FREEZING AND THAWING TESTS, AND CHECK AND COMPRESSION TESTS. EQUIPMENT USED ON THE PROJECT WAS LISTED. A DESCRIPTION OF CONSTRUCTION PROCEDURE INCLUDED (1) SCARIFYING, PULVERIZING, AND SHAPING, (2) APPLYING, CHECKING AND MIXING THE CEMENT, (3) APPLYING WATER, (4) SHAPING AND COMPACTING, AND (5) CURING. CONSTRUCTION COSTS WERE GIVEN.

Glover, VL  *Highway Research Board Proceedings*  1937

COMPACITION OF EARTH EMBANKMENTS
CONTENTS: THEORY PRELIMINARY SOIL STUDIES AND SURVEYS CONSTRUCTION METHODS SPECIFICATIONS NOTES ON GERMAN PRACTICE MISCELLANEOUS CONCLUSIONS APPENDIX.


EVALUATION OF VIBRATORY COMPACTION EQUIPMENT ON ROCKFILLS: INTERSTATE ROUTE 84
FIELD EVALUATION TESTS OF HEAVY VIBRATORY COMPACTORS ON ROCKFILLS ARE DESCRIBED. THE TESTING INDICATED THAT THE LIFT THICKNESS FOR ROCK FILLS COULD BE INCREASED FROM THE SPECIFIED TWO FEET TO FOUR FEET AND THE NUMBER OF ROLLER PASSES COULD BE REDUCED FROM THE SPECIFIED 6 TO 4 FOR THE MODELS OF HEAVY VIBRATORY COMPACTORS TESTED. THIS EVALUATION IS AN EXAMPLE OF HOW IMPROVED CONSTRUCTION EQUIPMENT CAN PROVIDE SAVINGS TO THE STATE WHEN THE CAPABILITY OF THE EQUIPMENT IS FULLY UTILIZED. IT ALSO DEMONSTRATES HOW THE PRINCIPLES OF "VALUE ENGINEERING" MAY BE APPLIED TO HIGHWAY CONSTRUCTION. /AUTHOR/

Geooffroy, DN  *New York State Dept Transportation*  Dec. 1969

SLURRY WALLS FOR BART CIVIC CENTER SUBWAY STATION DEEP EXCAVATIONS IN DIFFICULT GROUND HAVE LONG BEEN AN ENGINEERING CHALLENGE. THE SHARP INCREASE IN MASS RAPID TRANSIT SUBWAY CONSTRUCTION IN URBAN AREAS DURING THE 1960's, MORE THAN EVER BEFORE DEEP EXCAVATIONS ARE BEING PLANNED AND CARRIED OUT IN DIFFICULT GROUND CONDITIONS. NEW TECHNIQUES OF STABILIZATION IN PREDICTING THE LATERTAL EARTH PRESSURES, CRITERIA FOR STRUCTURAL DESIGN AND CONTROL OF CONSTRUCTION WERE DEVELOPED. THE STRUCTURE WAS INSTRUMENTED AND THE MEASURED DATA WERE EVALUATED AND COMPARED WITH PRECONSTRUCTION ESTIMATES.


A LIME STABILIZED CLAY FOUNDATION
A HIGHLY CLAYY CLAY WAS STABILIZED WITH 5 PERCENT CALCITIC QUICKLIME TO DEPTHS OF 5 TO 9 FEET BENEATH A CONCRETE FOOTING OF A LARGE POTASH STORAGE BUILDING. STABILIZATION PROCEEDED THROUGH AUGUST AND SEPTEMBER 1965 AND WAS COMPLETED WHEN THE MEAN AIR TEMPERATURE HAD DROPPED BELOW 40 F. THE FILL WAS THEN COVERED WITH 2 FEET OF CONCRETE OR SOIL BACKFILL AND LEFT SUBJECT TO A SEVERE CLIMATE. THE TEMPERATURE OF THE FILL STAYED CLOSE TO THE AIR TEMPERATURE AT THE TIME OF MIXING FOR SEVERAL WEEKS AFTER PLACEMENT. A MINIMUM UNCONFINED COMPRESSIVE STRENGTH AFTER 3 DAYS OF CURING WAS CHOSEN AS THE DESIGN CRITERION. BRICQTETTES COMPACTED IN 4-INCH MOLDS WITH STANDARD PROCTOR EFFORT WERE MADE FROM THE FIELD MIXTURES AND CURLED IN THE LABORATORY AND THEIR 3-DAY STRENGTH WAS COMPARED TO THE DESIGN VALUE. THE DENSITY OF THE FILL EXCEEDED THE DENSITY OF THE BRICQTETTES. THE COMPRESSIVE STRENGTH OF THE STANDARD BRICQTETTES AFTER 3 DAYS OF LABORATORY CURING WAS INSENSITIVE OVER A WIDE RANGE OF MOISTURE CONTENTS. /AUTHOR/

Waatt, WG, Machibroda, P  *Journal Materials*  June 1971
CONSTRUCTION EQUIPMENT AND METHODS

SO OBVIOUSLY A GOVERNING FEATURE OF DESIGN ONE HAS YET TO HEAR OF CORE BORINGS BEING USED TO CHECK THE SOUNDNESS OF MAJOR COLUMNS OF REINFORCED CONCRETE BUILDINGS. WHAT IS IT THAT MAKES THIS SO ACCEPTED A PRACTICE WITH CAISSONS IN CHICAGO? SURELY A BASIC PRECEPT OF BASIC ENGINEERING IS THAT DESIGN SHOULD PRODUCE A STRUCTURE, OR COMPONENT, THAT WILL SAFELY AND ECONOMICALLY CARRY ALL DESIGNED LOADS WITH NO POSSIBILITY OF FAILURE OTHER THAN THAT CAUSED BY A MAJOR CATASTROPH? IF THE AUTHORS COULD GIVE STATISTICS AS TO THE NUMBER OF SUCH FAILURES AS THEY DESCRIBE IN DISCUSSING THIS BASIC QUESTION, THE OVERALL PICTURE MIGHT THEN BE SOMEWHAT CLEARER. /DISCUSSER/

Legget, RF DISCUSSER Am Soc Civil Engr J Soil Mech Div Sept. 1971 HRIS 63 217277, 1P62220565

3A 233265 PRELIMINARY OBSERVATIONS ON SOIL MOISTURE AND "DRY" COMPACTION IN PAVEMENT DESIGN ON THE DARLING DOWNS, QUEENSLAND, WITH DISCUSSIONS AND CLOSURE

THIS PAPER DESCRIBES THE FIRST STAGE OF A LONG TERM INVESTIGATION INTO THE EFFECTS OF PAVEMENT CONFIGURATION AND SUBGRADE COMPACTION AND MOISTURE ON PERFORMANCE AT A TEST SITE ON THE EXPANSIVE CLAY SOIL ON THE DARLING DOWNS, QUEENSLAND. ALTHOUGH IT WILL BE SEVERAL YEARS BEFORE FULL QUANTITATIVE INFORMATION BECOMES AVAILABLE, SOME PRELIMINARY AND QUALITATIVE CONCLUSIONS CAN BE MADE AT THIS STAGE. RESULTS SUGGEST THAT THE SUBGRADE EQUILIBRIUM MOISTURE CONTENT WILL BE CONSIDERABLY DRIER THAN OPTIMUM MOISTURE CONTENT FOR STANDARD COMPACTION. WHERE PAVEMENTS ARE CONSTRUCTED ON SOIL WITH A MOISTURE CONTENT SIGNIFICANTLY HIGHER THAN OR LOWER THAN THIS EQUILIBRIUM CONDITION, DISTRESS DUE TO VOLUME CHANGE IN THE SUBGRADE CAN BE EXPECTED AS MOISTURE CONDITIONS MOVE TOWARDS THE EQUILIBRIUM. CONSTRUCTION PROCEDURES WHICH ENSURE THAT THE SOIL IS AT ITS EQUILIBRIUM CONDITION WILL MINIMIZE THIS VOLUME CHANGE PROVIDED PRECAUTIONS ARE TAKEN TO ENSURE THE STABILITY OF THE SUBGRADE. THE COMPACTIVE EFFORT, THE TYPE OF CONSTRUCTION ADOPTED, AND THE MAINTENANCE OF THE SEALED PAVEMENT AND THE SHOULDER HAVE A LARGE BEARING ON SUBGRADE STABILITY AND THEREFORE PAVEMENT PERFORMANCE. /ARRB/

Richards, BG Murphy, HW Chan, CY Gordon, R Neeson, JA DISCUSSER Shackel, B DISCUSSER Kiek, SN DISCUSSER Australian Road Research Board Proc Vol. 5 1970, pp 116-46, 16 Fig 4 Tab 18 Ref

3A 233306 LIME STABILIZATION CONSTRUCTION MANUAL

THIS MANUAL CONTAINS RECOMMENDED CONSTRUCTION PROCEDURES FOR THE USE OF GYPSUM LIME IN THE STABILIZATION OF MODIFICATION OF SUBGRADE (SUBBASE) AND BASE COURSES. PROS AND CONS OF ALTERNATIVE CONSTRUCTION STEPS AND EQUIPMENT ARE DISCUSSED. NEW METHODS FOR LIME SPREADING AND THE USE OF QUICKLIME FOR STABILIZATION ARE ALSO INCLUDED. /NLA/

National Lime Association 1972

3A 233333 EARTHWORK ON THE ASO VOLCANIC ASH SOIL

JAPAN CONSISTS OF VOLCANIC ISLANDS, AND VOLCANIC ASH SOILS OF THE PLEISTOCENE EPOCH ABOUND THROUGHOUT THE COUNTRY. THE ASH SOIL DISCUSSED HERE IS A SENSITIVE SOIL DERIVED FROM VOLCANIC ASH DISTRIBUTED OVER THE ASO AREA OF KYUSHU ISLAND. THE WATER CONTENT OF THE SOIL IS ABOUT 50%, WHICH IS LOW FOR JAPAN, WHERE CONTENTS APPROACHING 100% ARE NORMAL. HOWEVER, THE ASH SOIL SOON BECOMES SO SOFT THAT HEAVY CONSTRUCTION EQUIPMENT CANNOT WORK ON IT AFTER DISTURBANCE BY BULLDOZERS. THE DECREASE IN STRENGTH OF THE ASH SOIL IS NEARLY THE SAME AS THAT OF VOLCANIC ASH SOIL WITH A WATER CONTENT OF 200%. EARTH EMBANKMENTS WERE CONSTRUCTED WITH SUCH SOILS USING SUPER-WET-GROUND BULLDOZERS WITH 0.17 KG/SQ CM CATERPILLAR PRESSURE AGAINST A GROUND SURFACE 40 CM THICK. AFTER THREE PASSES THE WHEEL TRACES WERE LESS THAN 10 CM WHEN THE CONE VALUE OF THE UNDISTURBED SOIL WAS 4 KG/SQ CM OR MORE BUT MORE THAN 30 CM WHEN CONE VALUE WAS REDUCED TO 2 KG/SQ CM. VOLCANIC ASH SOILS HAVE A TENDENCY TO REGAIN THEIR STRENGTH AFTER BEING DISTURBED, PROBABLY AS A RESULT OF CONSOLIDATION. THE LATTER CAN BE INCREASED THROUGH THE USE OF FILTERS. IN THE TEST EMBANKMENTS THE WATER DRAINING FROM THE FILTERS WAS PLAINLY VISIBLE; A PROBLEM THAT HAD TO BE OVERCOME WAS SATURATION OF ASH SOIL JUST BELOW THE FILTER. ONCE THIS WAS SOLVED THE WATER CONTENT DROPPED FROM 50% TO 30%, AND CONE VALUE INCREASED TO MORE THAN 15 KG/SQ CM, SOMETIMES REACHING 50 KG/SQ CM A MONTH AFTER CONSTRUCTION, I.E., SUITABLE FOR CARRYING TRAFFIC. IT WAS NOTED THAT A SAND FILTER OF 40 CM DEPTH WAS REQUIRED TO DRAIN THE EMBANKMENT THOROUGHLY; FILTERS HAD TO BE INSTALLED AT EVERY 4 METERS OF EMBANKMENT HEIGHT.

Mochinaga, R Japan Road Association Annual Reports 1971, pp 42-7, 9 Fig. 1 Tab

3A 233380 CURRENT PAVEMENT DESIGN IN AUSTRALIA /IN JAPANESE/

THE PRINCIPAL DIFFERENCES IN SOIL PROPERTIES, SOIL TYPES, CLIMATE, TERRAIN, TRAFFIC DENSITY, POPULATION DENSITY, AND ROAD CONSTRUCTION COSTS BETWEEN JAPANESE AND AUSTRALIAN CONDITIONS ARE OUTLINED. THE USE OF STAGE CONSTRUCTION IN ESTABLISHMENTS OF A ROAD NETWORK IN AUSTRALIAN CONDITIONS, AND THE APPLICATION OF CBR AND SOIL SUCTION METHODS TO PAVEMENT DESIGN ARE OUTLINED. MORE RECENT WORK ON RESILIENCE MODULUS AND CURRENT STABILIZATION PRACTICE ARE ALSO MENTIONED. THE PROBLEMS OF ROAD CONSTRUCTION ASSOCIATED WITH EXPANSIVE CLAYS AND EDGE CRACKING ARE DESCRIBED, AS WELL AS THE EFFICIENCY OF VARIOUS TYPES OF COMPACTION MACHINERY IN AUSTRALIAN CONDITIONS. THE WORK OF THE AUSTRALIAN ROAD RESEARCH BOARD IS PARTICULARLY NOTED AND COMMENDED. /CSIRO/

Ingles, OG Pavements /Japan/ Vol. 6 No. 9, 1971, pp 34-6

ACKNOWLEDGMENT: Commonwealth Sci Indus Res Org /Austral/

3A 233437 PATENTED METHOD OF EXCAVATING SOFT GROUND TUNNELS BY DRIVING IN A SET OF ANTI-CRUNMBLING NEEDLES

THE ARTICLE DESCRIBES A METHOD, PATENTED BY THE AUTHOR FOR EXCAVATING TUNNELS IN SOFT GROUND. THE METHOD USES A SYSTEM OF TUBULAR STEEL 'NEEDLES' ABOUT 2.50M LONG DRIVEN INTO THE GROUND FOR STRENGTHENING PURPOSES. THE 'NEEDLES' ARE POSITIONED USING A CENTERING MEMBER. FURTHER STRENGTHENING MAY BE OBTAINED BY INJECTING THROUGH THE NEEDLES LIQUID CEMENT OR BENTONITE, WHICH WILL BE ABSORBED BY THE SURROUNDING SOIL.

Giacobino, GP Tunnels & Tunneling /UK/ Vol. 4 May 1972, 3pp, 6 Fig

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/IRR D 201 661, 1C62232341

495
3A CONSTRUCTION EQUIPMENT AND METHODS

3A 233465
ROADS FOR LOW TRAFFIC FLOW—AUSTRALIA
THE USE OF LOCAL, NON-TRADITIONAL, NATURALLY OCCURRING MATERIALS IN RURAL ROADS IN AUSTRALIA IS DISCUSSED. THE MATERIALS DO NOT ALWAYS COMPLY WITH THE USUAL STANDARD SPECIFICATIONS, AND INVESTIGATIONS ARE CONTINUING TO EVALUATE THOSE MATERIALS WHICH GIVE SATISFACTORY PERFORMANCE. THE PERFORMANCE OF LOW COST ROADS UNDER TRAFFIC REINFORCEMENT OF ROAD SURFACES ON TROPICAL OR SUB-TROPICAL CLIMATES IS INVESTIGATED. THE SCARCITY OF WATER IN MANY AREAS HAS PROMPTED THE INVESTIGATION ON SECTIONS OF SEALED RURAL ROADS CONSTRUCTED WITHOUT THE ADDITION OF WATER FOR COMPACTION OF THE CLAYEY SUBGRADES. SECTIONS OF ROAD ARE ALSO BEING INVESTIGATED IN WHICH CLAY SOIL SUBGRADES WERE CONSTRUCTED AT MOISTURE CONDITIONS INTENDED TO REDUCE SUBSEQUENT SEASONAL MOISTURE DAMAGE AND SHRINKAGE CRACKING OF INVESTIGATED CONCRETE STRUCTURE FORMED AS FOUR PARALLEL SECTION OF 107 FT. DETAILS ARE GIVEN OF THE CONSTRUCTION OF SHAFT FOUNDATIONS FOR THE NEW LONDON BRIDGE WITH A DEPTH UP TO 20 FEET LESS LAND WAS NEEDED TO CONSTRUCT SUCH WALLS AND THIS LED TO THE LOSS OF FEWER HOUSES. ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 233527
SHAFT FOUNDATIONS FOR THE NEW LONDON BRIDGE

Glynn, DF Perm Intl Assoc Road Congresses Proc Vol. 2 1971, 6 pp 21 Ref

3A 233556
CURRENT OVERSEAS PRACTICE
THE PAPER EXAMINES SOME OF THE USES OF CEMENT STABILIZED MATERIALS AND GIVES REASONS FOR THEIR ADOPTION FOR BASE AND SUBBASE CONSTRUCTION IN THE UNITED STATES, AUSTRALIA, GERMANY, AND HOLLAND. CONSTRUCTION AND SPECIFICATION METHODS ARE ALSO DISCUSSED, TOGETHER WITH THE PROBLEMS ENCOUNTERED ABROAD. THE EXTENSIVE USE OF CEMENT STABILIZED MATERIALS IS CONSIDERED AS EVIDENCE OF THEIR ECONOMIC AND PRACtical VIABILITY AS BASES TO MINOR ROADS AND PARKING AREAS, AND AS SUB-BASE MATERIALS. CEMENT STABILIZATION ALSO ALLOWS SUB-STANDARD MATERIALS, SUCH AS NATURAL SOIL AND INDUSTRIAL WASTE, TO BE CONVERTED TO GOOD ROAD CONSTRUCTION MATERIALS, WHICH RESULTS IN A SAVING OF THE LIMITED RESOURCES OF TRADITIONAL MATERIALS. MIX-IN-PLACE CONSTRUCTION IS PREFERRED AND SOME CURRENTLY USED PLANT IS MENTIONED, INCLUDING MACHINES CAPABLE OF PROCESSING IN A SINGLE LAYER TO A DEPTH OF 600MM. THE PAPER CONCLUDES BY DISCUSSING SPECIFICATIONS VALID IN VARIOUS COUNTRIES.

Lilley, AA Inst Intl Assoc Road Congresses Proc Vol. 19 No. 3, Mar. 1972 pp 4-11, 1 Tab, 13 Phot, 17 Ref

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 233576
DIAPHRAGM WALLING SAVES HOUSES ON A329 RELIEF ROAD PROJECT
THE DESIGN, CONSTRUCTION, AND COST OF STAGE 1 OF THE A 329 RELIEF ROAD NEAR READING IN BERKSHIRE ARE DISCUSSED. DIAPHRAGM WALLING WAS USED INSTEAD OF NORMAL REINFORCED CONCRETE RETAINING WALLS SINCE 13 TO 20 FEET LESS LAND WAS NEEDED TO CONSTRUCT SUCH WALLS AND THIS LED TO THE LOSS OF FEWER HOUSES.

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 233582
CEMENT STABILIZATION
A COMPREHENSIVE SURVEY IS MADE OF CEMENT STABILIZATION IN EUROPE AND A DETAILED DESCRIPTION IS GIVEN OF EXISTING ROAD CONSTRUCTION METHODS.

Cederberg, KG Cement Och Betong /Sweden/ Vol. 47 No. 2, 1972, pp 203-22, 5 Fig, 21 Phot

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 233588
CONSTRUCTION ON (VOLUMETRICALLY ACTIVE) SOILS
VOLUMETRICALLY ACTIVE SOILS OCCURR IN EXTENSIVELY IN RHODESIA, MOSTLY IN VLEIS, HAVE USUALLY BEEN AVOIDED BY CIVIL ENGINEERS AND TOWN PLANNERS. IN RECENT YEARS INCREASING LAND VALUES HAVE DICTATED BUILDING CONSTRUCTION, AND CONSEQUENT ROAD AND RAILWAY CONSTRUCTION IN VLEI AREAS. THIS PAPER SUGGESTS METHODS OF IDENTIFYING THESE ACTIVE SOILS, GIVES A HISTORY OF CONSTRUCTION PRACTICE, AND RECOMMENDS DESIGN AND CONSTRUCTION METHODS FOR SUCH TERRAIN.

Mitchell, RL Mackochie, WR Rhodesian Engineer /Southern Rhodesia/ Vol. 10 No. 5, Sept. 1972, pp 43-50, 10 Fig, 1 Tab, 4 Phot, 14 Ref

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/
CONSTRUCTION EQUIPMENT AND METHODS

3A 233628

SAND-CEMENT STABILIZATION IN THICK LAYERS

A NEW TYPE OF PAVEMENT STRUCTURE WAS USED IN THE NETHERLANDS FOR THE FIRST TIME IN 1969 ON A MOTORWAY. IT CONSISTS OF A 0.40M-THICK SAND-CEMENT LAYER UNDER A 0.26 M-THICK BITUMINOUS SURFACING COMPOSED OF 0.18 M GRAVEL-ASHALTIC CONCRETE AND TWO LAYERS, EACH OF 0.04 M ASPHALTIC CONCRETE, AS BASECOURSE AND WEARING COURSE. THE AMOUNT OF CEMENT REQUIRED FOR THE BASE AND THE CONSTRUCTION EQUIPMENT AND METHOD ARE DISCUSSED. /TRRL/

Greveld, ER, Polytechnisch Tijdschrift /Neth/ Vol. 26 No. 16, Aug. 1971, pp 639-42, 3 Tab, 5 Phot

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 233629

SIMPLE SOIL STABILIZATION METHOD PROMISES LOW-COST SECONDARY ROADS

THE ARTICLE DISCUSSIONS THE USE OF A STABILIZING/SOLIDIFICATION AGENT, KNOWN AS PERMAST, TO CONVERT A COUNTRY ROAD IN GEORGIA INTO A DUST-FREE HARD SURFACE. THE AGENT WAS MIXED WITH THE SOIL IN PROPORTIONS, AND TO A DEPTH, INDICATED BY LABORATORY TESTS. COMPARABLE COSTS TO SOIL/CEMENT STABILIZATION TECHNIQUES ARE CLAIMED, WITH ADDITIONAL SAVINGS IN TIME AND LABOR COSTS. /TRRL/

Fig. 1 Tab, 4 Ref

Roads and Streets Vol. 115 No. 12, Dec. 1972, p 52, 2 Phot

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/, IRRD 205 330, 2C6230530

3A 233635

LIME STABILIZATION OF ROADS IN CEYLON

THIS PAPER BROADLY DISCUSS THE CASE FOR THE USE OF LIME TO IMPROVE THE PROPERTIES OF A SOIL. THE MECHANISM OF LIME STABILIZATION IS DESCRIBED, AND SOME LABORATORY FINDINGS ARE PRESENTED REGARDING THE IMPROVEMENT IN SOIL PROPERTIES. A LABOR INTENSIVE METHOD OF CONSTRUCTION, USING A MINIMUM OF MACHINERY, IS OUTLINED, AND THE PERFORMANCE TO DATE OF SOME LIME STABILIZED ROADS IN CEYLON, IS DESCRIBED.

Yoganandan, GM, Ceylon Institute of Engineers Trans R&d Rept Vol. 1 1972, pp 39, 53, 9 Fig, 1 Tab, 4 Ref

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/.

3A 233643

A REVIEW OF SOIL-POLE BEHAVIOR


Brown, CB, California University, Berkeley, California Department Public Works, California Division Highways Hpr, July 1966

ACKNOWLEDGMENT: Bureau of Public Roads /US/, (4660002 65)

3A 233675

COOPERATIVE STUDY OF LANDSLIDES IN SOUTH DAKOTA

THIS INTERIM REPORT PRESENTS THE RESULTS OF THE FIRST YEAR'S WORK OF A PROPOSED THREE-YEAR STUDY, DESIGNED TO IDENTIFY SLIDE-PRONE GEOLOGICAL UNITS AND TO AID IN RECOGNITION AND PREVENTION OF SLIDES IN THESE AREAS. THE REPORT ILLUSTRATES THE VARIOUS PHYSIOGRAPHIC REGIONS OF SOUTH DAKOTA. GEOLOGICAL UNITS OF HIGH LANDSLIDE POTENTIAL ARE IDENTIFIED BY MEANS OF A LITERATURE SEARCH, AIR PHOTO AND MAP STUDIES, FIELD OBSERVATIONS, AND A QUESTIONNAIRE CIRCULATED TO STATE HIGHWAY ENGINEERS. NINETY TO 95 PERCENT OF ALL LANDSLIDES IN THE STATE WERE ASSOCIATED WITH THE PIERRE SHALE FORMATION. TWO EXPERIMENTAL SITES HAVE BEEN CHOSEN, WHERE DETAILED STUDIES OF CONSTRUCTION METHODS, AS WELL AS UNSTABLE SLOPE CONDITIONS, ARE IN PROGRESS. SLOPE INDICATORS, PIEZOMETERS, AND RESISTIVITY MEASUREMENTS HAVE BEEN UTILIZED. RESISTIVITY MEASUREMENTS WERE MADE IN AN ATTEMPT TO LOCATE THE CONTACTS BETWEEN VARIOUS MEMBERS OF THE PIERRE SHALE FORMATION. ORDINARY RESISTIVITY TESTS WERE OF LITTLE USE. HOWEVER, AS THE RESISTIVITY OF DIFFERENT SHALE MEMBERS DID NOT DIFFER APPRECIABLY A SELF-POTENTIAL RESISTIVITY METHOD FOR LOCATING THESE CONTACTS IS BEING ATTEMPTED. /BFR/

Bruce, RL South Dakota Department Highways Hpr-hpr-1/26/

ACKNOWLEDGMENT: Bureau of Public Roads /US/ (4665192 66)

3A 233686

THE FORCES ON RIGID CULVERTS UNDER HIGH FILLS


Davisson, MT Prakash, S Highway Research Record, Hwy Res Board 1963

ACKNOWLEDGMENT: Landesanstalt für Verkehrs- und Verkehrsplanung /Austria/

3A 233761

DEVELOPMENT OF GUIDELINE FOR THE DESIGN OF SUBSURFACE DRAINAGE SYSTEMS FOR HIGHWAY PAVEMENT STRUCTURAL SECTIONS

THE REPORT PRESENTS RESULTS OF INTERVIEWS WITH STATE HIGHWAY DEPARTMENT PERSONNEL. FIELD RECONNAISSANCE OF PAVEMENTS IN 9 CASE STUDIES OF SELECTED DRAINAGE DESIGN PROBLEMS FOR EXISTING PAVEMENTS. THE REPORT PRESENTS RESULTS OF INTERVIEWS WITH STATE HIGHWAY DEPARTMENT PERSONNEL. FIELD RECONNAISSANCE OF PAVEMENTS IN 9 CASE STUDIES OF SELECTED DRAINAGE DESIGN PROBLEMS FOR EXISTING PAVEMENTS.
CONSTRUCTION EQUIPMENT AND METHODS

MENTS ARE SATURATED WITH WATER FOR LONG PERIODS OF TIME EACH YEAR. IT IS DEDUCED THAT THIS SATURATION CONTRIBUTES TO CONSIDERABLE SHORTENING OF PAVEMENT LIFE. A NEW METHOD OF DESIGN IS PRESENTED TO TAKE CARE OF THE INFILTRATION OF SURFACE WATER.

INFLOW-OUTFLOW ANALYSES AND HIGHWAY GEOMETRICS ARE INCLUDED IN A PROCEDURE UTILIZING A TWO-LAYER GRADED FILTER TO RAPIDLY REMOVE ANY WATER ENTERING THE STRUCTURAL LAYERS.

Cedergren, HR Arman, JA O'Brien, KH
RESPONSIBLE INDIVIDUAL: Ring, GW (HRS-14)
Contract FH-11-7582

ACKNOWLEDGMENT: Federal Highway Administration

PB-231173/AS

3A 234099

HOLLAND

A NEW CONSTRUCTION CONCEPT WAS DEVELOPED PRIMARILY TO PROTECT CANALS AND OTHER WATERWAYS FROM SCOUR AND EROSION. IT INVOLVES PLACING DOUBLE WALLED CLOTH MATTRESS MATERIAL OVER THE BANK OR OTHER AREA TO BE PROTECTED. THE TWO LAYERS OF CLOTH, PREFERABLY NYLON, ARE WOVEN TOGETHER EVERY SIX OR EIGHT INCHES AT TIE POINTS. MULTIPLE SECTIONS OF SUCH MATTRESS MAY BE JOINED TO COVER WIDER AREAS. WHEN PROPERLY POSITIONED AND SECURED, CEMENT MORTAR IS PUMPED INTO THE MATTRESS TO INFILATE IT SO IT RESEMBLES ROCK-OR STONE PAVING. THE SIZE OF THE COBBLES DEPENDS ON THE SPACING OF THE TACK POINTS. ONE SECTION IS PUMPED AT A TIME UNTIL THE SCHEME IS COMPLETED.

THE SYSTEM CAN BE USED TO PAVE A STREAM BED BY STRETCHING THE MATERIAL FROM ONE BANK TO THE OTHER, EVEN WHERE STRONG CURRENTS EXIST. THIS DUTCH PROCESS IS BEING INTRODUCED INTO THE U. S. CONSTRUCTION INDUSTRY UNDER THE TRADE-MARK FABRIFORM.

NEW APPLICATIONS SUCH AS PILE JACKETING, TUNNEL LINING, BEACH PROTECTION, SMALL DAM ENCASMENT, ETC. ARE BEING TESTED OR STUDIED.

Prepakt Reporter Apr. 1967

3A 234111

THE NEW AUSTRIAN TUNNELING METHOD

THE METHOD /AUSTRIAN PATENT 165573 OF 1948/ IS TO CONSTRUCT A TEMPORARY CONCRETE ROOF AND THE PERMANENT FLOOR AS THE TUNNEL IS BEING BORED. DEFORMATION MEASUREMENTS OF THE TEMPORARY ROOF SHOW THE STRENGTH OF STEEL REINFORCEMENT REQUIRED FOR THE PERMANENT LOADBEARING ROOF. THE USE OF SPRAYED CONCRETE PERMITS GREATER STABILITY BY INCLUDING THE MOUNTAIN IN THE LOADBEARING SYSTEM. CONSIDERABLY THINNER LAYERS OF CONCRETE ARE BEING USED THAN WITH TRADITIONAL METHODS.

Von, RABCEWICZ L Sattler, K Bauingenieur /Germany/ 1965

3A 234138

ANALYSIS OF EMBANKMENT STRESSES AND DEFORMATIONS

THE FINITE ELEMENT METHOD IS APPLIED TO THE EVALUATION OF EMBANKMENT STRESSES AND DEFORMATIONS. CONSTRUCTION SEQUENCE PLAYS AN IMPORTANT PART IN THE DEFORMATIONS DEVELOPED IN EARTH EMBANKMENTS, AND IN INCREMENTAL CONSTRUCTION VERSION OF THE FINITE ELEMENT METHOD IS DESCRIBED WHICH ACCURATELY ACCOUNTS FOR THIS EFFECT. CALCULATIONS DEMONSTRATE THE INFLUENCE OF BASIC PARAMETERS SUCH AS MATERIAL PROPERTIES, SIZE, GEOMETRY ON THE STRESSES AND DEFORMATIONS DEVELOPED IN EMBANKMENTS, AND THE EFFECT OF FOUNDATION FLEXIBILITY ON THE EMBANKMENT.

MATERIAL PROPERTIES, SIZE, GEOMETRY ON THE STRESSES AND DEFORMATIONS DEVELOPED IN EMBANKMENTS, AND THE EFFECT OF FOUNDATION FLEXIBILITY ON THE EMBANKMENT.

BECAUSE THE EARTH USED IN EMBANKMENTS IS NOT AN IDEAL ELASTIC MATERIAL. THE FINITE ELEMENT PROGRAM WAS MODIFIED TO TAKE INTO ACCOUNT MORE REALISTIC STRESS-STRAIN RELATIONSHIPS. THE SOIL CONSTITUTIVE RELATIONS WERE EXPRESSED IN TERMS OF THE BULK MODULUS AND THE DEFORMATION MODULUS, AND IT WAS ASSUMED THAT ONLY THE DEFORMATION MODULUS WOULD VARY WITH STRAIN. RESULTS OF AN ANALYSIS OF OTTER BROOK DAM, USING NONLINEAR PROPERTIES DEFINED BY TESTS OF THE DAM MATERIALS, WERE FOUND TO BE IN GOOD AGREEMENT WITH FIELD OBSERVATIONS OF DEFORMATIONS IN THIS STRUCTURE.

Cedergren, HR Civil Engineering ASCE Nov. 1967

3A 234209

DESIGN AND CONSTRUCTION OF A HORIZONTAL VISCOS FLOW MODEL

THE HORIZONTAL VISCOS FLOW MODEL WITH INFINITE AREAL EXTENT CAN BE USED FOR ALMOST ANY WELL FLOW PROBLEM WHETHER TWO-DIMENSIONAL OR THREE-DIMENSIONAL, STEADY OR NONSTEADY, SINGLE AQUIFER OR MULTIAQUIFER. THIS MODEL CAN ALSO BE USED IN THE FIELD OF SOIL MECHANICS FOR SUBSURFACE DRAINAGE PROBLEMS. THE DESIGN INCLUDES SCALE MODEL ANALYSIS AND THE ANALYSIS OF PERFORMANCE OF FIELD OPERATIONS IN ORDER TO SIMULATE AN IDEAL AQUIFER. CONSTRUCTION, CALIBRATION, AND TEST PROCEDURES FOR THE MODEL ARE DESCRIBED. THE APPARATUS HAS PROVED TO BE BOTH A VALUABLE RESEARCH TOOL AND AN EXCELLENT TEACHING AID.

Varrin, RD Fang, HY
Ground Water July 1967

3A 234235

GRAIN SIZE VS DOLLARS FOR DRAINAGE AGGREGATES

Adequate subsurface drainage is recognized as one of the most important features in the designing and construction of many civil engineering works. In all such earth-accumulation projects, such as roads, highways and airports, money allotted to subsurface drainage usually is returned many times. However, a trend in the selection of types of aggregates for subsurface drainage systems has, in some cases, led to highly uneconomical designs. Several examples are given. Despite the large sum spent on drainage, many earth-accumulation projects suffer damage from water because of inadequate drainage capacity. Frequently the solution is found in the use of graded filters, a type of sandwich construction that utilizes a core of cleaned, washed and screened aggregate of one size within protecting envelopes of finer, selected filter materials. When coarse one-size aggregates are used in drainage layers, it is usually necessary to place a separate fine filter layer against the soil. Fine and coarse filter materials generally can be placed in layers of uniform thickness if the work is planned to prevent equipment operations that will cause rutting or shoving of these layers. A cost comparison table is presented as evidence that fine-grained sand filter material is economically justified when used for the removal of appreciable quantities of ground water and seepage. Drainage systems should always be designed using modern criteria for filter materials that will assure permanent, adequate water removal without clogging. Economic studies indicate the need for evaluating each subsurface drainage system on the basis of the benefits possible in relation to the amount of money spent.


3A 234138
CONSTRUCTION EQUIPMENT AND METHODS

3A 234267
MULTIPLE-SANDWICH METHOD OF SOFT-CLAY BANKING USING CARDBOARD WICKS AND QUICKLIME
THIS PAPER REPORTS BASIC EXPERIMENTS ON A NEW CONSTRUCTION METHOD FOR RIVER DYKES OR HIGHWAY EMBANKMENTS USING SOFT ALLUVIAL CLAY OF HIGH WATER CONTENT. BY THIS METHOD, SANDWICHES (5 CM THICK) CONSISTING OF CARDBOARD WICKS AND GRANULAR QUICKLIME ARE OVERLAIRED WITH A 60-70 CM CLAY LAYER. IT HAS PROVED FAIRLY SATISFACTORY IN PRACTICE. /AUTHOR/
Yamanouchi, T Miura, N Israel Soi Soil Mechanics & Fdn Eng Sept. 1967

3A 234407
UNDERGROUND CORROSION AND SALT INFILTRATION THE MECHANISM OF SALT PENETRATION INTO THE SOIL AND THE POSSIBLE EFFECTS OF INFILTRATED SALTS ON UNDERGROUND CORROSION ARE DISCUSSED. SIZEABLE QUANTITIES OF HIGHWAY DEICING SALTS ENTER THE SOIL ADJACENT TO HIGHWAYS. SALTS ARE MOVED THROUGH THE SOIL PRIMARILY BY THE MOVEMENT OF SOIL WATER, WITH DIFFUSION HAVING ONLY MINOR IMPORTANCE. THE RATE OF WATER AND SALT MOVEMENT DEPENDS ON THE SOIL PERMEABILITY. SALT PENETRATION IS AN UNDERGROUND TYPE CORROSION IN SEVERAL WAYS. INCREASED SALT CONCENTRATIONS REDUCE SOIL RESISTIVITY AND GENERALLY INCREASE THE CORROSIVENESS OF THE SOILS. THE NATURAL LEACHING PROCESS PRODUCES CONCENTRATION DIFFERENCES OVER NARROW DEPTHS WHICH CAN PRODUCE GALVANIC CELL CORROSION, THE IMPORTANCE OF WHICH WILL DEPEND ON THE STABILITY OF THE ANODE LOCATION. THESE EFFECTS ARE RELATED TO SOIL DRAINAGE. CONSTRUCTION PROCEDURES SHOULD BE CONTROLLED TO PROVIDE A UNIFORM AND WELL DRAINED SOIL AROUND PIPES.
Berthouex, PM Prior, GA Journal Awwa Mar. 1968

3A 234539
Gausse, RV Technique Routiere, Brussels /Belgium/ Dec. 1965
ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 234610
Rescher, OJ Bull Tech De La Suisse Romande /Switz/ July 1968
ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 234742
FIELD AND LABORATORY BEHAVIOR OF A LIGHTLY OVERCONSOLIDATED CLAY AN EXTENSIVE SERIES OF FLOOD LEVEES UP TO 10 FT HIGH IS BEING CONSTRUCTED IN LAUNCESTON, AUSTRALIA. THE LEVEES REST ON A SOFT CLAY AND A MAJOR FAILURE OCCURRED ON RAISING THE LEVEES TO A 7-FOOT HEIGHT. AN INVESTIGATION HAS BEEN MADE TO ANALYZE THE FAIURE AND TO RECOMMEND CORRECTIVE PROCEDURES. LABORATORY TESTING SHOWED THE SOIL TO BE LIGHTLY OVERCONSOLIDATED AND OBSERVATIONS ON A FULL SIZE INSTRUMENTED TEST LEVEE INDICATE THAT THE DEGREE OF OVERCONSOLIDATION, ALTHOUGH SMALL, INFLUENCES FIELD BEHAVIOR TO A MARKED EXTENT. TOTAL STRESS ANALYSES GAVE A FACTOR OF SAFETY AGAINST OVERTURN, BUT IF A FAILURE OF 1.90, AND A STRESS ANALYSIS GAVE SLIGHTLY BELOW UNITY ASSUMING THE CONSOLIDATION INDEX INDICATING THAT CRITICAL STATE CONDITIONS MAY APPLY. A FOUR STAGE CONSTRUCTION PROCEDURE HAS BEEN RECOMMENDED ON THE
CONSTRUCTION EQUIPMENT AND METHODS

THE FOLLOWING FACTORS HAD TO BE TAKEN INTO ACCOUNT AND EFFECTIVENESS OF SHEATHING SYSTEMS, DIAGNOSIS OF GROUND CONDITIONS. ADVANTAGES, DISADVANTAGES, STOPPAGE OF THE SINKING OF EACH WELL BECAUSE OF PROBLEMS IN CONSTRUCTING WELL SUNK FOUNDATIONS IN LIMESTONE IN ASTERIES DU ST AMPIEN: INCORRECT PREDICTION OF MECHANICAL CHARACTERISTICS, BEHAVIOR (SETTLEMENT, CONSOLIDATION, ETC.) AND (3) CONSTRUCTION METHODS.

LABORATORY AND IN SITU TESTING, ODOMETER SHEAR TESTS, PORE PRESSURE MEASUREMENTS, FULL-SCALE TESTS, PRESSURE METER, CONSOLIDATION TESTS, ETC. FROM THE POINT OF VIEW OF ITS COMPOSITION, MECHANICAL CHARACTERISTICS, BEHAVIOR (SETTLEMENT, CONSOLIDATION, ETC.) AND (3) CONSTRUCTION METHODS FOR THIS TYPE OF SOIL.

RRL/ACJC.NOWLOOEMENT: Road Research Laboratory /UK/

ACKNOWLEDGMENT. Road Research Laboratory /UK/

3A 235013
FILES AND PILE FOUNDATIONS /IN FRENCH/
PILE SYSTEMS ARE DESCRIBED: THE BEARING CAPACITY AND STABILITY OF PILES ARE DISCUSSED. NUMERICAL DATA AND EXAMPLES OF PRACTICAL APPLICATIONS ARE GIVEN. IT DEALS WITH WOODEN, METAL, CONCRETE AND REINFORCED AND PRESTRESSED CONCRETE PILES. CONSTRUCTION METHODS AND SITE EQUIPMENT ARE REVIEWED, STATIC AND DYNAMIC FORMULAE ARE PRESENTED, AND THE STABILITY OF GROUPS OF PILES IS ANALYZED.

/LCPC/RRL/

Zanon, A
Geologie Und Bauwesen, Vienna /Austria/

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 235022
DRILLING OF MOTORWAY TUNNELS IN VERY DIFFICULT ROCK /IN GERMAN/
A COMPARISON IS MADE BETWEEN TWO METHODS OF TUNNEL CONSTRUCTION USED FOR THE SERRA RIPOLI AND ROVINE TUNNELS IN THE MILAN-ROME-NALES MOTORWAY. BOTH METHODS WERE USED FOR THE SERRA RIPOLI TUNNEL, WHICH CONSISTS OF TWO PARALLEL TUNNELS; EACH TUBE WAS BUILT ACCORDING TO A DIFFERENT METHOD. THE CONSTRUCTION OF THE FIRST TUBE WAS CARRIED OUT ACCORDING TO THE STANDARD DRIFT METHOD AND TIMBERING. THE SECOND TUBE WAS DRIVEN IN HALF SECTION, AND A PRELIMINARY PROTECTIVE SHOTCRETE LINING WAS IMMEDIATELY APPLIED. LATER, METAL CENTERINGS COATED WITH SHOTCRETE WERE PLACED IN POSITION TO FORM A PRELIMINARY ARCH. THE OTHER CONSTRUCTION STAGES WERE SIMILAR TO THOSE OF THE STANDARD METHOD. THE USE OF SHOTCRETE RESULTED IN SAVINGS IN CONSTRUCTION COSTS AS THE THICKNESS OF THE TUNNEL LINING WAS REDUCED AND THE CONSTRUCTION SITE MECHANIZED.

/LCPC(R)/RRL/

3A 235031
EMBANKMENTS ON COMPRESSIBLE SOILS /IN FRENCH/
THIS BIBLIOGRAPHY LISTS PUBLICATIONS CONCERNED WITH THE CONSTRUCTION OF EMBANKMENTS BUILT ON VARIOUS TYPES OF SOIL. IT DEALS WITH (1) CONSTRUCTION, (2) STUDY OF SOIL IN-SITU AND IN THE LABORATORY (FULL-SCALE TESTS, PORE PRESSURE MEASUREMENTS, ODOMETER SHEAR TESTS, ETC.) FROM THE POINT OF VIEW OF ITS COMPOSITION, MECHANICAL CHARACTERISTICS, BEHAVIOR (SETTLEMENT, CONSOLIDATION, ETC.) AND (3) CONSTRUCTION METHODS FOR THIS TYPE OF ROAD.

/TRL/

Lab Cent Pouts Chauss. Paris /France/ 1969, 2 pp, 183 Ref

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 235047
DIFFICULTIES ENCOUNTERED DURING THE CONSTRUCTION OF THE FOUNDATIONS OF TWO STRUCTURES /IN FRENCH/
THE FOLLOWING FACTORS HAD TO BE TAKEN INTO ACCOUNT IN CONSTRUCTING WELL SUNK FOUNDATIONS IN LIMESTONE IN ASTERIES DU ST AMPIEN: INCORRECT PREDICTION OF GROUND CONDITIONS, ADVANTAGES, DISADVANTAGES AND EFFECTIVENESS OF SHEATHING SYSTEMS, STOPPAGE OF THE SINKING OF EACH WELL BECAUSE OF POSSIBLE LATERAL FRICTION, SUBSTANTIAL LOSSES OF CONCRETE IN THE LIMESTONE DISCONTINUITIES, AND DIFFICULTY OF ENSURING THE HOMOGENEITY OF THE PRESENCE OF LOOSE POCKETS OF CLAY AND SAND IN THE LIMESTONE. THEREFORE IT WAS NECESSARY TO CONDUCT MORE NUMERICAL AND DETAILED PRELIMINARY INVESTIGATIONS. RESULTS SHOWED THAT, ECONOMICALLY THE BEST SOLUTION WAS TO SINK A SMALL NUMBER OF LARGE, CREEP WELLS WHENEVER POSSIBLE. ATTENTION IS DRAWN TO THE IMPORTANCE OF USING VERY SPECIAL ELABORATE CONSTRUCTION METHODS FOR DEEP FOUNDATIONS BUILT UNDER WATER IN THIS TYPE OF SOIL.

/TRL/

Colliere, P Bull Liaison Labs Routiers /France/ No. 50, Feb. 1971, pp 113-48, 10 Fig, 4 Phot

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 235057
DEEP FOUNDATIONS PART II
CONSTRUCTION DEFECTS AND EXAMPLES ARE GIVEN OF DRY CONCRETING, CONCRETING UNDER WATER, CONCRETING UNDER DRILLING MUD, SHALLOW DRILLED SHAFTS, AND CORROSION OF PILES BY THE SURROUNDING MEDIUM: WOODEN PILES, METAL PILES. /TRRL/

Logeais, L Bull Liaison Labs Routiers /France/ No. 3, Apr. 1971, pp 45-56, 10 Fig, 41 Phot

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 235082
EARTHWORKS WITH EXPLOSIVES BY MEANS OF THE OVERBURDEN DRILLING METHOD /IN FRENCH/
IN ORDER TO REDUCE TO A MINIMUM THE INCONVENIENCE CAUSED BY DRILLING IN THE VICINITY OF BUILDINGS DURING THE CONSTRUCTION OF THE PARIS-LYON MOTORWAY, IT WAS DECIDED TO USE THE OVERBURDEN DRILLING METHOD WHICH WAS DEVELOPED IN SWEDEN. DETAILS ARE GIVEN OF THE METHOD AND OF ITS MAIN APPLICATIONS: DRILLING AND BLASTING OF THE BEDROCK WITHOUT PRELIMINARY REMOVAL OF SOIL COVERING, OPENING OF TRENCHES, BLASTING UNDER WATER, MORTAR BLINDING, STRENGTHENING OF SHEET PILES BY INSTALLATION OF CABLES OR BARS, TIE RODS, MINERAL SITE INVESTIGATION, ETC. /TRRL/

Basset, C Bull Liaison Labs Routiers /France/ No. 53, June 1971, pp 7-9, 2 Fig, 1 Phot

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 235105
LOW-STRENGTH CLAYEY SOIL /IN RUSSIAN/
THIS PUBLICATION CONTAINS 76 OF THE 117 REPORTS PRESENTED AT THE FEDERAL CONFERENCE ON CONSTRUCTION PROBLEMS ENCOUNTERED WITH LOW-STRENGTH CLAYEY SOIL. THE REPORTS ARE CLASSIFIED INTO THREE SECTIONS AS FOLLOWS: (1) ENGINEERING GEOLOGY APPLIED TO SATURATED COMpressIBLE CLAYEY SOIL; (2) CALCULATIONS OF STRUCTURES RESTING ON COMpressIBLE SOIL, AND SHEARING STRENGTH, CREEP AND RHEOLOGY; AND (3) ANALYSIS OF SOME CASES AND CONSTRUCTION METHODS FOR STRUCTURES ON COMpressIBLE SOIL. /TRRL/

Tsytovich, NA Aluste lnstitut /USSR/ 1965, 420 pp, Figs, Tabs, Refs

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 235162
SOFT GROUND TUNNELING TECHNOLOGY IN GERMANY
DEVELOPMENTS IN SOFT GROUND TUNNEL CONSTRUCTION REPRESENTING THE LARGEST APPLICATION IN GERMANY ARE PRESENTED. THE PAPER DEALS WITH OPEN CONSTRUCTION, CLOSED (COVERED) CONSTRUCTION WITH SOME SPECIAL METHODS SUCH AS THOS OF FREEZING AND TUNNELLING UNDER PROTECTIVE PIPES, MACHINE-SHIELD...
CONSTRUCTION EQUIPMENT AND METHODS

TUNNELLING AND WITH TUNNEL LININGS AND SEALS, THE DATA ARE BASED MAINLY ON PRACTICAL EXPERIENCE GAINED IN THE CONSTRUCTION OF UNDERGROUND RAILWAY TUNNELS. /RRL/

Ginza, G Technology and Potential of Tunnelling June 1970

ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 235214
THE UNDERGROUND ROUTINE OF URBAN HIGHWAYS
THE ADVANTAGES DERIVED BY THE COMMUNITY AND THE ROAD USER FROM THE CONSTRUCTION OF UNDERGROUND URBAN ROADS ARE DESCRIBED WITH REGARD TO COST, LAND LOSS, NOISE, VISUAL BARRIER, PEDESTRIAN BARRIER, COMMUNITY DIVISION, APPEARANCE, DRIVING COMFORT, ACCESS, AND VIEW. THE DEPTH OF TUNNELS, DESIGN OF ACCESS ROADS, TUNNEL SHAPE AND CONSTRUCTION METHODS, VENTILATION, LIGHTING AND SERVICES ARE DISCUSSED TOGETHER WITH THE FACILITIES OFFERED BY A CENTRAL CITY TERMINAL. /TRRL/

Marc, RC Roads & Road Construction, London /UK/ Vol. 49 No 578-9, Feb. 1971, pp 61-4, 1 Fig, 5 Phot

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 235229
TUNNELLING FOR URBAN HIGHWAYS
THIS PAPER DISCUSSES THE VARIOUS TUNNELLING METHODS, SUCH AS SUBMERGED TUBE CONSTRUCTION, CUT-AND-COVER WORK, AND SUB-SURFACE BORING TECHNIQUES, AND DESCRIBES IN SOME DETAIL THE PROGRESS WHICH HAS BEEN MADE TO IMPROVE CONSTRUCTION METHODS ESPECIALLY IN THE PROVISION OF TUNNELING MACHINES WHICH ARE REDUCING THE DIRECT COST OF TUNNEL CONSTRUCTION. INDIRECT COSTS, SUCH AS EXCESSIVE LAND COSTS, DIVERSIONS OF SERVICES BOTH TEMPORARY AND PERMANENT, DISRUPTION TO TRAFFIC AND DISTURBANCE TO AN ESTABLISHED WAY OF LIFE ARE CONSIDERED. CONCLUSIONS ARE DRAWN RELATING TO THE VIABILITY OF TUNNELING FOR HIGHWAYS. /TRRL/

Tough, SG Inst Hwy Engineers Journal, London /UK/ Vol. 18 No 6, June 1971, pp 21-7, 1 Tab, 3 Phot

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 235232
DESIGN AND CONSTRUCTION OF THE HONG KONG CROSS-HARBOR TUNNEL
THE DESIGN AND CONSTRUCTION OF THE HONG KONG CROSS-HARBOR TUNNEL ARE DESCRIBED. THE TUNNEL, WITH HEADROOM OF 16 FT HAS DUAL TWO-LANE CARRIAGE-WAY, EACH 22 FT WIDE, WIDENING TO 215 FT ON THE KOWLOON SIDE FOR TOLL BOOTHS LINES. THE SUBMERGED SECTION CONSISTS OF 15 UNITS, VARYING IN LENGTH FROM 324 TO 374 FT AND WEIGHING OVER 20,000 TONS, WHICH ARE OF TWIN STEEL TUBE CONSTRUCTION WITH A REINFORCED CONCRETE KEEL AND INTERIOR AND EXTERIOR LINING, AND BALLAST CONCRETE. WHEN COMPLETED, THE TUNNEL WITH ITS SUBMERGED SECTION LENGTH OF 5256 FT WILL BE THE LONGEST TWIN STEEL SUBMERGED TUNNEL IN THE WORLD. /RRL/

Innes, KW Tunnels & Tunnelling /UK/ July 1971

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 235233
TUNNELLING ON THE BRIXTON EXTENSION OF THE VICTORIA LINE
THE EXCAVATION AND CONSTRUCTION METHODS USED FOR THE 5.5 KM-LONG EXTENSION OF THE VICTORIA LINE FROM VICTORIA TO BRIXTON IN SOUTH-WEST LONDON IS DESCRIBED. THE CONSTRUCTION, WHICH COMPRISMAにく TUNNELLING METHODS, TOTAL COSTS AMOUNTED TO 12.5 M POUNDS. /TRRL/

Bubbers, BL Tunnels & Tunnelling /UK/ Vol. 3 No 4, July 1971, pp 235-42, 5 Fig, 1 Phot, 4 Ref

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 235234
UNDERGROUND MOTORWAYS FOR URBAN AREAS
THE CASE IS DISCUSSED FOR THE CONSTRUCTION OF URBAN MOTORWAYS BELOW GROUND LEVEL, AND THEIR ADVANTAGES AND STRESSED REDUCTION IN NOISE AND AIR POLLUTION, AND CREATION OF VALUABLE LAND SPACE THANKS TO RELATIVELY LOW INTRUSION ON THE URBAN ENVIRONMENT. THE GENERAL COMPARISON OF CONSTRUCTION COSTS IS DIFFICULT AS AMENITY VALUES, LAND AND REDEVELOPMENT COSTS, AND LOCAL SOIL CONDITIONS HAVE TO BE CONSIDERED. DEMAND WILL GROW IN THE FUTURE FOR MOTORWAY TUNNELS, AND PRIORITY SHOULD BE GIVEN TO RESEARCH INTO PROBLEMS OF TUNNEL DESIGN, STRUCTURAL LOADING, PLANT, MAINTENANCE AND CONSTRUCTION OPERATION REQUIREMENTS. /TRRL/

Lyons, DJ Tunnels & Tunnelling /UK/ Vol. 3 No 4, July 1971, pp 277-8, 2 Fig, 2 Tab

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 235272
LIST OF PUBLICATIONS (1951-1970)
A LIST OF THE PAPERS, REPORTS AND TECHNICAL NOTES, PRODUCED BY THE PORT AND HARBOUR RESEARCH INSTITUTE SINCE 1951, IS PRESENTED GROUPED AS FOLLOWS: HYDRAULICS AND COASTAL ENGINEERING; SOIL MECHANICS AND FOUNDATION ENGINEERING; STRUCTURAL MECHANICS AND EARTHQUAKE ENGINEERING; MATERIALS TECHNOLOGY; DESIGNING; PORT PLANNING; DREDGING AND CONSTRUCTION EQUIPMENT; AIRPORT ENGINEERING. /RRL/

Transportation Ministry /Japan/ Apr. 1971, 86 pp

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 235365
FACTORS AFFECTING VERTICAL LOADS ON UNDERGROUND DUCTS DUE TO ARCHING
PORTION, WILL TEND TO BRACE ITSELF AGAINST THE END MASSES THEREBY INCREASING THE NORMAL PRESSURE AND THE LONGITUDINAL STRAINS AT THE ENDS AND DECREASING THE PRESSURE AT THE MIDDLE. THE EFFECTS OF SUCH ARCHING ACTION ARE CONSIDERED TO BE ESPECIALLY SIGNIFICANT IN THE CASE OF LONG CONDUITS INSTALLED UNDER HIGH FILLS.

Costes, NC. Highway Research Board Bulletin 1956

3A 235575
MIXING-IN-PLACE SOIL AND PORTLAND CEMENT CONSTRUCTION METHODS CAN BE FOUND TO MIX PORTLAND CEMENT GROUT AND SOIL IN PLACE BELOW GROUND AT THE RATE OF 1,000 CU YD A DAY AT $5.00 TO $15 PER CU YARD. WHEN SUCH METHODS AND APPARATUS ARE DEVELOPED, THERE WILL BE WIDESPRREAD USE IN THE FIELD OF UNDERGROUND CONSTRUCTION. AMONG THE MORE IMPORTANT APPLICATIONS MAY BE STABILIZING SAND DEPOSITS UNDER NUCLEAR POWER PLANTS IN EARTHQUAKE REGIONS. /ASCE/


3A 235605
HYDRAULIC FILLS TO SUPPORT STRUCTURAL LOADS DATA ARE COMPILED BASED UPON A REVIEW OF THE LITERATURE, CONCERNING THE RELATIVE DENSITY, PENETRATION RESISTANCE, COMPRESSION RATIO, AND RATE OF CONSOLIDATION. ONLY HYDRAULIC FILLS PLACED BY SLUICING METHODS ARE CONSIDERED. THE CONSECUENCES OF EACH TYPE OF FILL ARE ILLUSTRATED AND DISCUSSED. THE PLACEMENT AND ENGINEERING PROPERTIES OF THE MOST DESIRABLE TYPE OF FILL—THAT DERIVED FROM A FAIRLY CLEAN SAND—are consideised in detail. /ASCE/


3A 235642

Tunnels & Tunnelling /UK/. Jan. 1970

3A 235645
HILL BUILT OVER TUNNEL A TUNNEL WAS BUILT AND CONSTRUCTED TO ACCOMMODATE THE NEW YORK, NEW HAVEN AND HARTFORD RAILROAD LINE NEAR BERLIN, CONNECTICUT. A HILL WAS BUILT ON AND AROUND THE TUNNEL TO ACCOMMODATE THE ROAD BASE OP THE ARCH UNITS AT THE CASTING YARD DEVELOP THE HINGE ACTION. AREAS OF THE JOINT ABOVE AND BELOW THE PAD ARE FILLED WITH CLOSED CELL NEOPRENE SPONGE. LENGTHS OF NEOPRENE SHEET WERE USED TO WATERPROOF PARALLEL JOINTS BETWEEN ARCH UNITS.

Tunnels & Tunnelling /UK/. Jan. 1970

3A 235688
SOME DESIGN CONSIDERATIONS IN THE SELECTION OF UNDERGROUND SUPPORT SYSTEMS GUIDELINES FOR THE DESIGN OF SUPPORTS FOR UNDERGROUND OPENINGS IN BOTH SOIL AND ROCK ARE PRESENTED AND DISCUSSED FOR SEVERAL SPECIFIC SITUATIONS. THE DESIGN AND CONSTRUCTION OF BOTH SHAFTS AND TUNNELS IN A TOTAL RANGE OF GROUND CONDITIONS OCCURRING DURING THE BART CONSTRUCTION HAVE BEEN LESS THAN EXPECTED. TUNNELLING COSTS AND PROGRESS RATES ARE PRESENTED.

Tunnels & Tunnelling /UK/. Jan. 1970
CONSTRUCTION EQUIPMENT AND METHODS

TUNNEL. THE COST RELATIONSHIPS ARE ILLUSTRATED BY NUMEROUS DETAILED COST ESTIMATES OF TUNNELS IN BOTH SOIL AND ROCK. FINALLY, THE PROBLEMS OF GROUND MOVEMENTS AROUND SOFT GROUND TUNNELS ARE DISCUSSED AND METHODS FOR PREDICTING THE MAGNITUDE OF SETTLEMENT OVER SOFT GROUND TUNNELS ARE PRESENTED.

AUTHOR/ Pock, RB
Illinois University, Urbana Nov. 1969

CPSI PB190 443, 1P63211125

3A 235836

TWO DIFFERENT EXCAVATING METHODS APPLIED TO NIHONZAKA TUNNEL OF TOKYO-NAGOYA EXPRESSWAY THE NIHONZAKA TUNNEL, IN TWIN TUBES, IS OVER 2,000 M. IN LENGTH. CONSTRUCTION WAS INITIATED AT BOTH PORTALS USING TWO DIFFERENT METHODS. SIDE WALL PILOTS FOLLOWED BY FULL SECTION DRIVING WAS ADOPTED FOR THE EAST, WHILE THE DRIVING OF THE HALF WAS APPLIED FOR THE WEST. BASALT PREVAILED EXCEPT FOR SOME CONGLOMERATE ROCK. THE TWO METHODS WERE COMPARED IN RELATION TO: (1) CONSTRUCTION PROCEEDURE, (2) EQUIPMENT, (3) ACTUAL PROGRESS SCHEDULE AND CYCLE TIME, (4) DRILLING HOLES AND INSTALLATION OF STEEL SUPPORTS, AND (7) ARCH LINING. ALTHOUGH THE METHODS WERE SIMILAR IN GEOLOGICAL CONDITIONS, NAMELY, WATER LEAKAGE CONDITION THE SAFETY AND PROGRESS SCHEDULE SHOWED THAT BOTH METHODS HAD DISTINCT ADVANTAGES AND DISADVANTAGES IN EAST PROJECT. THE FULL SECTION-EXCAVATION IS ABOUT 9 M. AND IN THE WEST PROJECT THE HEIGHT IS AS LOW AS 5.5 M. IN THE WEST, DURING EXCAVATION, MORE TENSION WAS REQUIRED WHEN THERE WAS WATER LEAKAGE. THE WEST PROVED TO BE SUPERIOR TO THE EAST IN A PROGRESS SCHEDULE SINCE THE RATE OF EXCAVATION IS ABOUT THE SAME FOR PILOT DRIVING, EXTENDING EXCAVATION FOR FULL SECTION-DRIVING, AND UPPER HALF-EXCAVATION, WHILE THE LOWER HALF-EXCAVATION SHOWED PROGRESS.

Hachiyu, Y Tajima, T Japan Road Association Annual Reports 1969

3A 236348

NEW CONCEPTS FOR PIPELINE EXCAVATION IN ROCK BECAUSE OF A COMBINATION OF MUNICIPAL INDEBTEDNESS AND LOCAL ROCK CONDITIONS, A TOWN IN OREGON THAT WAS REQUIRED TO INSTALL A SEWER CONTRACTED WITH AN ENGINEERING FIRM TO STUDY THE FEASIBILITY OF APPLYING NEW TECHNOLOGY TO THE PROBLEM. TWO FINDINGS EMERGED THAT MAY BE OF INTEREST TO OTHER CITIES: (1) UNORTHODOX SEWER SYSTEMS SUCH AS VACUUM AND COMMUNICATION SYSTEMS ARE FEASIBLE, (2) ALTERNATIVE BORING MACHINES OPERATING IN DIFFERENT SUBSURFACE CONDITIONS. IT IS ESTIMATED THAT THE CURRENT RATE FOR COMPLETING AN AVERAGE LINED TUNNEL AVERAGES ONLY SEVEN TO FIFTEEN PERCENT OF THE RATED ADVANCE CAPABILITY OF MACHINE TECHNOLOGY. THE AUTHORS ALSO DISCUSS CURRENT TUNNEL APPLICATIONS TO A VARIETY OF SERVICES, INCLUDING SUBSURFACE URBAN TRANSPORTATION, PENETRATION OF PHYSICAL BARRIERS TO HIGH SPEED INTERCITY TRANSPORTATION, & STORAGE AND TRANSPORT OF NATURAL RESOURCES. THE REPORT CONCLUDES WITH AN OVERVIEW OF POTENTIAL RESEARCH AND DEVELOPMENT TO IMPROVE CURRENT TUNNELING TECHNOLOGY. THE ANALYSIS EMPHASIZES IMPROVED SUPPORT SYSTEMS AND PROJECTS A SEVENFOLD INCREASE IN TOTAL TUNNEL MILEAGE GIVEN POTENTIAL GROWTH IN SUPPORT TECHNOLOGY. IN ADDITION, THE AUTHORS RECOMMEND THAT FUTURE DEVELOPMENT PROGRAMS BE COORDINATED AMONG THE VARIOUS ASPECTS OF TUNNEL CONSTRUCTION TO ENSURE COMPATIBILITY AMONG NEW SYSTEMS. /UMTA/

North American Rockwell Corporation Dec. 1967

ACKNOWLEDGMENT: UMTA

3A 236428

SOFT GROUND TUNNELING SYSTEMS STUDY-PART I: TECHNICAL DISCUSSION THE PURPOSE OF THIS STUDY IS TO DEVELOP CONCEPTS FOR SOFT GROUND TUNNELING SYSTEMS WHICH WOULD BE CAPABLE OF OPERATING IN WEAK AND WET STRATA, BUT WITHOUT THE USE OF COMPRESSED AIR AS A WORKING ENVIRONMENT. SEVERAL TYPES OF MECHANICAL EXCAVATORS ARE USED IN SOILS WHICH HAVE MEDIUM-TO-GOOD OPEN CUT STABILITY. MOST OF THESE EXCAVATORS ARE COMBINED WITH A SEPARATOR MOUNTED ON A WHEEL OR DISK CUTTERHEAD. THE CUTTERHEAD IS ROUTED WHILE BEING JACkED AGAINST THE SOIL FACE, RIPPING OR GOUGING THE SOIL LOOSE. A NEW MEMO MACHINE, BEING EMPLOYED IN THE SAUGUS TUNNEL IN CALIFORNIA, USES A DIFFERENT CONCEPT. RATHER THAN A
CONSTRUCTION EQUIPMENT AND METHODS

ROTATING WHEEL ARRANGEMENT, A 1-1/2 YEAR RIPPER BUCKET IS EMPLOYED. THE BUCKET CAN BE TURNED AND MOVED IN ANY DIRECTION. TO BREAK OUT MATERIAL FROM THE FACE, IT IS WORKED IN AN UPRIGHT POSITION (LIKE A BACKHOE) TO PULL LOOSE MATERIAL ONTO AN INCINERATED MUCKING CONVEYOR. THE MACHINE CAN BE FITTED WITH A RIPPER TOOTH WHEN CONDITIONS AT THE HEADING REQUIRE IT. THE PROBLEMS OF ENVIRONMENTAL CONTROL ENCOUNTERED IN UNDERGROUND EXCAVATION FOR TUNNELING, MINING, OR OTHER CONSTRUCTION ARE ESSENTIALLY THE SAME: GASES, DUST, HEAT HUMIDITY, EXCESSIVE NOISE, VIBRATION, LACK OF ADEQUATE LIGHT, AND THE NEED FOR PROTECTIVE CLOTHING AGAINST HAZARDS. THE USE OF BULKHEADS, INSTALLED IN THE SHIELD OF TUNNELING MACHINES IMMEDIATELY BEHIND THE CUTTERHEAD TO ISOLATE THE TUNNEL FROM WATER-SATURATED SOILS, IS BELIEVED TO HOLD CONSIDERABLE PROMISE. MEMCO DEVELOPED A MACHINE UTILIZING THE BULKHEAD PRINCIPLE AND HAS BEEN EMPLOYING IT SUCCESSFULLY ON A TUNNELING PROJECT IN SOUTH AMERICA. WITH THIS MACHINE, MUCK IS TRANSPORTED TO AND THROUGH THE BULKHEAD, NEAR THE TOP, ON A CONVEYOR BELT SYSTEM. IT HAS NOT YET ENCOUNTERED A CONDITION WHERE WATER FLOW THROUGH THE SOIL HAS BEEN SUFFICIENT TO COMPLETELY FLOOD THE AREA IN FRONT OF THE BULKHEAD, AND WILL HAVE TO BE MODIFIED TO HANDLE THIS CONDITION.

ACKNOWLEDGMENT: UMTA

3A CONSTRUCTION EQUIPMENT AND METHODS

3A 236577 CONSTRUCTION PROCEDURES AND EQUIPMENT FOR DROP SHAFTS METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

THE PROBLEMS OF RAISE BORING IN THE CHICAGO AREA ARE DISCUSSED. THE DIMENSIONS OF THE FIVE HOLES TO BE BORED ARE GIVEN. THE PILOT HOLES WOULD BE 12 INCHES IN DIAMETER, AND THE DRILL STEEL, 10" HIGH-STRENGTH STEEL. STUDY LED TO THE CONCLUSION THAT IF THE STEEL COULD STAND THE TENSION AND TENSION, AND THE HYDRAULICS COULD SUPPLY SUFFICIENT THRUST, THEN THE STABILITY OF THE WHOLE WOULD BE BEST ON A ONE-PASS SYSTEM. THE DRILL STEEL, WITH SUFFICIENT INCLINE STABILIZERS, WOULD HAVE A PILOT HOLE 12 INCHES IN DIAMETER, WHICH WOULD ALLOW A MAXIMUM OF 1.125 INCH HORIZONTAL MOVEMENT. SPECIAL PRECAUTIONS WERE TAKEN TO SURVEY VERY ACCURATELY THE POSITION OF THE RAISE DRILL AND TO PREENGINEER ITS ALIGNMENT. THE CONTRACT ALLOWED FOR 0.5 PERCENT DEVIATION WHICH WOULD BE ABOUT ONE FOOT. CONCERN FOR ACCURACY WAS SPECIALLY HIGH. THE REPORT HIGHLIGHTS AREAS OF CONCERN. A SPECIFIC METHOD OF TRANSPORTATION HAD TO BE DEVELOPED TO CARRY EACH HEAD THROUGH THE TUNNEL. THE BUILDING OF MODELS IS ADVISED. THE SPECIFIC FRAME FOR TRANSPORTING THE HEAD WAS SLUNG BETWEEN A MUCK TRUCK AND A MUCK LOADER FOR THE JOURNEY THROUGH THE TUNNEL. HYDRAULIC JACKS AND RIGGING CONNECTED TO ANCHOR BOLTS PRE-DRIVEN INTO THE ROCK ARCHES, WERE USED TO MANIPULATE THE HEAD IN THE CONFINED SPACES, AND FINALLY TO POSITION IT UNDER DRILL STEEL. RETRACTION AND ROTATION PROCEDURES ARE OUTLINED. PROBLEMS ENCOUNTERED IN EXPERIENCE LED TO DEVELOPMENT OF PRECAUTIONARY MEASURES. THESE INCLUDE SUCH AREAS AS VALVE SYSTEMS, HANDLING DRILL STEEL, FOUNDATIONS ON WHICH THE RAISE DRILL IS PLACED AND CONTROL OF WATER, BLASTING OF ROCK SUPPORT RINGS, EQUIPMENT FOR GRouting, AND TOOLS FOR WORKING INSIDE EACH DROP SHAFT ARE DESCRIBED. THE CONSTRUCTION OF THE CONCRETE LINER AND MUCK STORAGE AND HANDLING ARE REVIEWED. CONCLUSIONS DRAWN FROM PRACTICAL EXPERIENCE ARE PRESENTED. IT IS URGED THAT SPECIAL ATTENTION BE PAID TO THE SAFETY AND SECURITY OF CONSTRUCTION PERSONNEL.

Roberson, BL Military Engineer Vol. 64 No. 422, Dec. 1972, pp 424-8, 5 Phot

3A 236568 OFF SHORE SHAFT CONSTRUCTION IN THE NORTH SEA


Adamson, JN N Am Rapid Excav & Tunnelling Conf Proc Vol. 2 June 1972, pp 915-29, 1 Fig

3A 236563 MOBILE RIVER TUNNEL COMPLETION OF THE MOBILE (AL.) RIVER TUNNEL, SCHEDULED FOR LATE 1972, PROVIDES A VITAL LINK IN INTERSTATE-10. THE STEEL, TWIN-TUBE SECTIONS ARE APPROXIMATELY 40 FEET DEEP BY 80 FEET WIDE AND ARE 346 FEET LONG. TWIN CYLINDRICAL TUBES 36 FEET 9 INCHES IN DIAMETER PROVIDE SEPARATE WATERTIGHT ENCLOSURES FOR THE ROADWAY AND AIR DUCT FOR EACH TUBE. AN OUTSIDE OCTAGONAL STEEL FORM PLATE RETAINS THE BALLAST CONCRETE WHICH IS POURED AROUND AND BETWEEN THE CYLINDRICAL TUBES TEMPORARY STEEL BULKHEADS CLOSE THE TUBE ENDS TO CONTROL SUFTANCY WHILE THE SECTIONS ARE AFLOAT AND DURING SINKING AND JOINING OPERATIONS. SEVEN TUBE SECTIONS ARE REQUIRED. THE TUNNEL LENGTH IS 3,000 FEET PORTAL TO PORTAL. CURVED RAMPS APPROXIMATELY 715 FEET LONG AT EACH END MAKE THE TOTAL LENGTH APPROXIMATELY 4,430 FEET. THE TUNNEL LENGTH COMPRISSES (FROM WEST TO EAST) 200 FEET OF CAST-IN PLACE CONCRETE ARCH SECTION, 50 FEET OF VENTILATION STRUCTURE, 26.5 FEET OF TRANSITION SECTION, 2,422 FEET OF PREFABRICATED SECTIONS SUNK IN A TRENCH DREDGED TO PROFILE (SEVEN SECTIONS), 26.5 FEET OF TRANSITION SECTION, 50 FEET OF VENTILATION STRUCTURE, AND 225 FEET OF CAST-IN-PLACE CONCRETE ARCH SECTION. TANGENT GRADES OF 5.25 PERCENT (WEST) AND 5.05 PERCENT (EAST) ARE CONNECTED BY A VERTICAL SAG OF 0.5 FEET THROUGH THE TUNNEL AND ARE 0.50 PERCENT. SECTIONS FABRICATED TO FIT THE PROFILE. A MINIMUM COVER OF 5 FEET IS PROVIDED UNDER THE SHIP CHANNEL (600 FEET WIDE BY 40 FEET DEEP, ALLOWING 2 FEET FOR OVERDREDGING. AT THE LOW POINT, THE TOP OF THE TUNNEL AND THE ROADWAY ARE, RESPECTIVELY, 57 FEET AND 83.3 FEET BELOW THE RIVER SURFACE. DETAILS OF CONSTRUCTION ARE GIVEN.

Roberson, BL Military Engineer Vol. 64 No. 422, Dec. 1972, pp 424-8, 5 Phot

CONSTRUCTION EQUIPMENT AND METHODS

3A 236809
THE NAPLES TANGENTIAL ROAD, THE GROTTOES TRAVERSED BY THE VOMERO TUNNEL

Moesta, F Autostrade /Italy/ Vol. 14 No. 6 June 1972, pp 4-18, 17 Fig, 15 Phot

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/ IRRD 202 872, 2C63235555

3A 236815
MINI ROCK MOLE BIDS FOR SMALL BORE MARKET
A DESCRIPTION IS PRESENTED OF A SMALL NON-CIRCULAR ROCK TUNNEL BORING MACHINE, THE "MINI-FULLFACER" DEVELOPED BY ATLAS COPCO, AND DESIGNED FOR SHORT DRIVES (30-1000 METRES) AND SHALLOW DEPTHS. ESTIMATES OF COSTS OF OPERATION ARE GIVEN. /TRRL/

Cottrill, A New Civil Engineer /UK/ Vol. 4 Aug. 1972, pp 30-1, 4 Fig, 5 Phot

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/ IRRD 202 880, 2C63235571

3A 236841
A REVIEW OF STRUCTURAL DIAPHRAGM WALLS

Andrews, DC Commonw Sci Indus Res Org /Austral/ Coal Paper Vol. 173 20 pp, 10 Fig, 1 Tab, 13 Phot Ref

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/ IRRD 206 965, 2C6323947

3A 236859
SPRAYED CONCRETE IN HARD ROCK TUNNELS
THE USE OF CONCRETE SPRAYING TO GIVE TEMPORARY ROCK SUPPORT IN TUNNEL CONSTRUCTION IS DISCUSSED. THE SPRAYED LINING RESTRAINS LOOSENING OF THE EXPOSED ROCK AFTER BLASTING OPERATIONS SO THAT LOADS ARE CARRIED BY THE ROCK ARCH INSTEAD OF BY A SUPPORTING STRUCTURE. BRIEF DETAILS ARE ALSO GIVEN OF THE USE OF CONCRETE SPRAYING IN THE FOUNDATION OF A TUNNEL BY THE SAND-PLOW SYSTEM AND FORMING THE FOUNDATION OF A SUNKEN TUNNEL. /TRRL/

Garrod, AD Hetherington, JS Tunnels & Tunnelling /UK/ Vol. 5 N 1973, pp 473-9, 7 Fig, 2 Tab, 2 Phot, 2 Ref

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/ IRRD 206 698, 2C63236284

3A 236860
EXCAVATING AND LINING THE SONNENBERG TUNNEL
DETAILS ARE GIVEN OF METHODS USED FOR THE CONSTRUCTION OF THE SONNENBERG TUNNEL WHICH CONSIST OF TWO INTER-CONNECTED 2-LANE TUNNELS. THE TWO ELECTRO-HYDRAULIC MACHINES ALTHOUGH COMBINED IN ONE UNIT, OPERATE LATERALLY. DETAILS ARE ALSO GIVEN OF METHODS USED TO SEAL THE TUNNEL TUBES USING PVC-FOIL INSULATION. THE TUNNEL IS EXPECTED TO BE IN USE BY THE END OF 1975. /TRRL/

Bensch, E Tunnels & Tunnelling /UK/ Vol. 5 N 5 Sept. 1973, pp 445-51, 4 Fig, 1 Tab, 6 Phot

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/ IRRD 206 699, 2C63236285

3A 236861
FOUNDATION OF A TUNNEL BY THE SAND-FLOW SYSTEM

Griiffoen, A. Vanfrooom, A. Tunnels & Tunnelling /UK/ Vol. 5 No. 4 1973, pp 354-63, 12 Fig, 11 Phot

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/ IRRD 206 696, 2C63236286

3A 236898
PRAGUE METRO CONSTRUCTION PROCEEDS THROUGH DIFFICULT GEOLOGICAL CONDITIONS
A RECONSTRUCTION SCHEME DESIGNED TO MEET THE GROWTH OF MASS TRANSPORTATION IN PRAGUE IS DESCRIBED. WITHIN THIS SCHEME AN UNDERGROUND RAILWAY SYSTEM WILL BE DEVELOPED ALONG FOUR MAIN ROUTES AND WILL BE SUPPLEMENTED BY BUS AND TRAMWAY SERVICES. THE TOTAL LENGTH OF THE NETWORK WILL BE 92.7 KM, HAVING A TOTAL OF 104 STATIONS. WITHOUT 26 KM WILL RUN ON THE SURFACE, 39 KM WILL BE EXCAVATED AT A SHALLOW DEPTH OF 10-14 M. THE REMAINING 27.7 KM WILL BE TUNNELLED DEEP UNDER THE CENTER OF THE CITY. GENERAL DETAILS ARE GIVEN OF PROPOSED TUNNELLING METHODS, EQUIPMENT, ROLLING STOCK, AND SIGNALLING EQUIPMENT. /TRRL/

Tunnels & Tunnelling /UK/ Vol. 4 No. 1 pp 63-5, 1 Fig

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 237037
TUNNELS FOR ROADS AND MOTORWAYS
THE PAPER USES THREE EXAMPLES OF ROAD TUNNEL CONSTRUCTION IN BRITAIN TO SHOW HOW WIDE VARIATIONS IN TUNNELING COST DEPEND UPON GROUND CONDITIONS. THE EXAMPLES USED ARE THE GREAT CHARLES STREET TUNNEL,
CONSTRUCTION EQUIPMENT AND METHODS


Wood, AM
Quarterly J of Engineering /UK/ Vol. 5 No. 1, 1972, pp 111-26, 4 Fig, 3 Tab, 20 Ref

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 237045
BORED COMPACTION PILES
THE DESIGN OF BORED COMPACTION PILES, THEIR METHOD OF CONSTRUCTION AND THE TYPE OF EQUIPMENT REQUIRED FOR THEIR CONSTRUCTION, ARE DESCRIBED. DETAILS ARE GIVEN OF THE ADVANTAGES OF THIS TYPE OF PILE IN WHICH REINFORCEMENT IS DRIVEN INTO FRESHLY PLACED CONCRETE AND THE SURROUNDING SOIL. SAFE LOADS ARE GIVEN FOR 3M. BORED COMPACTION PILES IN SANDY SOIL. /TRRL/

Indian Concrete Journal Vol. 46 No. 7, July 1972, pp 278-80, 2 Tab, 2 Phot, 1 Ref

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 237152
CAUSES OF SETTLEMENT IN RELATION TO THE CONSTRUCTION METHODS USED FOR UNDERGROUND TUNNELS
THIS ARTICLE ANALYSES THE CAUSES OF COLLAPSE INSIDE A TUNNEL AND OF SURFACE SETTLEMENT DUE TO UNDERGROUND EXCAVATIONS, AND IS BASED ON FIELD EXPERIENCE IN THE SHIELD DRIVEN CONSTRUCTION OF A SECTION OF THE BUDAPEST UNDERGROUND RAILWAY, WHICH PASSES THROUGH THE TOWN CENTER. /TRRL/

Le Strade /Italy/ Apr. 1972, pp 232-7, 4 Fig, 1 Tab

ACKNOWLEDGMENT: Transport & Road Research Lab /UK/

3A 237183
THE ROLE OF SOIL ENGINEERING IN ECONOMIC DEVELOPMENT IN ASIA OPEN FORUM
PANELISTS PRESENTED THEIR VIEWS ON VARIOUS ASPECTS OF SOIL ENGINEERING IN ASIA. THE CONTRACTOR'S POINT OF VIEW IS OUTLINED AND THE IMPORTANCE OF USING APPROPRIATE CONSTRUCTION METHODS FOR THE PREVAILING CONDITIONS ESPECIALLY SOFT SUB SOIL CONDITIONS IS STRESSSED. FOUNDATION DESIGN AND THE NEED FOR ADEQUATE PRELIMINARY SITE INVESTIGATIONS SUCH AS SOIL SAMPLING, AND LABORATORY AND IN-SITU TESTING ARE INVESTIGATED. EXAMPLES ARE GIVEN OF THE ROLE PLAYED BY ENGINEERING GEOLOGY IN PROJECTS IN TURKEY, PAKISTAN, THAILAND AND LAOS. PRACTICES ADOPTED IN ASIAN COUNTRIES ARE OUTLINED TOGETHER WITH THE THREE FUNDAMENTAL DIFFICULTIES ENCOUNTERED IN ASIA, E.G. SCARCITY OF SOIL ENGINEERS, LACK OF SOIL MECHANICS TRAINING AMONG SOIL ENGINEERS AND POOR LABORATORY FACILITIES IN SOUTH EAST ASIA. THE ECONOMIC ASPECTS OF SOIL ENGINEERING ARE EXAMINED. /TRRL/


ACKNOWLEDGMENT: Road Research Laboratory /UK/

3A 237276
ENGINEERING SITE INVESTIGATIONS IN PERMAFROST AREAS
MOST ENGINEERING PROBLEMS IN PERMAFROST AREAS ARE CAUSED BY THAWING OF PERENNIALY FROZEN GROUND WHICH CONTAINS LARGE QUANTITIES OF ICE. SUCH ICE SEGREGATION IS MOST SERIOUS IN FINE GRAINED SOILS. THE PAPER DESCRIBES THE SITE INVESTIGATION PROCEDURE TO OBTAIN THE INFORMATION NEEDED FOR DESIGN AND CONSTRUCTION IN THESE CONDITIONS. THE FIRST PHASE CONSISTS OF PRELIMINARY OFFICE STUDIES OF AVAILABLE RECORDS AND AIRPHOTOS AND PLANNING THE FIELD OPERATION WITH ITS PROBLEMS OF ACCESS AND COMMUNICATIONS. THE SECOND PHASE IS FIELD INVESTIGATIONS INCLUDING A GENERAL EXPLORATORY SURVEY FOLLOWED BY DETAILED INVESTIGATION. THE FINAL STAGE PROVIDES FOR SITE INVESTIGATIONS AND THE PREPARATION OF REPORTS. THE NEED FOR RECORDING AND EXCHANGING ALL OBSERVATIONS, EXPERIENCES AND CONDITIONS ENCOUNTERED IN THE NORTH IS NEEDED IF GENERAL KNOWLEDGE IS TO BE INCREASED. /CGRA/


ACKNOWLEDGMENT: Canadian Good Roads Association

3A 237285
PROTECTIVE STRUCTURES AND COMPONENTS

Library of Congress Nov. 1966

ACKNOWLEDGMENT: Clearinghouse Fed Sci & Tech Info AD646 390 $3.00, 3C64085550

3A 237635
BARK AS FILLER-AND LIGHT FILL MATERIAL IN ROAD EMBANKMENTS /IN NORWEGIAN/
BARK WAS USED AS CONSTRUCTION MATERIAL ON A NEW MOTORWAY AT VINTERBRU NEAR OSLO. THE PROBLEM OF OBTAINING BARK IN SUFFICIENT QUANTITIES DURING THE CONSTRUCTION PERIOD IS DISCUSSED. THE EFFICIENCY OF DIFFERENT TYPES OF CONSTRUCTION MACHINERY IN HANDLING THE BARK BOTH REGARDING VOLUME CAPACITIES AND TRACTION CONDITIONS DURING THE LOADING, HAULING AND UNLOADING STAGES IS THEN MENTIONED. METHODS EMPLOYED IN PLACING AND COMPACTING THE BARK ARE DESCRIBED. IMPROVED LOAD SPREADING EFFECT IS OBTAINED BY 20-40 CM LAYER OF COMPACTED BARK MATERIALS WITH LOW BEARING CAPACITY. FURTHER RESEARCH IS NEEDED ON THE USE OF BARK IN ROAD CONSTRUCTION, BUT EXPERIENCE INDICATES THAT IT CAN BE EASILY HANDLED EVEN IN WET CONDITIONS DURING RAINY PERIODS BY ORDINARY CONSTRUCTION MACHINERY. /SVV/RRL/

Klem, I H Klem, G S Teknik Ukeblad Oslo /Norway/ Feb. 1970

ACKNOWLEDGMENT: Road Research Laboratory /UK/
ORGANIC CATIONIC CHEMICALS AS STABILIZING AGENTS FOR IOWA LOESS

This paper presents the results of preliminary evaluation studies of a number of organic cationic chemicals as stabilizing agents for Iowa loess. The loess ranges texturally from silty loam to silty clay. An unconfined compression test is used for rating the chemicals. In this test, the principal criteria of stability are compressive strength, moisture absorption, and swelling after 24 hours immersion in water. The effects of the chemicals on air-dry strength and shrinkage during air drying are also considered in evaluating the benefits to stability. Though of a preliminary nature, the investigation demonstrates the superiority of several of the nineteen cationic chemicals used. Chemicals designated by the trade names ARQUAD ZT, ARQUAD 2S, ARMEN RESIDUE, ARMAC T, CRUDE AMINE, AND ARMEN RESIDUE ARQUAD, ARE CONSIDERED PARTICULARLY WORTHY OF FURTHER STUDY. THESE CHEMICALS IN AMOUNTS RANGING FROM 0.08 TO LESS THAN 1.0 PERCENT BY DRY WEIGHT OF THE SOIL SUBSTANTIALLY IMPROVE THE STABILITY OF LOESS. USED IN SUCH AMOUNTS, THE COST OF THE CHEMICALS PER SQUARE YARD OF BASE COURSE EQUALS THAT OF CLAY STABILIZATION WITH STABILIZATION, AND COULD BE ADDRESSED TO THE SOIL IN THE AMOUNT NECESSARY FOR COMPACTION TO NEAR STANDARD PROCTOR DENSITY. IN THE CONCENTRATIONS USED, THE VISCOSITY OF THE SOLUTION OR DISPERSION IS LOW ENOUGH TO PERMIT SPRAYING. FIELD EXPERIMENTATION WILL BE NECESSARY TO EVALUATE MORE FULLY THE EFFECTIVENESS OF THE CHEMICALS. /AUTHOR/

Hoover, JM Davidson, DT Highway Research Board Bulletin 1956

INSULATED ROAD-STATE ROAD 26

THE RECOMMENDATION FOR AN EXPERIMENTAL SECTION OF INDIANA HIGHWAY, INCORPORATING FOAM-PLASTIC INSULATING LAYERS TO ATTENUATE FROST PENETRATION, WAS DEVELOPED. WITH THE HELP OF INDIANA STATE HIGHWAY OFFICIALS, A FLEXIBLE PAVEMENT CONSTRUCTION WAS SELECTED, WITHIN WHICH THE PROPOSED FIELD INSTALLATION WOULD BE LOCATED. TWO INSULATED SECTIONS AND ONE NON-INSULATED SECTION COMPRIS THE PROPOSED FIELD INSTALLATION. SELECTION OF THE INSULATION THICKNESSES TO BE USED WAS BASED ON THE RESULTS OF A COMPUTER ANALYSIS DEVELOPED AT PURDUE UNIVERSITY. THIS PROGRAM, UNDER THE CONDITION OF ONE-DIMENSIONAL HEAT FLOW BY CONDUCTION, PREDICTS THE DISTRIBUTION OF TEMPERATURE WITH TIME THROUGHOUT A LAYERED MEDIUM. INPUT DATA UTILIZED WERE BASED ON CLIMATIC RECORDS FOR THE AREA IN WHICH THE SITE IS LOCATED AND ON ESTIMATED THERMAL PROPERTIES OF THE COMPONENT LAYERS OF THE PROPOSED HIGHWAY CROSSSECTION. METHODS OF EVALUATING THE THERMAL AND STRUCTURAL PERFORMANCE OF THE INSULATED AND NON-INSULATED SECTIONS WERE RECOMMENDED. THERMAL PERFORMANCE TO BE EVALUATED BY MEANS OF THERMOSTATICALLY PLACED THERMISTORS, SPECIFICALLY PLACED IN EACH OF THE THREE SECTIONS AND STRUCTURAL PERFORMANCE BY MEANS OF BENDEL MAN BEAM TESTS. SPECIAL CONSTRUCTION PROCEDURES WERE RECOMMENDED FOR THE FIELD INSTALLATION, DUE TO THE EXPERIMENTAL NATURE OF THE PROJECT. /AUTHOR/

3A 237712

BASES AND FOUNDATIONS ON FROZEN SOIL

CONSTRUCTION AND MAINTENANCE OF STRUCTURES ERECTED ON FROZEN SOILS: GENERAL INFORMATION ON FROZEN SOILS PHYSICOMECHANICAL PROCESSES IN FREEZING SOILS PHYSICAL PROPERTIES OF FROZEN SOILS MECHANICAL PROPERTIES OF FROZEN SOILS PROPERTIES OF FROZEN SOILS BASES AND FOUNDATIONS ON FROZEN SOILS PROPERTIES OF FROZEN SOILS METHODS OF CONSTRUCTION ON FROZEN SOILS AND ENGINEERING PREPARATION OF THE SITE PRINCIPLES OF FOUNDATION DESIGN BY THE METHOD OF RETAINING THE FROZEN CONDITION OF BASE SOILS FOUNDATION DESIGN METHODS WHICH CONSIDER THAWING OF FROZEN BASE SOILS PRINCIPLES OF FOUNDATION DESIGN TO RESIST FROST HEAVING SPECIAL FEATURES OF FOUNDATION CONSTRUCTION AND MAINTENANCE OF STRUCTURES ERECTED ON FROZEN SOILS

Tystoivitch, NA Highway Research Board Special Reports 1960

sealed tube keeps frost frozen to hold buildings

A heat transfer system consisting of two tubes and an antifreeze solution enclosed within a larger one is recommended. This arrangement guards against frost heaving. The cost of the antifreeze is about $0.14 per square yard of base. It would be needed to keep the soil frozen around the average size house in Fairbanks and similar latitudes. One thermopile contains two chemically inert plastic inner tubes, each running from end to center about half the length of the unit. The steel shell is built around the tubes, filled with a special liquid chemical and then sealed at both ends. The tubes are placed upright in the ground with 25% to 30% of their length above the ground's surface. Best performance is obtained by placing the tubes in early fall. The tubes are not driven into the ground, but placed in a hole in which a mixture of sand and gravel is then packed around them. Three steel tubes, 20 ft. long and 6 in. in diameter, have been installed to stabilize a railroad bridge built in 1947 that had started to shift as permafrost thawed. It is suggested that thermopiles can be constructed every 40 to 50 ft. Along pipeline routes will support the line and keep the ground from thawing.

Engineering News-record July 1969

subgrade insulation for frost heave control:

SUBGRADE INSULATION FOR FROST HEAVE CONTROL: SUMMARY OF SECOND AND THIRD WINTER PERFORMANCE

This report discusses the second and third winter followup of observations on two roadway test installations near Anchorage, Alaska, where expanded, expanded, polystyrene insulation boards and foamed-in-place urethane were used as subgrade insulation layers to prevent frost heaving. Frost penetration depths and surface elevation changes were measured periodically in both insulated and adjacent uninsulated sections under this study. Some data were also obtained on frost penetration near the edges of the insulation layer. Relative performance of the two insulation layers is compared on the basis of temperature differential data. Not all the data presented relating to design and performance of insulated roadways under climatic conditions similar to project area, which had a design air freezing index of 2500 to 3000 degrees F-days and a mean annual air temperature of 36 degrees F. /AUTHOR/
CONSTRUCTION EQUIPMENT AND METHODS

Alaska Department Highways July 1971

3A 238066
HIGHWAY CONSTRUCTION ON SOILS OF THE TYPE "MASSAPE" /IN PORTUGUESE/

SPECIFIC METHODS OF PAVING IN THE RECONCAVO BAHIANO ARE DISCUSSED WITH REGARD TO THE SOIL PROPERTIES THERE. SPECIFIC STUDIES OF SOILS AND ECONOMIC SOLUTIONS FOR THE PAVEMENTS ARE PRESENTED. /RRI/

Monteiro, R
Fed Dist Hwy Dpt, Salvador /Braz/

ACKNOWLEDGMENT: Road Research Institute /Brazil/

3A 238116
PILLARS AND PILES IN THE GROUND FROST PROBLEMS


Herje, JR

3A 238117
FROST INSULATION OF PIPE TRENCHES

CONTINUING EXPERIMENTS IN THE AREA OF FROST INSULATION OF PIPE TRENCHES IS DESCRIBED AND THE CONCLUSIONS DRAWN ARE PRESENTED. THE TEST PROCEDURE CONSISTS OF INSULATING 3 OF 4 ADJACENT AREAS WHILE THE LAST SERVED FOR REFERENCE. POLYSTYRENE SHEETS (STYROFOAM) OF 0.05 M. THICKNESS AND 30 KG/CUBIC METER WERE USED AS INSULATION AND LAID IN TWO LAYERS WITH STAGGERED JOINTS. THE TOTAL THICKNESS OF THE INSULATION WAS 0.1M. A LAYER OF SAND 0.05M. WAS LAID UNDER THE INSULATION. THE COVER OVER THE INSULATING LAYER OF THE 3 TEST AREAS WERE 0.1 M., 0.3 M., AND 0.5 M. THICK RESPECTIVELY. VERTICAL INSULATION WAS PLACED BETWEEN THE AREAS AND AT THEIR ENDS. THE TEST AREA AND ABOUT 3 M AROUND IT WAS KEPT CLEAR OF SNOW. IN ORDER TO INVESTIGATE THE EFFECT OF HEAT GIVEN OUT BY A WATER PIPE, A HEATING CABLE WAS PLACED UNDER THE INSULATING SHEETS. RESULTS INDICATE THAT A 1.5M. WIDE LAYER OF INSULATION IS GREATLY EFFECTIVE AND FROST PENETRATION WAS REDUCED CONSIDERABLY. IT IS ALSO SHOWN THAT THE RELATIVELY NARROW LAYER OF INSULATION MUST NOT BE LAID TOO SHALLOW IN THE TRENCH. THE INSULATING LAYER VERY EFFECTIVELY REDUCES THE HEAT LOSS FROM A WATER PIPE. IN THE CALCULATION OF RESULTS, CONDITIONS HAVE BEEN REGARDED AS STATIONARY. EXTREME SUBSURFACE TEMPERATURES WERE USED, AND A LINER TEMPERATURE DISTRIBUTION FROM THE SURFACE DOWN TO THE LIMIT OF FROST PENETRATION IS USED AS AN INPUT. SOME VARIATIONS FROM THESE ASSUMPTIONS ARE REVIEWED. THE RESULTS ARE DISCUSSED, RECOMMENDATIONS ARE MADE, AND THE DIRECTION OF FUTURE RESEARCH IS INDICATED.

Gundersen, P
CONSTRUCTION EQUIPMENT AND METHODS

HAVE TO BE ADAPTED TO THE SITE-CLIMATE AND THAT
PRACTICAL EXPERIENCE ALWAYS WILL HAVE TO BE AN
IMPORTANT FACTOR WHEN CHOOSING SUITABLE PROTEC-
TION MEANS.

Thue, JV
Royal Norwegian Council Sci & Ind Res No. 8, Dec. 1972, pp 68

3A 238135
CONSTRUCTION OF AN UNATTENDED SEISMOLOGICAL
OBSERVATORY (USO) IN PERMAFROST
THE CONSTRUCTION OF A LARGE DIAMETER CASED BORE-
HOLE AND SURFACE INSTRUMENT SHELTER FOR THE IN-
STALLATION OF A HIGH RESOLUTION, LONG TERM
RECORDING SEISMOGRAPH IN MARGINAL PERMAFROST 15
MILES WEST OF FAIRBANKS, ALASKA, IS DESCRIBED. PERMA-
FROST EXTENDED TO A DEPTH OF 123 FT AND CONSISTED OF
FROZEN SILT, PEAT AND SANDY SMALL GRAVEL AND WAS
UNDERLAIN BY A THAWED GRAVEL AQUIFER. THE FIRST 48
FT. OF 16-IN. HOLE WAS DRILLED WITH A TRUCK-MOUNTED
AUGER. A FAILING 1500 MOUNTED ON A TRACKED TRAILER
WAS MODIFIED TO ACCOMMODATE A 4-IN.-ID KELLY, SWIVEL
AND DRILL PIPE SO THAT COMPRESSED AIR IN REVERSE
CIRCULATION COULD BE USED FOR CUTTINGS REMOVAL.
AIR WAS CIRCULATED BY EITHER PRESSURIZING THE ANNU-
LUS THROUGH A ROTATING SEAL OR BY AN AIR EDUCTOR
(INJECTOR). THESE SYSTEMS WERE USED TO COMPLETE THE
HOLE TO 92 FT. ALTHOUGH CONSIDERABLE DIFFICULTY WAS
ENCOUNTERED, DRILLING RATES OF 10 FT/HR WERE MEA-
SURED WHEN USING COMPRESSED AIR CHILLED TO BELOW 20
DEG F, SHROUDED BITS TO PROVIDE ADEQUATE BOTTOM
HOLE CLEANING AND EITHER THE EDUCTOR OR THE PRES-
SURIZED ANNULUS. THE LATTER IS PREFERRED SINCE COM-
PRESSED AIR REQUIREMENTS ARE MUCH LESS. ELEVEN AND
THREE QUARTER IN. O.D. CASING WITH FLUSH, STEP-
THREADED JOINTS, WITH A FLUSH FLUSHED WITH SLURRY AS GROUT. FORTY THERMOCOUPLES WERE IN-
STALLED IN THE FILL PLACED OVER THE CASING AND IN THE
GROUND BENEATH TO MONITOR THERMAL BEHAVIOR.
DATA FROM THESE ARE DISCUSSED. FIVE THERMISTORS
ATTACHED TO THE BOREHOLE PACKAGE YIELDED DATA ON
THE GROUND BENEATH TO MONITOR THERMAL BEHAVIOR.
DATA FROM THESE ARE DISCUSSED. THERMISTORS
ATTACHED TO THE BOREHOLE PACKAGE YIELDED DATA ON
THE GROUND TEMPERATURE AT THE 80 TO 85 FT DEPTH
INTERVAL. USING THESE DATA, THE PERMAFROST THICK-
NESS OBTAINED BY EXPLORATORY DRILLING, AND THE
MEAN ANNUAL AIR TEMPERATURE, THE GROUND TEMPERA-
TURE PROFILE AT DEPTH IS ESTIMATED. THIS ANALYSIS YIELD.
S A GROUND TEMPERATURE OF ABOUT -1.7 DEG C FOR
THE FIRST 48 FT., THE BACKFILLING WITH GRANULAR
MATERIAL WAS FOUND TO BE SATISFACTORY FOR SHALLOW
DEPOSITS BUT WAS UNECONOMICAL FOR MUSKEG DEPTHS IN
EXCESS OF 5 TO 6 FT. THE ROLLING SURCHARGE METHOD OF
STABILIZATION IS SIMPLE AND CONSISTENT WITH HIGH
PRODUCTIVITY CONSTRUCTION. THE PROCEDURE IS BEGUN
BY BULLDOZING THE EMBANKMENT SURCHARGE INTO THE
MUSKEG AREA FROM ONE SIDE. HAULING UNITS BRING
ADDITIONAL MATERIAL TO THE TRAILING EDGE OF THE
SURCHARGE. BULLDOZERS CONTINUALLY MOVE MATERIAL
FROM BACK OF THE SURCHARGE TO THE LEADING EDGE
AND PUSH IT AHEAD INTO THE MARSH. THE USE OF THE
DRAINAGE WHERE THE UPPER LAYERS OF THE MUSKEG
MAT TER ARE TOO FIBROUS OR STIFF IS DESCRIBED. A
SURCHARGE HEIGHT OF ABOUT 5 FT. IS USED AS A STARTING
POINT. THE HEIGHT IS VARIED UP OR DOWN DURING CON-
STRUCTION. PERMAFROST CONDITIONS ARE DESCRIBED
AND THE TASK OF PREDICTING THE BEHAVIOR OF THE
THAWED PERMAFROST AND THE RATE AND DEPTH OF POST-
CONSTRUCTION THAW IS DISCUSSED. SINCE THE DEGRADE-
TION OF THE PERMAFROST CANNOT BE PREVENTED, A DE-
SIGN CRITERION HAS BEEN ESTABLISHED IN WHICH THE
RATE OF THAW AND SUBSEQUENT SETTLEMENT IS HELD TO
TOLERABLE LIMITS. THAW REDUCING METHODS ARE OUT-
LINED. CLEARING AND REMOVAL OF ORGANIC DEBRIS IS
REQUIRED IN CONTRACT SPECIFICATIONS. THE INSULATING
PROPERTIES OF PEATS AND MOSSES, THE MAINTENANCE OF
ECONOMICAL. THE DRIVING OF FLOWING WATER FROM THE
HOLE AND SURFACE INSTRUMENT SHELTER FOR THE IN-
STALLATION OF AN UNATTENDED SEISMOLOGICAL
OBSERVATORY

Becker, JC
Civil Engineering Ase Vol. 42 No. 7, July 1972, pp 75-7, 2 Fig,
2Phot

3A 238688
QUALITY CONTROL IN HIGHWAY CONSTRUCTION
PROGRAMS

QUALITY CONTROL IS OFTEN DEFEATED BY THE

EACH OF THE PARTIES IN HIGHWAY CONSTRUCTION ENGI-
NEERING PROJECTS HAS RESPONSIBILITIES TO THOSE WITH
WHOM HE HAS AN IMMEDIATE AND DIRECT CONTRACTUAL
RELATIONSHIP. THESE RESPONSIBILITIES ARE DETERMINED
PRIMARILY BY THE TERMS OF PARTIES' WRITTEN CON-
TRACTS. THE MATTER OF ASSURING THAT CONSTRUCTION IS
PERFORMED ACCORDING TO ACCEPTABLE STANDARDS OF
QUALITY IS CUSTOMARILY COVERED BY CONTRACT AND
CERTAIN DOCTRINES OF LAW. THE IMPORTANCE IS DIS-
CUSSED OF SPECIFICATIONS IN HIGHWAY PROJECTS AND IN
QUALITY CONTROL. THE CRITERIA OF QUALITY IS DISCUSSED
IN RELATION TO: THE CONCEPT OF EQUALITY AND TRADE
PRACTICES, QUALITY CONTROL MUST DEPEND UPON CON-
TRACT PROVISION FOR STORAGE AND HANDLING OF MATE-
RIALS, INSPECTION PROCEDURES, AND ADJUSTMENT
PROCEDURES. THE CONTRACT LAW THAT HIGHWAY DE-
PARTMENTS AND CONTRACTORS ARE CONCERNED
WITH IS LARGELY ADMINISTRATIVE LAW.

Dunbar, DW
Highway Research Record, Hwy Res Board 1969

3A 239960
EARTHMOVERS POLLUTE LITTLE BUT FACE EMISSION
STANDARDS

THE DIESEL IS CONSIDERED THE PREDOMINANT ENGINE
USED IN CONSTRUCTION EQUIPMENT. SMOKE REGULATIONS,
WHICH ARE IN EFFECT OR PENDING, ARE DISCUSSED TO
POINT OUT THE INDUSTRY IS SUBJECT TO CONTROLS. AN
ESTIMATE OF THE AMOUNT OF HYDROCARBONS, CARBON
MONOXIDE, AND OXIDES OF NITROGEN Emitted BY EARTH-

509
COMPOSITE ACTION WITHOUT SHEAR CONNECTORS

In order to develop composite action in a beam with the flange embedded in the deck slab, sufficient natural bond friction forces must exist between the flange and concrete to transfer the horizontal shearing forces. The methods are discussed and the results are presented of a series of tests that were conducted to determine if natural bond forces are adequate. Details are given of the test specimens which were hybrid castellated steel beams. To evaluate composite action, instrumentation was provided to measure slip between the concrete and steel, deflection of the composite beam, and strains in the beam and concrete slab. The loading condition, and the test procedure are described, and the slip measurement results are set forth. Load deflection characteristics, stress distribution, horizontal shear stress and repeated loads are other aspects covered. Conclusions based on the test results are presented.

W. Watson, J (Mulach Steel Corporation); O’Nial, R.; Barnoff, RM
(Pennsylvania State University, University Park); Mead, E. (Mulach
Steel Corporation) Engineering Journal Vol. 11 No. 2, 1974, pp 29-33, 10
Fig., 8 Ref.

3A 260123

PAVEMENT CRUSHED, REUSED TO STRENGTHEN RUNWAY BASE

A badly cracked pavement at Orange Municipal Airport in Orange, Massachusetts was recently reconstructed by reconstituting the existing pavement and a portion of the existing base by pulverizing and mixing them with a travelling hammer mill. The reclaimed mixture of old pavement and base was used as a stabilized base of improved gradation characteristics which was overlayed with a new bituminous concrete surface course. Cobble (6 to 12 inches) which frost had migrated from the subgrade into the base course were also crushed during this process to a 2 inch maximum size, and no wasting of materials was necessary. This method of reconstruction was about 15 percent less expensive than removing and wasting the old pavement, upgrading the existing base with imported aggregate and paving.

K. Briggs (Edwards and Kelcey, Incorporated) ASCE Civil Engineering
Vol. 43 No. 4, Apr. 1973, pp 82-84, 1 Fig., 1 Tab., 2 Phot.

3A 260255

NOISE CONTROL AND CIVIL ENGINEERING

The report explains noise nomenclature, describes tools and mathematical models for reducing noise on engineering projects, and makes recommendations for revising engineering education. The various Federal, State and local regulations related to noise are reviewed. Future construction planning will have to take into account noise control in scheduling and deployment of construction equipment. The Environment Protection Agency’s (EPA) document ‘Noise from Construction Equipment and Operations, Building Equipment and Home Appliances’ (dealing with construction noise), describes a model which predicts noise from various types of construction projects. On the basis of field interviews, EPA calculated “usage factors” for each piece of equipment. An average noise level for each phase of each job was calculated and tabulated. Tables are also presented of the various types of equipment that can be quieted, the degree of quieting and the cost of quieting. Options for compliance open to construction planners are listed.

Important aspects of traffic noise are identified: noise levels rise 9 dBA each time the average speed is doubled; for a constant average speed, doubling the number of vehicles per hour increases average noise by 3 dBA; stop and go traffic introduces higher peak levels and often lower averages; smooth but slow traffic has a low average and low peaks. A mathematical model is described which was used to device various methods of decreasing sound emission levels from a mixture of different types of vehicles, different vehicles, different volumes and different emission characteristics. Ways of handling problems dealing with traffic noise abatement are outlined. The need is indicated for education of the civil engineer to help him cope with problems of noise control and reduction. Topics that should be included in an elementary acoustics course are listed.

K. Krokosky, EM Dym. CL (Carnegie-Mellon University) ASCE Civil
Engineering Vol. 44 No. 5, May 1974, pp 45-49, 3 Tab.

3A 260354

ILLUSTRATED TERMINOLOGY FOR CONCRETE VIBRATORS

The German, English, French, Italian, Dutch and Swedish terminology for components for internal poker vibrators, external vibrators, concrete compactors incorporating flotation units, surface vibrators, concrete surface
CONSTRUCTION EQUIPMENT AND METHODS

3A 260400
THE UNDERGROUND RAILWAY IN VIENNA [Die Wiener U-Bahn]
The author reports on the planning and construction of the underground railway in Vienna. Construction methods used include the following: The open-pit method, for which a description is given of jointing of slurry trench walls with precast concrete for depths greater than 20 m and supporting of the freestanding slurry trench walls and access shafts by means of soil anchors, steel frames or sections of plate beams; and the closed construction method, for which a description is given of the fully automatic shield. Settlements of the soil above the shield and the main causes of this, the provision of a safety wall in front of St. Stephen's Cathedral, and the construction of a drilled pile wall by means of a low-vibration worm drill. /TRRL/ [German]


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 301118)

3A 260435
WATER USED TO PRELOAD UNSTABLE SUBSOILS
During the construction of an 1100 acre contained reservoir development at Elizabeth, New Jersey, the Port Authority of New York and New Jersey found that following circumstances favored the use of water rather than sand for surcharge: the lack of area to dispose of sand surcharge; the increased cost to purchase additional fill; the ready availability of sand for dikes and water for surcharge; the shorter construction period. The steps to construct, fill, maintain and empty the water surcharge site of two lakes, 44 acres and 19 acres, are fully described. Problems such as seagulls, wind and cold weather during the construction and preload periods are detailed together with the solutions. Field observations were required to monitor the performance of the water preload and dandle dike stability. A brief cost estimate of the project, together with photographs and illustrations are also provided.


3A 260445
MEMBRANE ENCAPSULATED SOIL LAYERS (MESL) FOR ROAD CONSTRUCTION IN COLD REGIONS
The possible use is examined of membranes to encapsulate frost susceptible soils, compacted at water contents below optimum, to inhibit frost action by maintaining the water content at a low level. Laboratory test data are presented to show the effects of soil type and compaction conditions on the potential field performance of such encapsulated soils. The three soils tested in the laboratory are: a moderately plastic clay from PJlott, AL; a sandy soil from Elmendorf, Alaska. Soils similar to those tested will also be utilized in field trials subjected to freezing and thawing. The results of the unfrozen water content determinations, and freezing tests on the Ellisworth clay are described and discussed. The Ellisworth clay seems ideally suited to use in membrane encapsulated soil layers (MESL) in a frost area. The behavior of Hanover silt in a brief test program was very different. CBR values for unsoked samples of Hanover silt decrease much more rapidly with increasing water content on the wet side of optimum than values for Ellisworth clay. On the dry side of optimum, the CBR of the silt is essentially constant. Freezing tests, post thaw strength and possible chemical treatment are also considered. Investigations indicate Elmendorf clay is less plastic (PI=18) and of more uniform particle size than the Ellisworth clay (PI=25). Freezing point depression tests suggest that a significant percentage of the soil water may remain unfrozen at temperatures only a few degrees below zero deg. C. Freezing tests, lime treatment and placement requirements related to Elmendorf clay are also considered.

This paper was presented during the Symposium on Frost Action on Roads held in Oslo, Norway, 1-3 October, 1973.

Quinn, WF Carbee, D Johnson, TC (Cold Regions Research and Engineering Laboratory) Organization for Economic Cooperation and Devel Conf Paper 1973, pp 417-438, 12 Fig., Tabs., Refs.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 214595)

3A 260447
PAVEMENT DESIGN IN COLD AREAS
A replacement method is described which is based on the CBR design, and the use of insulation in road construction. The subgrade bearing capacity during the thawing period was investigated and design CBR value has been set up for each group of soil characters. The pavement depth and the replacement depth was compared and the larger is taken for the determination of pavement structures. The field CBR tests on subgrade, frost protection layers and 30 cm thick layer of frost prevention layers above the surface of subgrade, are reported and discussed. Since Roads in Hokkaido show large freezing depth, a replacement depth of roads should be 80 percent of the deepest frost penetration in existing gravel roads. This corresponds to about 70 percent of the frost penetration in the roads which are replaced to full depth with nonfrost grained materials. A frost damage correcting measure is outlined. When the pavement depth (above) is smaller than the standard replacement depth, frost-susceptible materials shall be filled below the subbase course for such a depth of difference. The minimum depth of frost preventing layer shall be 15 cm. The qualities required of replacement materials are listed. Care is urged in the selection of insulating material and the use is noted of extruded polystyrene board on subgrade soil. However, quantitative studies of its' effect on frost action were not performed.

This paper was presented during the Symposium on Frost Action on Roads held in Oslo, Norway, 1-3 October, 1973.


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 214611)

3A 260471
POLYSTYRENE FOAM IS COMPETITIVE, LIGHTWEIGHT FILL
Shortly after construction, the abutments of a Michigan bridge began to move toward the river. The problem was caused by the fact that the approach roads to the bridge were of earthfill (125 lbs/cu ft), creating large forces against bridge piers and abutments. After examining several possible solutions, the best solution was considered to be the use of polystyrene foam (3 lbs/cu ft) as fill. It weighs much less than sand or very soft clay, minimizing the amount of excavation. It also has long-term durability and won't absorb much moisture. Ease of placement, immediate availability, and comparatively low cost were also factors in its favor. The construction procedures utilized are briefly discussed in this article.

Coleman, TA (Michigan Department of State Highways & Transp) ASCE Civil Engineering Vol. 44 No. 2, Feb. 1974, pp 68-69, 2 Fig., 3 Phot.

3A 260476
FALSEWORK FAILURES: CAN THEY BE PREVENTED?
Several falsework failures which have made news headlines have caused concern as to the adequacy of falsework checking procedures. Although billed as "Bridge Collapses," eight instances in which falsework has failed in California in recent years are analyzed and in all cases it is shown that the failure was strictly falsework and not the finished bridge structure. The question of what can be done to prevent falsework collapses is raised and some suggestions are made as ways to improve the quality of this temporary structure which traditionally has been the responsibility of the contractor. The State recognizes its responsibility to the traveling public and new procedures are outlined to improve falsework quality. /AUTHOR/

Elliott, AL ASCE Civil Engineering Vol. 43 N No. 0, Nov. 1973, pp 74-76, 4 Phot
3A 260486

IMPACT OF METRICATION ON THE CONSTRUCTION INDUSTRY

A thorough discussion is presented concerning the desirability of national metrification and the present status of this important matter. Metrification alternatives are considered, leading to the conclusion that nothing short of complete and genuine metrification can provide the maximum benefit. A necessary point of beginning for metrification of the construction industry as a whole is the familiarization of large numbers of people with the metric system. It is additionally determined that metrification of the construction industry must necessarily proceed simultaneously within each of its four elements: design; material and equipment production; contractors; and labor. The ramifications of metrification as they apply to each of these four areas are discussed and specific problem areas are identified.

Energy Issues


3A 260568

UNDERWATER CONCRETE FORMING TIME SLASHED

Dramatic reductions in both time and manpower requirements for forming concrete structures underwater are possible because of a unique fiberglass form. The forms are manufactured by filament winding fiberglass and resin and are made in standard lengths of 60 feet and in diameters from two to 12 feet and even larger. The cylindrical forms are split lengthwise so that they can be spread open and slipped around a piling and allowed to snap shut. The fiberglass angle bars are lugged together to form a spillproof closure. If left in place, these forms provide protection against corrosion.

Dixie Contractor Vol. 49 No. 4, July 1974, p 28

3A 260780

RAIL TUNNEL IN ROCK SPEEDS B.C. TRAINS

The article describes the construction of the 4568 ft. long, 16 ft. wide and 24 ft. 6 in. high railway tunnel being blasted through granite-like granodiorite rock at Nelson Creek, West Vancouver, Canada. If the preliminary rock survey, showing solid, uniform rock formation is correct, no steel lining and are made in standard lengths of 60 feet and in diameters from two to 12 feet and even larger. The cylindrical forms are split lengthwise so that they can be spread open and slipped around a piling and allowed to snap shut. The fiberglass angle bars are lugged together to form a spillproof closure. If left in place, these forms provide protection against corrosion.

Tunnels and Tunnelling Vol. 4 No. 6, Nov. 1972, pp 547, 1 Fig., 1 Phot.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 208731)

3A 260897

FROST PROTECTION OF EXISTING ROADS BY A TOP INSULATING LAYER [Frostbeskyttelse av Eksisterende Vegar Med Toppulysarlagemetoden]

It has been calculated that some 35000 km (22000 miles) of the Norwegian road network requires strengthening in order to comply with the standards set up for 8 ton axle load. A new method of protecting existing roads from frost and at the same time strengthening them is described for a 3.6 km (2.2 miles) long stretch. The method uses boards of insulating materials of high compressive strength placed directly on top of the existing road with a thin layer of asphaltic gravel on top of the insulating boards. Constructional details given in some detail as it is of great importance that this thin addition to the existing road behaves as uniformly as possible. Deflection measurements with the beakelman beam do not indicate any great differences before and after construction, and both the total deflection and radius of curavture are within the limits generally accepted for a normal standard road. Temperature gauges are placed immediately above and below the insulating boards and 1 m (3.3 ft) below the boards. Air temperature gauges are placed in and cloud conditions will be observed twice daily in order to gather data about the relation between the above parameters and formation of ice on the road surface. /TRRL/

Norwegian/English"

Borg, JVN (Committee on Frost Action in Soils, Norway). Frost I Jord No. 9, Mar. 1973, pp 7-19, 6 Fig., 5 Phot. 1 Ref.

ACKNOWLEDGEMENT: Transport and Road Research Laboratory (IRRD 206696)

3A 260931

CALCULATION OF LATERAL THRUST ON TUNNEL WALLS

This study of the underground railway system in Prague, Czechoslovakia, analyzes the working stress conditions of an underground railway tunnel. Design criteria and tolerance limits for earth pressures in soft and compact ground are discussed. Construction techniques preliminary to tunnel drilling are outlined for various ground conditions. /TRRL/ [Italian]

Straka, J Strade No. 11, 1973, pp 649-654, 7 Fig., 1 Tab.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 208731)

3A 261075

SIMPLIFIED MUFFLER SHELL CONSTRUCTION

The inventor describes a simplified method for attaching the outer shell of the muffler to the inner tube. The technique involves forming the ends of the shell in a manner which reduces the diameter progressively. Two enlarged sections are then formed on the inner tube on each side of the point where it meets the outer shell. The configuration may then be spot welded at this point. /GJS


Straw, EG (Tenneco Incorporated) Department of Commerce


3A 261274

AN ANALYSIS OF NOISE CONDITIONS PRESENT IN COMMERCIAL AND MILITARY VEHICLES

A noise survey was conducted to determine whether hazardous noise conditions exist within construction, farms, or military vehicles. A check was also made on the basic modes of public transportation: plane, railroad, bus, taxi, and private automobiles. Extreme noise conditions were found in much of the construction and farm equipment. The military design vehicles also showed some situations of extreme noise. The public transportation modes were generally free from any extreme noise conditions. (Author) Sponsored by the Army.

Elliott, JE

Texas A&M University 1971, 63 pp

ACKNOWLEDGMENT: National Aeronautics and Space Administration (N73-12754)

PURCHASE FROM: National Technical Information Service 5285 Port Royal Road, Springfield, Virginia 22151 Repr PC, Microfiche N73-12754, AD-747685

3A 261499

BIBLIOGRAPHY ON WINTER CONSTRUCTION, 1967-1971

No Abstract.

Kaplan, CW Metrish, RM

Cold Regions Research and Engineering Laboratory Special Report 204, Apr. 1974, 77 pp, 746 Ref.

3A 261505

UPHILL HAUL-SCRAPERS VERSUS BOTTOM DUMPS WHICH ARE THE BEST?

A comparison is made of various haulage systems to determine which is the most efficient. The systems considered are the pushloaded scraper (PLS), twin-engined pushloaded scrapers (TEPLS) and top loaded bottom dump haulers (TLBDH). The material to be handled is a sand-silt-clay mixture. Areas compared are the characteristics of the machines, controlling cycle times, production and costs. The PLS, with the exception of the top loaded rear dump hauler, is closest to the "all material and all length of haul" concept. It shows lower unit cost in upgrade haulage than does the TLBDH up to plus 140 feet difference in elevation.

Church, HK Roads and Streets Vol. 116 No. 9, Sept. 1973, 4 pp, 3 Fig., 1 Phot. 511
CONSTRUCTION EQUIPMENT AND METHODS

3A 261591
REINFORCED EARTH WALL ALLOWS ROAD WIDENING IN TIDAL ESTUARY

The building structure which includes a facing of interlocking facing. They attach to tabs cast into the panels with 0.5-in. bolts. Vertical angles to the wall face are on 19.5- and 30.0-in. are on the side of a creek. The interlocking precut concrete panels are described in 6 to 9-in. lifts which are then rolled. Vertical joints are filled with cork and vertical gaps are sealed with a filter material. The structural integrity of the RE wall is provided by metal strips imbedded in lifts of compacted earth fill. Strips which are imbedded at right angles to the wall face are on 19.5 and 30.0-in. centers behind the concrete facing. They attach to tabs cast into the panels with 0.5-in. bolts. Vertical spacing of the 15-, 23-, and 28-foot-long strips is 7.5 in. near the top and bottom of the fill in 30-in. in between. The 44,000 cu. yd. of fill is placed in 6 to 9-in. lifts which are then rolled.


3A 261638
ACCURACY OF EQUILIBRIUM SLOPE STABILITY ANALYSIS

The discussant of this paper described studies performed in an attempt to develop a simple method for predicting embankment deformation. The limit-equilibrium safety factors of compacted embankments were compared with the "actual" safety factors determined rigorously using the stress-strain relationships and the equations of compatibility of deformations. The mathematical simulation of embankments included compaction stresses and stage construction under water. The hydraulic numerical program was based on the one developed by Kondner was adopted with parameters selected to fit experimental results from actual consolidated undrained triaxial tests in clayey soil. Fourteen embankments were analyzed under end-of-construction condition, their "actual" safety factors being between 1.0 and 1.5 and their slope angles ranging from 1 (horizontal) to 1 (vertical) to 3 (horizontal) on 1 (vertical). For each embankment, contours of equal major principal strain (epison) were determined and the potential failure line was defined as the locus of epison (max). In every case this locus could be reasonably approximated by a circular arc. The "actual" safety factor is defined as the mean value of a ratio (gives). A graph of the conventional safety factors versus the "actual" ones shows the former is always lower than the latter. The difference is as large as 30 percent and is dependent on the safety factor and on the slope angle.


3A 261755
COMPUTER SIMULATION APPLIED TO SLIPFORM PAVING

A computer simulation model called SFSIM has been developed in the SIMSCRIPT 11.5 language which attempts to incorporate the main interactions that can occur during typical paving operations. The computer analysis enables the determination of the optimum number of trucks to employ for any batch plant location and their scheduling. A diagram is presented of the typical slipform paving operation. Time lapse photography equipment was used to collect typical time data for the components. Pictures were taken at a rate of one frame every 4 seconds. The duration of each job operation was determined by counting the number of frames in which that operation occurred and multiplying by 4 seconds. Typical frequency distributions were thus obtained of the times required to service a truck at the wash-out area, load at the plant and unload at the paver. Stop watch readings while riding the truck yielded the truck speeds for each part of the cycle. The time distributions were fed into the simulation. Frequency distributions for the time between equipment failures and the downtimes expected at each failure were also incorporated into the program. A diagram is presented of the flow chart of the logic used in the computer program which is designed to be flexible enough to model almost any normal slipform project. Some of the parameters that may be specified are listed. The types of questions that may be answered are illustrated by examination of selected results for a typical pavement 21,600 ft long, 9 in. thick, 24 ft wide, dual lane.

Willenbrock, JH (Pennsylvania State University) Roads and Streets Vol. 116 No. 6, June 1973, pp 144-146, 3 Fig.

3A 261768
GROUND FREEZING TECHNIQUES AT SALERNO

The article describes the construction of the Santa Lucia Tunnel, under Salerno, and considers the use of soil freezing in one tunnel section in detail. A geological section of ground under Salerno is shown; four types of strata present are volcanic, alluvial deposits, and dolomites (sectonic and non-sectonic in origin). Tunnelling difficulties caused by water are discussed. Water and soil cave-ins from the face were stopped by injection. A hydrological study was prepared. Preference of soil freezing over other techniques is discussed. Low temperature brine circulating in freeze pipes causes water in the voids to freeze, giving sealing and stabilization of the soil. The arrangement of freeze pipes is shown. Frost penetration and mechanical properties of frozen soil are considered. The freeze wall conditions of design and their practical realisation are given. The construction method of calottes with a preliminary lining of steel beams and reinforced gunnite was adopted. Relevant construction data are listed. No settlement of structures on the surface occurred where soil freezing was applied, and the method was cheaper and safer than the chemical injection method. /TRRL/

Braun, B; Macchi, A Tunnels and Tunnelling Vol. 6 No. 2, Apr. 1974, pp 81-89, 4 Fig.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 209603)

3A 261894
THE USE OF GAP GRADED MIXES IN ASPHALT OVERLAY

A type of gap graded mix intermediate between continuously graded asphalt concrete and a high sand content gap graded rolled asphalt has been used in the Natal asphalt overlay programme with good results. A full scale overlay experiment at Umbumbulo, trial sections at Tugela and a survey of some 150 miles of overlay already completed are described and their performance evaluated. The mix used appears to give good performance in layers thinner than called for in terms of current design methods. Explanations are given for its apparently superior flexibility and crack resistance over the more traditional asphalt concrete. Indirect tensile strength tests have been undertaken, which indicate a high tensile strength for this mix in the temperature ranges experienced in Natal. Economics of stage construction are possible because of the good performance of thin (less than 4") layers of gap graded mix even over old distressed pavements of high deflection levels. /AUTHOR/


Knight, K (Natal University); Groth, P (Natal Roads Department); Akeroyd, FM (Mobil Oil Southern Africa Pty, Limited) International Conf Struct Design Asph Pvmts (3rd) Proceeding Vol. 1 Sept. 1972, pp 1178-87, 6 Fig., 4 Tab., 15 Ref., Apps.

3A 261998
WELL FOUNDATIONS FOR ROAD BRIDGES

The paper discusses the design and method of construction of well foundations for road bridges. A single large diameter circular well is preferred to groups of smaller circular wells for ease of sinking and shuttering. It is recommended that careful consideration be given to the following loading combinations: (1) breaking force and seismic force, (2) seismic force and high flood, (3) seismic force on maximum live loads, and (4) live load surcharge. /TRRL/


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 201631)

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CONSTRUCTION EQUIPMENT AND METHODS

3A 262079
TECHNICAL INFORMATION BULLETIN SP-39
Canadian research projects pertaining to the long-term effects of high temperatures on concrete, are outlined and discussed in 10 papers included in a Symposium publication, "Behavior of Concrete Under Extreme Weather Conditions." The effect of temperature and aging on the thermal expansion and modulus of elasticity for concrete and the temperatures between 100 and 150 degrees F are discussed in one paper. The effect of vacuum processing on the strength of concrete and the pulse velocity at 0 degrees F, after initial standard curing for various periods of time, is also reported. Field curing during winter and protection against freezing are covered in another paper. Other aspects covered in the papers presented here include results from field-cured cylinders and drilled cores taken from large columns and slab specimens exposed during winter, the winter curing of concrete, the effect of temperature on air-extracted concrete, the behavior of lightweight concrete exposed to high temperatures and the fire endurance of concrete masonry walls.

McFarland, HC
American Concrete Institute Bulletin SP-39, Sept. 1973, 3 pp

3A 262678
PRESPLITTING
Presplitting is defined and the experience of the California Division of Highways with the use of the technique is reported on metamorphic rock. The application of the technique was successful and increased future use is anticipated. The factors which contributed to obtaining satisfactory results are discussed and an analysis of costs is made. Specifications are discussed and the proposed specifications for the California Division of Highways are presented. /FHWA/

Smith, T McCauley, M. Meears, R
Contract F-8-7

ACKNOWLEDGMENT: Federal Highway Administration (P-0056), California Department of Transportation
PURCHASE FROM: NTIS Repr. PC: Microfiche
PB-199352

3A 263277
AN APPROACH TO PHI SUB U EQUALS ZERO ANALYSIS FOR STAGE CONSTRUCTION
A method is presented for estimating the gain in the undrained strength of the subsoil due to the decrease in pore pressure under the sustained first-stage loading or preload during embankment construction. Results of the theoretical consideration are summarized in an equation which, when used in determining the increase in undrained strength, makes it possible to analyze the stability of stage construction by the phi sub u equals zero method.


3A 262895
THE EFFECT OF HIGHWAYS UPON THE ENVIRONMENT
Community concern about the environmental effects of highway developments is reviewed. The opinions of professional environmentalists are discussed and steps taken to limit detrimental environmental effects are outlined. Legislation is now being enacted in some states to limit permissible noise level of each vehicle which operates on the highway. Congress is expressing interest in vehicle and construction equipment noise, and Federal legislation may be enacted. In highway location and design, the engineer must give consideration to the problems associated with highway noise. Some design-technique recommendations are proposed. Concern for soil erosion has prompted the issuance of Federal guidelines for minimizing soil erosion from highway construction. Emphasis must be placed on practical measures to eliminate soil erosion and the resultant stream or lake siltation. These measures must be incorporated in every highway project. Fitting the highway to the natural and cultural features should be the concern of every highway engineer. A highway must be boosted and designed such that it forms a tie between areas on either side of the highway. Attention is being given to location of highways along natural boundaries of ecosystems and to the continuation of established wildlife trails across highway right-of-way. Preservation and conservation of lands and historic sites is another recognized goal in highway programs.

Twentieth Annual Meeting held at University of Arizona, April 15-16, 1971.
Wells, RJ (Environment Development Division (FHA)) Arizona Conf Roads & Streets Proc 1971, pp 1-4

3A 263035
TRANSVERSE JOINT CONSTRUCTION AND SEALING PRACTICES 1968-1972
Since March 1968, transverse contraction joints in New York State have been constructed 5/8-in. wide with beveled edges, and sealed with 1/1-4-in. wide performed polychloroprene compression sealers. This study was initiated to evaluate this new system, and to investigate three laboratory tests that may more accurately predict field performance of sealers. This interim report evaluates joint construction and sealing methods, as well as field performance for the first 3 to 4 years. During 1968 and 1969, 10 construction projects throughout the state were selected for observation. On each, a test section of approximately 30 consecutive joints was established where successive stages of construction and sealing could be observed. The various methods, materials, and types of equipment used are evaluated. In addition, 12 other projects were selected in 1969 and 1970 for observation of seal performance. Quarterly evaluation surveys have been conducted to determine long-term performance. After service of up to 4 years, the joints are being performed satisfactorily and no sealers have failed. Some fines have been collected between the sides of the sealers and the joint faces, but none have worked their way to the bottom of joint grooves. /FHWA/

Prepared in cooperation with the U.S. Department of Transportation, Federal Highway Administration, under the study "Constructing and Sealing Transverse Joint." Carlson, R.D. New York State Department of Transportation Intrm Rpt. Mar. 1974, 38 PP

SSN 57-1
ACKNOWLEDGMENT: Federal Highway Administration (S-0225)
PURCHASE FROM: NTIS Repr. PC: Microfiche
PB-232557/AS

3A 263104
ORGANIZATION OF A COUNTY BRIDGE RENEWAL PROGRAMME
The procedure for planning and organizing a county bridge renewal program is examined and recommendations made for inspection, determination of priorities and arranging for the work to be spread over a period of years. Standardization of design and construction methods are commented on, and the maintenance and strengthening of existing structures to ensure a sustained renewal rate designed to provide an even flow of work on design and construction. Attention is drawn to the importance of co-ordination at National Roads Board level with a view to the full employment of available forces on renewal and, where possible, extending the life of existing structures. /Author/


3A 263111
MODERN DESIGN AND CONSTRUCTION TECHNIQUES FOR CONCRETE ROAD PAVEMENTS
The primary purpose of this paper is to present facts concerning the up-to-date design criteria and construction techniques utilized in rigid portland cement concrete road pavements. As concrete pavements are present not being utilized in the national road program, this paper by necessity describes overseas trends and practices but particular reference is made to the application of these techniques to New Zealand road conditions. The paper presents information on fatigue design methods for plain and reinforced concrete pavements, joint technology subgrade, support
CONSTRUCTION EQUIPMENT AND METHODS

criteria, and construction methods emphasizing current slip-form paving equipment and practice. Roadway Engineers in New Zealand are now becoming aware of the need for providing durable, heavy-duty pavements for the rapidly increasing volume and weight of traffic. Concrete pavements can play their part in satisfying this need. /AUTHOR/


Ralston, J (New Zealand Portland Cement Association)

National Roads Board, New Zealand Proceeding Vol. 1 1972, pp 411-426, 13 Fig., 7 Tab., 17 Ref.

3A 265167

THE EFFECT OF TRAFFIC ON BRIDGE DECK CRACKING

This paper summarizes a study of the effects of construction practices and traffic on bridge deck cracking. This was the second phase of a 2-phase research project. Factors related to the growth of cracks, particularly the influence of traffic and the resulting vibrations were also studied and reported. Observation of the construction of a bridge deck and the following stages of the life of the deck were made on two separate sets of bridges. The investigation included measurements of depth of cover and deck thicknesses and also the determination of the location amount of cracking on the bridges. Observations were also recorded of bridges subjected to construction traffic.

Held at University Center at the University of Tennessee, Knoxville on April 13th and 14th, 1972


3A 265491

SURCHARGES MINIMIZE POST-CONSTRUCTION SETTLEMENT

The benefits of surcharges and waiting periods in highway construction are predicted by the application of the principles of soil mechanics. The use of these methods of construction minimizes the amount of detrimental settlement subsequent to paving. Time-consolidation data are used to determine the length of waiting periods. Unconfined and quick-undrained triaxial compression test results are used to determine the safe height of embankments over new pavement construction to either height. Time studies and consolidated quick-undrained triaxial compression test data can be used to determine the increase in strength compatible with controlled rate of loading, but interpretation of test data and engineering judgment are significant factors. Comparison of field measurements and calculations based on test data indicate that the predictions of amount of settlement are somewhat more reliable than the predictions of the rate of settlement.

Kleiman, WF (California Division of Highways)


3A 265340

ASPHALT CONSERVATION

Two methods are suggested for asphalt conservation. The first involves mix selection. It is estimated that by selecting blends that use lesser volumes of asphalt, a reduction in asphalt demand by as much as 10 percent can be achieved. This does not mean "cutting out asphalt resulting in a leaner mix." It just means selecting a mix that at optimum asphalt required a lesser volume of asphalt. Since asphalt mixes normally average 5 percent asphalt, a 10 percent reduction would be 10 lbs., which at an average of 67 dollars/ton would result in a 34-cent reduction per ton of mix. The second method of conservation is by stage construction with additional overlay applied for full design thickness when needed.

Foster, CR

Paving Forum 1974, pp 10-11, 3 Tab.

3A 2653619

COST ANALYSIS OF LIME-TREATED SOILS

A street improvement program was developed about ten years ago in Gridley, California, to reduce long term maintenance costs and provide streets throughout the city with adequate drainage, curb and gutter, base course and asphalt concrete surface course. Investigation showed lime stabilization to be the best method of base construction. Addition of approximately 4 percent lime increased the R value of the native soil from between 8 and 30 to a value of 80. All the work is done under force account and engineering is provided by the city. A construction crew of four men formerly assigned to maintenance of soil and sand streets, handles each job. This article covers the construction procedure, cost records, cost comparison and annual cost savings.

Williams, WP (Gridley, City of, California) Western Construction Vol. 41 No. 6, June 1966, pp 114-115, 1 Tab.

3A 2653648

EVALUATION OF EXPERIMENTAL STABILIZED SOIL BASE CONSTRUCTION, WEBSTER COUNTY, IOWA

This paper presents a portion of the results of an experimental stabilized soil road base program initiated by the Iowa State Highway Commission and the Webster County Engineer's Office. The 8.058-mi long site chosen is typical of the Clarion-Nicoller-Webster soil association area materials found in hundreds of miles of farm-to-market roads in the north-central third of Iowa. The Webster series, a black, heavy-textured, poorly drained clayey soil, dominates. Variable thickness base sections were constructed by using the inplace soil materials stabilized with Type I portland cement, lime, limly ash and a combination of lime and portland cement. The surface course was a double bituminous armor cost using 3/8-in. crushed stone chips. The experimental features of the project were divided into two primary objectives. Both directly related: (a) evaluation of conventional construction procedures, existing construction-inspection specifications and techniques, and recommendations for establishment and/or changes to each of the above areas; and (b) evaluation of the constructed material by field and laboratory tests for determination of suitability requirements in the development of design criteria for low-cost stabilized soil road bases. This paper deals principally with the area of the first objective. Presented are an evaluation of the construction techniques, gradation specifications preceding introduction of the stabilizing agent(s); discussion of use of lime as a pretreating agent for reduction of plasticity and increase of friability, comparison of laboratory and field standard Proctor moisture-density relationships, in-place field density determinations using oil density and standard Proctor penetrometer methods, and variation of unconfined compressive strength of 7-day moist-cure specimens with variations in moisture and density. /Author/ in Highway Research Record No. 92. "Lime Stabilization", 1965, pp 21-42. Presented at 43rd Annual Meeting of Highway Research Board, 13-17 January 1964.

Hoover, JM (Iowa State University) Highway Research Record No. 92, 1965, pp 21-42, 8 Fig., 10 Tab., 10 Ref.

3A 2653811

SITE CONTROL TESTS AND THE CONSTRUCTION OF EMBANKMENTS USING PULVERISED FUEL ASH FROM LAGOONS

From experience of practical handling on site and a series of laboratory tests, the authors give a general description pulverised fuel ash from lagoons and some of its properties-the variability of which is stressed. Methods used in the control and construction of pulverised fuel ash embankments on the A1 improvement works near Wetherby are described and, in the light of this, the need for rapid site control tests is indicated. Based largely on research at the Department of Transportation at Birmingham University, proposals are made to meet the requirements of such tests.

Elks, AD Redman, JT

Surveyor - Public Authority Technology July 1965, pp 36-40, 6 Fig., 10 Phot., 4 Ref.

3A 2653813

EMBANKMENTS ON COMPRESSIBLE SOILS

The authors give a rather complete theoretical treatment of the problem, in which for practical purposes is paid to equilibrium and settlement. The practical part of the publication however is less elaborated; different methods to overcome construction difficulties are described, but the authors do not point out why and when these should be applied.

Karst, H Bouges, F De Nie, FC

Annales de l'Institut Tech du Batiment Travaux Pub N. 205, Nov. 1964, p 1361-84

ACKNOWLEDGMENT: Applied Mechanics Reviews

3A 2653942

COLD WEATHER LIME STABILIZATION

In recent years, lime stabilization of poor quality subgrade soils to upgrade quality or provide acceptable subbase material has increased in popularity.
as a construction alternative. However, in many situations, specifications relative to cutoff dates for lime stabilization construction have rendered the alternative unfeasable. Previous studies have revealed that soil-lime mixtures cured prior to subjection to freeze-thaw conditions undergo autogenous healing that resulted in continued strength gain. The purpose of this study was not to evaluate the ramifications of autogenous healing of soil-lime mixtures but to evaluate the behavior of soil-lime mixtures subjected to cold weather stabilization. The basic premise involved in this study was that soil-lime mixtures subjected to freeze-thaw conditions immediately after compaction would not undergo patentolytic reactions until favorable curing conditions were attained. Soil-lime reaction that would not occur during cold weather treatment would then be renewed under favorable conditions to produce latent strength gains. The scope of this study involved the investigation of the behavior of only one soil subjected to cold weather lime stabilization. The selected soil was evaluated at only one lime content, which was established as the stabilization lime content for that soil.

Rosen, WJ Marks, BD (Tennessee University, Knoxville) *Transportation Research Record* No. 501, 1974, pp 25-41, 6 Fig., 6 Ref.

**PURCHASE FROM:** TRB Orig. PC

**3A 263992**

**TESTS ON MODEL BRIDGE BEAMS IN PRECAST TO IN SITU CONCRETE CONSTRUCTION**

This report describes and gives results of two phases of model testing carried out on elements of a viaduct forming part of the proposed M11 London-Cambridge motorway. The results of the tests showed the design proposals for the section considered to be adequate, and that some economies might be achieved by dispensing with the taping of the end-blocks of the precast beams. (A)


**ACKNOWLEDGMENT:** Transport and Road Research Laboratory (IRRD 209242)

**3A 263999**

**FIRST FOUR-LANE DEMOUNTABLE FLYOVER**

This article describes Britain's first four-lane demountable flyover, which is part of the London-Tilbury trunk road-the A 13. The flyover carries four lanes in a simple 44 ft wide carriageway and is 1084 ft. long. It consists of eighteen 36ft spans, four 18 ft anchor spans and two 63 ft spans. The 104 deck units, of composite steel and reinforced concrete, are supported on 3-leg portal trestles. Owing to lack of space the deck was constructed in two halves. Because of difficulties in maintaining adequate skid resistance to the concrete panels on previous flyways, 1 1/4" of hot rolled asphalt surfacing has been used. Joints between the deck units were polysulphide sealed. Construction details of the widening of the bridge over the Barking-Dagenham dock railway line are included. (TRRL/)

*Highways and Road Construction* Vol. 42 No. 1753, 1974, p 23, 1 Phot.

**ACKNOWLEDGMENT:** Transport and Road Research Laboratory (IRRD 209868)

**3A 264002**

**EXPANDED TUNNEL LININGS**

Information on all known types of expanded tunnel linings from 1920 to date is given. The longitudinal and cross sections of eleven linings are shown in conjunction with a description of their construction and method of expansion. Practical usage is indicated when applicable. The design of segments making up a ring should be simple and robust. Although expanded tunnel linings have been used only for self-supporting ground their use is predicted for ground which is not self-supporting. (TRRL/)


**ACKNOWLEDGMENT:** Transport and Road Research Laboratory (IRRD 209601)

**3A 264224**

**PRECOMPRESSIION FOR SUPPORT OF SHALLOW FOUNDATIONS**

A survey of the state-of-the-art of professional practice in controlling foundation settlements by precompression concludes that the use of this method for the support of shallow foundations is a relatively new, useful, and flexible tool for the soils engineer. Methods for accomplishing precompression and means for accelerating it post-construction primary consolidation and for reducing post-construction secondary compression. The scope of the use of this method and suggested areas for future use and study are presented. (Author/)

Aldrich, HP (Haley and Aldrich, Incorporated) *ASCE Journal of Soil Mechanics & Foundations Div* Vol. 91 No. SM2, Mar. 1965, pp 5-20, 3 Fig.

**3A 264291**

**PILE AND PIER FOUNDATIONS**

In the design of pile and pier foundations the construction procedures play a significant and often dominant part in determining the extent of settlement that may occur. Settlements are examined under two simplified categories: (1) those that occur although adequate knowledge already exists for their prevention, and (2) those that occur for reasons inadequately understood. Because the first category is much the larger it is examined in most detail. Illustrations of excessive settlements caused by lack of knowledge of soil mechanics and of construction practices on the part of the designer are presented. The designer must be aware of the construction problems involved in his choice of foundation and transmit this awareness to the inspector. Examples of outdated knowledge and misconceptions still in use are given. Among the problems still requiring further investigation are (1) increase of point load with time of a pile passing through a compressible cohesive soil to embedment in a stiffer material, (2) estimation of settlements of long friction piles in cohesive soils of uniform or of stratified character, and (3) influence of the size of the pile group or foundation as a whole on the magnitude of settlement. (Author/)


**3A 264392**

**STABILIZED BASE IN MUNICIPAL STREET CONSTRUCTION**

The use of a stabilized base applied in a single lift of 5-inch compacted thickness has enabled Woodbridge Township to construct better streets in less time and at lower cost on the unstable soils in the area. Construction method, mix design, etc. are given, as well as the results of tests made on the newly constructed pavements.


**3A 264402**

**MEASURED PORE PRESSURES USED FOR THE CONTROL OF TWO-STAGE CONSTRUCTION OF AN EMBANKMENT**

Because of soft foundation soil it was necessary to use two-stage construction for a double-track railway embankment varying in height from 21 to 33 feet. Effective stress methods of analysis were used and piezometers were installed in the foundation soil to indicate the pore pressures. Pore pressures measured during the first-stage loading indicated that the second stage could be added to complete the embankment about a year after the first stage. Measurements of pore pressures continued during the second stage loading so that a continuing check on stability could be maintained. The embankment was successfully completed. (Author/)

DeLory, FA (Toronto University); Gass, AA (Golder (HQ) and Associates, Limited); Wong, WW (Canadian National Railways) *Canadian Geotechnical Journal* Vol. 2 No. 3, Aug. 1965, pp 216-233, 7 Fig., 2 Tab., 12 Ref.

**3A 264508**

**SURFACE POPOUTS: HOW ARE THEY AFFECTED BY JOB CONDITIONS?**

This report is the result of a joint industry study of construction techniques and their influence on surface popouts caused by alkali-silica reaction. The investigation used large sized slabs to determine how various job conditions, subsoils, concrete mixes, and surface treatments influence the formation of popouts. Although Southern California materials were used in this study,
such popouts are relatively commonplace in slabs-on-grade in other parts of the United States.


3A 264571 Vibrations during construction operations

The subject of earth vibrations related to construction operations is examined in perspective. Comparison of conventional demolition methods versus demolition, by explosives is considered. Graphical data are presented illustrating the relative intensities of vibration from various construction equipment and sources. Finally, these vibration intensities are compared to damage criteria and normal human evaluation criteria.


3A 264576 Tied-back excavations in Los Angeles area

Based upon experience, the use of tied-back shoring to restrain a vertical excavation is a feasible and practical alternative to internal bracing. However, to properly restrain the excavation with minimal movements of the embankment, certain design and construction procedures should be observed. The overall stability of the embankment is of utmost importance. The use of active earth pressures in the design of shoring has proved to be satisfactory. Anchor capacities may be estimated on a theoretical basis. In designing the shoring system, proper attention should be given to resisting the downward component of the anchor load. Adjacent to streets or existing structures, the shoring should be monitored. The success of a shoring job depends on the experience of the shoring contractor and quality of workmanship.


3A 264610 Development of cold weather paving specifications

Cold weather paving specifications were developed from work by Corlew and Dickson who used a computer solution to predict the cooling rate of bituminous concrete. Virginia had previously used a minimum atmospheric temperature as a criterion; however, it was evident that other factors had a significant effect on the cooling of bituminous concrete, so the computer solution was considered as a possible basis for new specifications. Although the solution had been checked by field measurements, it was decided to obtain further verification by plotting cooling curves for freshly placed hot mix. The curves were developed by measuring the cooling rates of bituminous mats of varying thicknesses under a variety of weather conditions. The field measurements verified the computer solution, and it was used to develop new cold weather paving specifications. The first specifications, put into effect in 1970, was written in tabular form using the downward component of the anchor load. Adjacent to streets or existing structures, the shoring should be monitored. The success of a shoring job depends on the experience of the shoring contractor and quality of workmanship.


3A 264673 A till coperdam in the St. Lawrence River

This paper deals with the design, construction, and performance of a drydock in the St. Lawrence River enclosed by a till dyke dumped in water. Alternative designs and methods of selecting a suitable till are discussed. Construction procedures are described along with the installation of a two-stage wellpoint system to intercept seepage through the riverbed beneath the dyke. Particular emphasis is placed upon the methods of control and observations taken during and after construction. It is concluded that a till dyke dumped in water can form a stable and impermeable mass; however, care must be taken to apply any surcharge slowly to allow time for the dissipation of pore pressures in the underwater till.

Sutcliffe, FH (General Engineering Company Limited) Canadian Geotechnical Journal Vol. 2 No. 3, Aug. 1965, pp 261-273, 5 Fig., 1 Tab.

3A 264755 Underwater construction, drilling and blasting. Explosives handling is a specialty

The special equipment, skills and knowledge required to drill blastholes and load explosives underwater are reviewed. Detonating fuel or submarine electric detonators should be used for fire charges. The depth of the drill hole below grade is of primary importance in subaqueous blasting operations. Special precautions are described in the drilling through loose sand and rock to overlying rock. A non-sparking metal loading tube extending from the large deck to the bottom of the drilled hole should be used to load all charges. Alternative methods for blasting in the wet, and subatmospheric blasting are outlined as well as several methods (mudcapping, snakehole blasting, blockhole blasting) employed to shelter underwater formations. The excavation of trenches and canals, the cutting off of underwater timber piling, and the removal of submerged obstacles are also discussed.


3A 264799 Polymer concrete-reinforced concrete beams

Composite beams consisting of reinforced concrete and a layer or cap of polyester concrete in the region of high compressive stress are tested and evaluated. The creep characteristics of polyester concrete were evaluated using a series of creep tests, and the effect of sustained load on the ultimate compressive strength was also determined. Composite beams which were 6.6 x 5.6 x 64 in. (15.2 x 16.5 x 162.6 cm) were fabricated by capping precast reinforced concrete beams with a layer of fibrous polyester concrete of various given thicknesses. The composite beams were subjected to third-point loads on a simply supported length of 57 in. (145 cm). Load-deflection behavior and ultimate strength were determined for various combinations of reinforcement and depth of fibrous polyester concrete cap. Experimental and analytical results indicate that the fibrous polyester concrete composite beams are performance and material cost effective relative to reinforced concrete beams with the same percentage to tensile reinforcement.

ACI

These abstracts are brief summaries of all ACI technical material published outside of these proceedings and are indexed in the Annual Proceedings Index. Number SF 40-14.

Lott, J Naus, D Howdyshell, P American Concrete Institute. Journal of Proceeding Vol. 70 No. 11, Nov. 1973, p 767

3A 264849 Data on the use of explosives [Algunos Conceptos en el Uso de Explosivos.]

Explosives commonly used in civil engineering are reviewed and their specifications for use are cited. A study is made of detonating agents and pressure or shock waves. Specifications are given for calculating the quantity of explosives required for a given operation. [TRRL/ [Spanish]

Delupi, R Vialidad No. 6, Oct. 1971, pp 3-7, 2 Fig., 1 Phot., 3 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 101019)

3A 264886 Reconditioning high-volume freeways in urban areas

Current practices in freeway rehabilitation are recorded that have been successfully used to overcome some of the problems that are associated with such projects. Planning and programming processes are described step-by-step, important design considerations are noted, and construction management practices to include traffic control are described. Many unfilled needs for improving the urban freeway rehabilitation process are identified. Rehabilitation program planning is usually preceded by an inspection using sufficiency rating systems or other quantifiable values for project selection. Project objectives are defined in terms of the types of repairs and/or improvements to be made and the intended service life. Both program planning and definition of objectives recognize the constraints of environmental considerations in all urban highway projects. Air and noise pollution, waste disposal, and energy and resource utilization are considered.

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CONSTRUCTION EQUIPMENT AND METHODS

and evaluated in the project planning phase. If the impact of the project on urban traffic plans is to be controlled, the rehabilitation project must include a comprehensive public information program. The project design for an urban area must accommodate overhead structure clearances, retention of drainage features, limitations of work area, curing time restrictions, deadload restrictions on structures, and a cost-versus-service life elevation. Typical pavement rehabilitation projects have included leveling courses of bituminous concrete, varying in thickness from 2 to 5 in. Successful strip-surfacing in each wheelpath (where rutting has occurred) is described as well as slip-form paving of thin bonded concrete resurfacing. Alternative traffic controls for rehabilitation work sites are reviewed and the importance of construction management is emphasized. Design characteristics for new or rebuilt freeways are considered that are intended to provide maintainability. Conclusions and recommendations based on the study are presented.

Transportation Research Board NCHRP Reports 1974, 56 pp., Figs., Tabs., 5 App.

PURCHASE FROM: TRB Orig. PC

3A 264889
PROCEEDINGS OF WORKSHOP ON CUT-AND-COVER TUNNELING: PRECAST AND CAST-IN-PLACE DIAPHRAGM WALLS CONSTRUCTED USING SLURRY TRENCH TECHNIQUES
Various aspects of the design, construction and performance of traditional sheeting systems are reviewed, and recently developed technology for precast and cast-in-place diaphragm walls constructed using slurry trench techniques are examined. An overview is presented of support systems for cut-and-cover tunneling and the cost of cut-and-cover subway construction is discussed. The main advantages of diaphragm walls are listed. The elements of diaphragm wall design are detailed, particularly, water tightness and ground movements associated with excavation. A discussion of contracting for underground systems stresses innovation, competition, and awareness of the uncertainties and risks. The operations involved in the construction of a slurry wall and the applications of the prefabricated panel slurry wall are reviewed, as well as their future outlook. Geotechnical perspectives in underground metro systems are discussed.

This workshop was sponsored jointly by the Office of the Secretary of Transportation and the Federal Highway Administration.

D'Appolonia, DJ D'Appolonia, E Namy, D
RESPONSIBLE INDIVIDUAL: Majtenyi, SI

PURCHASE FROM: NTIS Repr. PC, Microfiche

PB-238043

3A 264984
NICE STUDY SESSION ON MOTORWAYS.WATERPROOFING LAYERS IN PAVEMENTS [Giornate Autostradali di Nizza, I Mastri Stradali di Impermeabilizzazione]
WATERPROOFING LAYERS USED IN ROAD CONSTRUCTION IN FRANCE ARE GENERALLY OF THREE TYPES: MASTIC ASPHALT, RESINS (NOTABLY PITCH-RESIN MIXTURES), AND PREFABRICATED MULTI LAYERS. ADHESION, HARDENING, TENSILE, AND DURABILITY TESTS ON THESE MATERIALS ARE BRIEFLY DESCRIBED, AND EXAMPLES ARE GIVEN OF THEIR USE ON PAVEMENTS AND HIGHWAY STRUCTURE. [Italian]

Hossard, C (Agenzia per la Borgragna Della Settavroute) Autostrade Vol. 15 No. 9, Sept. 1973, pp 29-31

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 209857)

3A 264987
HUMBER BRIDGE SLIPS INTO SHAPE
THE SLIPOFFORM PROCESS FOR BUILDING THE SUPPORT TOWERS OF THE WORLD'S LARGEST SPAN ON THE HUMBER BRIDGE IS DESCRIBED. DETAILS OF THE 2.2 KM. LONG BRIDGE, WITH A MAIN SPAN OF 1410M, ARE INCLUDED. INSTEAD OF CONVENTIONAL STEEL, REINFORCED CONCRETE IS USED FOR THE TWO MAIN SUSPENSION TOWERS, WHICH RISE AT THE AVERAGE RATE OF 100MM/HOUR TO A

HEIGHT OF 160M. CONSTRUCTION OF THE SLIDING FORMWORK STRUCTURE AND ITS OPERATION ARE DESCRIBED. EACH TOWER LEG HAS A CRANE AND 24 HYDRAULIC CLIMBING JACKS. THE LEGS ARE SLIPPED SIMULTANEOUSLY AND THEY HAVE KEPT TO WITHIN 15 MM OF THE DESIGN SPECIFICATION. MOST OF THE CONCRETE IS TAKEN UP THROUGH THE LEG CORES IN SKIPS CONTROLLED BY AN ELECTRIC ROPE-GUIDED HOIST. POKER VIBRATORS WORK THE CONCRETE MIX AND EXTERNAL SURFACES ARE GIVEN A BRUSHED FINISH. CONSTRUCTION DETAILS AFTER THE COMPLETION OF THE TOWERS ARE OUTLINED.


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 209873)

3A 265001
CONSTRUCTION METHOD BY FORMWORK CONCRETING CYCLES AND LAUNCHING CYCLES [Procede de construction par cycles de betonage en coffrage fixe et cycles de pousage].
After a brief history of the "Taktschiebeverfahren" (alter-site concreting and launching) construction method, a study is presented of the technique, based on examples of box-girder bridges already built: concreting area (and more particularly fixed metal formwork), forepier, sliding bearings, and launching devices. Details are given of the piers and possible temporary bearings, and attention is drawn to the importance of the correct design of the webs. Two possible arrangements for longitudinal prestressing cables are compared. The economic advantages of the technique, which result from a judicious combination of prefabrication and in-situ casting, are discussed. [French]


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 101035)

3A 265188
FROM STEAM TO THE LASER BEAM, EVOLUTION IN CIVIL ENGINEERING CONSTRUCTION MACHINERY [De la vapeur au rayon laser, ou, l'évolution des engins de travaux publics]
A review is presented of the discoveries and technological inventions which resulted in the mechanization of civil engineering construction sites: steam engines, electricity, compressed air, diesel engine, etc. Attention is drawn to the wide use of the laser and its qualities. Construction machinery is classified according to the nature of work it is performing: transport and handling equipment, lifting and earthmoving machinery, construction and maintenance equipment for roads and railways, tunnel drilling machines, and equipment used for the manufacture of cement and concrete. Mention is made of equipment ranging from the old steam roller to the "jumbo" laser-guided drilling machine. [French]

Pontremoli, P Travaux pp 3-44, Figs., Photos.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 100453)

3A 265206
MILWAUKEE BOASTS 600 FT STEEL ARCH
The main bridge unit of Milwaukee's Harbor Bridge project, a through tied arch, is now completion following closure of the span recently. Delta-shaped approach piers, embedded downspouts and a blue and gold paint system for the steel exemplify the aesthetic concern of those responsible for its development. Five contracts, including the largest ever awarded in Wisconsin, provided the construction industry with an opportunity for innovative use of methods, materials and equipment. Box girder sections of the arch unit are fabricated of ASTM A588 steel, a matter of concern to more than a few engineers on projects throughout the country. The $24,000,000 structure is the engineering feature of one of Milwaukee's most controversial and important freeways. [ASCE] /

CONSTRUCTION EQUIPMENT AND METHODS

3A 265242
PREFERRED METHODS OF CONSTRUCTION PART I: PATCHING
The introduction describes the need for standardization in methods of construction, the way in which the problem has been dealt with, and the components of the standard methods. Patching is defined together with the scope of the method, and the general aspects of the method in relation to the surfacings needing patching and the facilities & labour available. Details of the method are given under the following headings: general requirement; traffic signs; safety, welfare and other equipment, materials, tools, plant, transport, measuring equipment, organization, information, location of materials and pre-operational site situation. A comprehensive table sets out the specification and sequence of operations for preparation before patching, the treatment of cavities, base course application and compaction, wearing course application and compaction, initial and final sealing, surface treatment and pavement cleaning.

This report was co-authored by the Scottish Development Department and the Welsh Office.

Department of the Environment, England Standard 1973. 8 pp

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 209307)

3A 265276
EVALUATION OF CONSTRUCTION TECHNIQUES FOR NEW ANTHROPOIDAL OVERLAYS
Runway surfaces that will prevent hydroplaning of high-speed jet aircraft during wet weather operations have become a primary requisite for airfields operated by the Air Force and the civilian aviation community. This report describes the materials, construction techniques, and results obtained from a program of field testing addressed to the need for antihydroplaning surfaces. The materials selected for field testing consisted of friction-textured asphalt slurry, Palmer-Pavetread, porous asphalt cold mix, porous asphalt hot mix with latex rubber, and a porous aggregate structure with a resinous binder (Bondale). The construction of test surfaces from these materials, with the exception of Bondale, are described. Special emphasis is given to the construction techniques and construction problems associated with the use of the new materials. (Modified author abstract)

Hargrett, ER
New Mexico University, Albuquerque, Air Force Weapons Laboratory, (AF-683M) Final Rpt. June 1974, 38 pp

Contract F29611-74-C-0030

ACKNOWLEDGMENT: NTIS (AD-784870/8)
PURCHASE FROM: NTIS Repr. PC, Microfiche AD-784870/8

3A 265334
ENERGY CONSERVATION IN PAVEMENT CONSTRUCTION
Effective use of energy in the construction of asphalt pavements can result in significant conservation and in most cases reduce the cost. Through the planned use of stage construction, the pavement may be developed only as required by traffic growth. Although this does not reduce the total energy requirement, it does result in the energy and cost being spread over a longer period of time and used only if demanded by traffic. Paving should be planned for completion during the summer months, which will also result in a lower energy demand for preparation of hot-asphalt mixes because aggregate most areas will contain less water and require less heat for drying at that time. Use of the drum mixer so that lower mixing temperatures may be used will also reduce energy requirements as will use of emulsified asphalt, obviating the need to heat or dry the aggregate.

Lovering, WR
Military Engineer Vol. 66 No. 434, Dec. 1974, pp 356-357

3A 265360
AN EXPANDED/GROUTED TUNNEL LINING
The erection is described of precast concrete tunnel lining rings designed so that their diameter and hoop thrust could be controlled when they were used as an expanded lining. The adjustment also allowed the same rings to be expanded inside a shield, where they were locked together, the lining standing without lateral support from the ground or the use of former rings. The external cavity was filled with grout, as in the construction of bored rings. Both modes of use produced a smooth bore tunnel. The rings, which consisted of wedge-blocks differed from the conventional form. For erection as a tied and grouted ring two holes were formed in each block, parallel with the longitudinal axis of the tunnel, and positioned so that the adjacent holes on either side of the cross joint were a constant distance apart. For the trials reported here, the concrete blocks were cast with their inner face downwards, the extrados being finishing by trowelling. Each ring was 610 mm long, and 114 mm thick and comprised 10 symmetrical wedge-shaped blocks, tapered longitudinally at 1 in 10 on two faces, with a mean arc length of either 630 mm or 650 mm. Details are outlined of the method of excavation and erection. During erection, the longitudinal holes were found to be an aid to lifting the blocks by inserting bars as handles. The trials demonstrated that using the same type of segment and similar methods of erection, either an expanded or a grouted wedge block lining could be constructed.

Collins, SF
Tunnels and Tunneling Vol. 6 No. 6, Nov. 1974, pp 52-54, 4 Fig., 2 Phot., 2 Ref.

3A 265445
ELEVATED STRUCTURES COMPLETED ON EUROPE'S LARGEST INTERCHANGE
Details are given of the Gravelly Hill Interchange, which forms part of the Midlands Link Motorway. The interchange has eighteen different paths which vehicles will be able to take through a free flow system. Construction problems and their solutions are outlined, and costs quoted. The interchange was completed at the beginning of April. /TRRL/


ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 60258)

3A 265559
UNDERWATER CONCRETING
The author points out that recent advances in technique and equipment have brought about a reappraisal of the value of underwater concreting which was used in the past as a method of last resort. It is recommended that the concrete mixes have a minimum slump of 125mm, and contain at least 350kg of cement per cubic metre, and that reinforcement and shuttering should be as simple as possible. The article discusses the advantages and disadvantages of various methods of placing concrete under water-pumping, the tremie pipe, underwater skips and toggle bags, the latter being flexible canvas skips. Also discussed is the growing of aggregate directly in the forms, and bagwork, which is the building-up of walls underwater, using concrete-filled hessian bags. The final method discussed is the diving bell containing a skip within it. This technique approximates to placing concrete in the dry, permitting the use of conventional mixes. Its disadvantage is that the men within the bell must suffer compression and decompression with each skipful of concrete.

Greaves, IS

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 207590)

3A 265569
OPTIMAL SCHEDULING OF TRANSPORT IMPROVEMENTS TO CATER FOR GROWING TRAFFIC CONGESTION
The purpose of this article is to investigate some aspects of the effect which the construction gear and characteristics of traffic growth can have upon the attractiveness of certain types of investment. Cases are considered where traffic flow is increasing and is independent of the proposed transport improvement. Congestion cost models are derived and applied to the duplication of a shipping berth and to urban and rural roads. The method used is based on the minimisation of the present value of the total cost, in which case the minimisation of the total cost is also the maximisation of the net present value of the improvement.

Backley, DJ (New South Wales University, Australia); Goonawrinne, SG (University College, London) Journal of Transport Economics Vol. 3 No. 2, May 1974, pp 122-135, 5 Fig., 15 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 209910)
CONSTRUCTION EQUIPMENT AND METHODS

3A 265609
NEW UNDERGROUND RAILWAY CONSTRUCTION IN MUNICH [Neue Konstruktionen Bahn-Bau in Muenchen]
After a description of the general concepts of the Munich underground railway the various methods used in the construction of the underground railway, such as open cut, shield driving, mining techniques and cover method are discussed. Details are given of problems which occur together with an indication of the solution to these. [German]
Joas, H No. 68/6, Apr. 1973, pp 18-30, 15 Fig., 6 Phot.
ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 341325)

3A 265660
UNDERWATER VIBRATOR
A vibratory plate unit for the compaction of sand, gravel and crushed aggregates under water has been developed. The unit weighs 1.8 tons and has a bottom plate measuring 0.9 m by 1.1 m. Each of the two self-synchronizing electric motor vibrators exerts a centripetal force of 4.8 tons, totalling 9.6 tons in a vertical direction when operating at a frequency of 1,450 vibrations/min. The vibrators are enclosed in a watertight housing and the unit may be operated from a pontoon-mounted crane. The unit has been used for compacting the circular foundation for a lighthouse where the bottom was at a depth of 18 m and comprised about 0.6 m of fine sand on hard boulder clay. It has also been used in conjunction with the building of a quay, involving compaction of crushed aggregate to form the foundation at a depth of 11 m.

Ground Engineering Vol. 7 No. 5, Sept. 1974, p 56

3A 265672
PLANNING OF ROAD PROJECTS-EARTHWORKS-JAPAN
The use of computers in the cost estimation of earthworks is described and a flow diagram illustrates the cost estimation system for project design. The report also describes methods for securing trafficability of construction machinery when cohesive volcanic ash soil is used for earthworks (mixing with other material), and methods of improving soil used as subgrade material (mixing with lime). The results are discussed of theoretical and experimental studies on design of pavement over weak subgrade. An important factor in determining pavement thickness is the strength of the foundation, particularly the subgrade. Studies are being performed on the theoretical analysis of conventional experimental methods for replacing poor subgrades with better material, and on the establishment of advanced design methods. The results are presented of research into design of subgrade surfaces due to wheel load. Expressway earthworks are described in an area of cohesive volcanic ash soil. Problems of road construction on peaty ground are described, and slow-and-stage execution, counterweight fill execution, pushing out replacement, sand-drain, and sand compaction-piles methods are outlined. The stability of cuts, embankments and slopes has been researched. Various procedures are considered for slope protection to deal with the problem of failure resulting from surface and seepage water during rainfall.

Presented at the XIVth World Road Congress, Prague, Czechoslovakia, 1971.
Kuno, G (Chuo University, Japan); Kohno, H (Civil Engineering Institute, Japan); Tohi, M (Japan Highway Public Corporation);
Yamamura, K (Ministry of Construction, Japan) Permanent International Association of Road Congr Book I-15, 1971, 31 pp. 18 Fig., 4 Tab.

3A 265695
FLEXIBLE PAVEMENTS, SPAIN
In the Report a summary is given of the method of structural design of flexible pavements laid on very weak subgrade with CBR as low as 2 or less, which is a condition frequently encountered in Japan. Also included is a description of the so-called sandwich method which has steel plates in the intermediate layer and has been specially designed to solve the soft subgrade problem. Full-scale test pavements and performance surveys of existing pavements have been made in various places to study the applicability of the new design. Some typical examples are described in this report. Also, the method of performance survey and the general conditions of the survey and research for determining the timing of pavement repair and the method of repair based upon the serviceability which is derived from the performance survey are reported. As for bituminous binders, their present status in our country, including special bituminous materials, is briefly explained. Bitumen stabilized roadbases have been widely used in our country and the economic benefit of this type of stabilizatin has been probed especially in large projects such as Tokyo-Nagoya Expressway construction. The design standards of bitumen stabilized base course in Tokyo-Nagoya Expressway and those specified in the Asphalt Pavement Manual are described in this report. Full-scale test pavements for various purposes have been carried out in order to study bituminous mixtures. Also referred to are the test pavements which have been designed to study the characteristics of bituminous mixtures such as stability, adhesion, and resistance against abrasion by tyre chains. A few interesting results are now evident although test pavements have not been subjected to traffic long enough to obtain comprehensive results. Precautions for laying bituminous mixture during cold weather in our country are mentioned. Thin wearing course overlays are used for road maintenance. The results of full-scale test pavements to compare the different types of thin wearing courses are also given in the report. [Author/ Presented at the XIVth World Road Congress, Prague, Czechoslovakia, 1971.

Luelmo, FS Boccaleri, SR Alonso, LV Permanent International Association of Road Congr Book II-21, 1971, 31 pp, 3 Fig., 3 Tab.

3A 265736
EXPERIENCE WITH BITUMINOUS PAVEMENTS FOR FEDERAL MOTORWAYS AND HIGHWAYS [Expérience des Chaussées Bitumineuses Pour Autoroutes et Grande Routes Federales]
The author reviews the tendencies in the Federal Republic of Germany, in flexible pavement construction: construction methods, evolution, problems encountered, control measures to ensure quality. The favorite surfacing at the moment is Gussasphalt, because of its resistance to abrasion, ease of application, and because it eliminates the need for compaction. 25 typical structures have been standardized. The corrugation of a Gussasphalt surfacing has no effect on its skidding resistance but helps in the insertion of surface chippings. The tendency at the present time is to eliminate it. The optimum chippings content is under study and the tendency is towards the maximum permissible content of 55%. The other points under investigation are: high-bearing capacity base course, resurfacing operations, replacement of granular frost blankets by an additional bituminous layer and the coating process without dedusting. Excellent results were obtained with a permanent decentralized quality control of raw materials, quality control of the manufacture of bituminous mixtures, and acceptance controls which give a five-year guarantee for dense surfacings. [French/Dutch]
Nakkel, E Bitume Informations No. 24, Aug. 1971, 3-29, 4 Fig., 29 Phot.
ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 100381)

3A 265751
MODELLING CURRENT DEVELOPMENT OF POKROVSKY'S METHOD OF MODELLING COMPOSITE CONSTRUCTION INVOLVING LARGER VOLUMES OF SOIL, AND THE ANALYSIS OF COMPOSITE SOIL CONSTRUCTION BY METHODS ESTABLISHED FOR STEEL STRUCTURES ARE Discussed. IT IS ASSUMED THAT THE ELEMENTARY VOLUME BEHAVES ACCORDING TO THE PRINCIPLE OF EFFECTIVE STRESS; THAT ALL TIME EFFECTS RELATE TO STEADY OR TRANSIENT FLOWS OF A POROUS FLUID PHASE; AND THAT THE EFFECTIVELY STRESSED SOIL PHASE IS A RIGID OR ELASTIC OR PLASTIC CONTINUUM WHICH IS TIME-INDEPENDENT. POKROVSKY'S METHOD IS APPLIED TO THE VARIATION OF WATER LEVELS AND TO THE APPLICATION OF EXTERNAL STATIC LOADING.
Bolton, MD English, RJ Hird, CC Schofield, AN Manchester University, England Conf Paper 1973, pp 251-8, 14 Fig., 6 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 210303)
CONSTRUCTION EQUIPMENT AND METHODS

3A 272003
CRASH CUSHION TRAILER PROTECTS WORKERS, DOUBLES PRODUCTION THRU ADDDED SECURITY

Although accidents to maintenance workers are comparatively infrequent, occasions do arise when vehicles in lanes adjacent to the work areas go out of control and hit construction equipment and workers, despite warning signs and traffic cones placed before and around the work site. Use of the new crash cushion trailer developed by Texas Transportation Institute has resulted in doubled productivity by maintenance crews, because they can concentrate on their work without having to watch out for traffic. The crash cushion trailer consists of thirty 55-gallon steel barrels, welded together at the bottom and top rims, riding on a single axle and two wheels and connected by a hitch to a truck. The truck, which doubles as a supply or equipment truck, moves behind the work crew at a distance of approximately 200 feet. Out-of-control vehicles traveling in the direction of the work site are likely to impact the trailer instead of the men and machinery. The steel drums crumple in a controlled manner, bringing the errant car to a safe stop and at the same time saving the workmen from injury. Each trailer would cost about $1,500 if all new materials were used, but costs can be cut considerably by using second-hand equipment. For instance, used paint drums can be used instead of new drums. In this case, 11-inch holes must be cut in the top and bottom in place of the regular 8-inch holes to allow for the heavier gauge metal of the used paint drum (16 gauge instead of 20 gauge). This saves around $9.80 a drum, or a total of $270 for the whole unit.

Highway Research News No. 54, 1974, pp 52-54, 5 Phot.

PURCHASE FROM: TRB Repr. PC

3A 276009
MODERN TUNNEL CONSTRUCTION-A CONFERENCE HELD BY STUVA IN STUTTGART

The following papers are briefly discussed: Tests on and Practical Experience with Sturdy Trench Walls, Subsoil Injection and Steel Tunnels Lining in the Construction of the Underground Railway in Vienna, by Ellinger; Results of Research Carried Out By Stuva, by Genw; Problems Encountered During the Construction of the Urban Railway in Frankfurt/Main, by Eule; Modern Design of Underground Railway Stations, by Husmann; The Sion tunnel in Lucerne as an Example of Driving Large Tunnel Sections in Hard Rock With Fully Mechanized Heading Machines, by Feil; The Use of Freezing Techniques in Civil Engineering, by Neumr; Planning of the Urban Railway in Stuttgart, by Hulfe; and Experience During the Construction of Subterranean Traffic Facilities in Stuttgart, by Schuur. /TRRL/ [German]

Blenenmann, F Strasse Breucke Tunnel Vol. 24 No. 4, Apr. 1972, pp 85-92, 2 Fig.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 300550)

3A 276022
LOW COST ROAD CONSTRUCTION

The publication contains the following reports: Low Cost Roads in the Service of Agriculture, by Frowein, WA; Experiences in the Planning of the Agricultural Road Network in Hungary, by Gaspar, L; Design of the Longitudinal Section of Agricultural Roads, by Hernandez, JL; Notes on Farm Roads, by Hrusea, 0; The Recent Planning and Traffic Loading of Agricultural Roads with the Growth of Modern Agricultural Machines, by Klempert, B; The Quality of Agricultural Roads, by Kyritsis, S; Specifications and Construction Method for Agricultural Roads Treated with Calcium Chloride, by Laporte, JG; Study of the Design of the Agricultural Road Network, by Lelequeux, J and Therasse, R; The Stress on Agricultural Roads, by Moesser, H; Rationalization of Agricultural Road Construction, by Ott, R; Low Cost Road Construction—Diagnosis, Forecast, Therapy, by Seidel, J; Gronung at the Edges of Roads and in Fine-Grained Subsoil with Particular Reference to Victoria, Australia, by Turner, AK; and The Contribution Made by Agricultural Roads in a Catchment Area, by Wilson, TV and Lignon, J. /TRRL/

Schriftenreihe d Dt Nationalen Komeite d Inter No. 4, 134 pp, Figs., Tabs.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 300442)

3A 291064
OVERCOMING ABNORMAL EARTH PRESSURE IN KUBIKI TUNNEL

During the construction of the Kubiki Railway Tunnel in Japan, strong swelling earth pressure was encountered in a silt rock zone and the 230 M long heading was ruptured. It was decided to use the "short beach" method of excavation to reduce the time during which the section was unsupported by the concrete lining. Tunnel lining methods are briefly discussed. /TRRL/

Civil Engineering in Japan Vol. 9 1970, pp 30-1, 3 Phot.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 264005)

3A 291079
SWITZERLAND NUMBER 9 AUTOROUTE DULEMAN TUNNELS AT BELMONT, CHAUDERON CRIBLETTE AND ANCHORED WALLS AT CHAUDERON AND CRIBLETTE

The article gives details of the design and method of construction used for the Belmon, Chauderon and Criblette tunnels as part of the N.9 autoroute between Lausanne and Chexbres. The tunnels each comprise two tubes whose cross section varies between 74-80 sq m. depending on rock conditions. The roadway width is 7.75 m with a clearance of 4.3 m. The method of tunnel driving known as the Belgian method was used. It consists in driving a heading at the crown over the entire length and then excavating the core and the walls. Details are also given of the anchored walls constructed to retain the overburden on the upslope side of the cuttings at the approach to both tunnels. /TRRL/

Betschen, G (Societe Generale Pour L'Industrie, Lausanne) Tunnels and Tunelling Vol. 5 No. 2, Mar. 1973, pp 159-164, 7 Fig., 4 Phot.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 205799)

3A 291109
STUDIES OF STABILIZATION PAVEMENT SHOULDERS-PRILIMINARY REPORT

Data collected during a bibliographic study of shoulder stabilization are presented. Details are given of the object of shoulders, their structure and geometrical features, drainage, current types, and construction methods. The main techniques of shoulder stabilization are described, and conclusions are drawn, particularly as regards design. /TRRL/

Rodrigues, M Laboratorio Nacional de Engenharia Civil R&D Rept. Vol. 52/1 Feb. 1962, 16 pp, 6 Fig., 35 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 204816)

3A 291126
THE CASE FOR STEEL PLATE TUNNEL LININGS

The case for steel tunnel linings is presented. The author suggests the development of a steel lining for tunnels consisting of plates machine-cut to size, transported flat to the construction site, and then rolled to the required radius. The ground deformations would be accommodated by the elastic and ductile straining of the ring as a whole, locating lugs would be provided to assist erection, and joints would be made watertight by sealing welds. The cost of fabrication and site welding is estimated to be around $35 per ton. The importance of perfect circularity and uniform hydrostatic pressure is discussed. /TRRL/

Chapman, J New Civil Engineer No. 48, 1973, 30 pp, 2 Fig.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 206842)
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Publications of the Transportation Research Board referred to in this issue are available from the Transportation Research Board. Articles and reports issued by other agencies are NOT available from TRB. They may be obtained from the publication source shown immediately following the name of the author on the document record or from the document distribution center identified by the availability statement that follows the abstract on the document record.

ASCE
American Society of Civil Engineers
345 East 47th Street
New York, New York 10017
Telephone 212-644-7671

ASME
American Society of Mechanical Engineers
345 East 47th Street
New York, New York 10017
Telephone 212-644-7703

DOTL
U.S. Department of Transportation Library
400 Seventh Street, S.W.
Washington, D.C. 20590
Telephone 202-426-2565

ECMT
(All documents available through OECD)
European Conference of Ministers of Transport
2 rue Andre Pascal
Paris 75175, France
Telephone 524.97.22

ESL
Engineering Societies Library
United Engineering Center
345 East 47th Street
New York, New York 10017
Telephone 212-644-7611

GPO
U.S. Government Printing Office
Superintendent of Documents
Washington, D.C. 20402
Telephone 202-783-3238

IEEE
Institute of Electrical and Electronics Engineers
345 East 47th Street
New York, New York 10017
Telephone 201-981-0060

IPC
IPC (America), Inc.
205 East 42nd Street
New York, New York 10017
Telephone 212-889-0700

IRRD
International Road Research Documentation
19 rue de Franqueville
75 Paris, 16e, France
Telephone 1-524.92.42

ITTE
Institute of Transportation and Traffic Engineering
University of California
412 McLaughlin
Berkeley, California 94720
Telephone 415-642-3604

NAE/NAS/NRC
National Academy of Sciences
Publication Sales
2101 Constitution Avenue, N.W.
Washington, D.C. 20418
Telephone 202-389-6731

NTIS
National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161
Telephone 703-321-8543

NTCL
Transportation Center Library
Northwestern University
Evanston, Illinois 60201
Telephone 312-492-5273

OECD
OECD Publications Center
1750 Pennsylvania Avenue, N.W.
Room 1207
Washington, D.C. 20006
Telephone 202-386-8755

Reports emanating from research projects sponsored by the Federal Highway Administration and the Urban Mass Transportation Administration are normally available from the National Technical Information Service. If the abstract carries a document order number (PB or AD followed by 6 digits), the report is available from NTIS.

When no availability is specified, the user should consult an established transportation library.

A loan service for publications and a photocopy service for articles and papers are available at two TRISNET Centers as explained on page viii.

A large number of documents are available from a few sources. The names, addresses, and telephone numbers of those sources are listed below under the abbreviation used for each.
LOAN AND PHOTOCOPY SERVICE FOR DOCUMENTS CITED IN THIS VOLUME

The Northwestern University Transportation Center Library and the University of California Institute of Transportation Studies Library are functioning as TRISNET Centers in the operation of a prototype document delivery system under contract to the U.S. Department of Transportation. The publications cited in this volume may be requested from either of these libraries.

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In referring your requests to either library, please cite for each publication:

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- Author
- Title
- Publisher or journal title
- Date of publication

The request may be either for loan of the publication for a period of 2 weeks plus estimated mailing time (Northwestern accepts a user's request directly, but University of California requires submission of an interlibrary request) or for photocopies of articles and conference papers. If the document is unavailable in the library, referral to best available source will be made.

Loan services are free when publications are mailed at the book rate. If the user requires priority mailing, the library will charge for mailing costs. Photocopies of articles or individual conference papers are made at the rate of 10 cents per page plus a handling charge of 50 cents per item. In all cases invoices are mailed with the loan or photocopy.

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312-492-5273
TWX 910-231-0872

University of California
Institute of Transportation Studies Library
412 McLaughlin Hall
Berkeley, CA 94720
415-642-3604
WHAT EACH ONGOING RESEARCH SUMMARY CONTAINS

The items of information contained in each ongoing research summary are described below. Some summaries are incomplete with respect to one or more items of information. The omitted information was not available to HRIS at the time of processing this volume.

**Document Record Number**
HRIS document records for summaries of ongoing research projects are listed within HRIS subject areas according to 6-digit TRIS accession numbers. A 6-digit accession number, by which documents are listed, is given at the beginning of each summary. The subject area is shown at the top of each page. In general there are gaps between accession numbers of successive summaries.

**Title**
The title of the research project is given immediately after the accession number.

**Performing Research Agency**
Abbreviated name of the agency or agencies that conduct the research. When furnished to HRIS, the agency-assigned project number appears to the right of the agency name.

**Investigators**
Surnames and initials of the research investigators if known.

**Funding Agency (Sponsor)**
The name of the agency or agencies that sponsor the project by providing all or some part of the funds. Any sponsor project numbers or other identifying data appear to the right of the sponsor's name, either on the same line or on the following line.

**Project Data**
Known project data identified by the following abbreviations for the data items:

- AS: project status
- RD: reporting data
- AD: funding approval data
- CD: contract date
- SD: project start date
- DC: estimated project completion date
- TF: total funds
- FT: type of funding
- CN: contract or grant number
- CT: contract type
- FY: funds by fiscal year

**Summary Statement**
Objective and scope of the project, methods used, and results obtained.

**Supplemental Notes**
Additional information about the project such as announcement of the availability of a special package to aid in the implementation of the results of the research project.

**Citations**
Reports that emanated from the research project during the last year. Full text reports for projects sponsored by the U.S. government are generally available from the National Technical Information Service, Springfield, Virginia 22161, telephone 703-321-8543. Reports that emanate from other research projects may be obtained from the research agency or the sponsor. Agency addresses are given in the Source Index.

**HRIS Information Sources**
Name of the agency or other information system furnishing the information to HRIS. When more than one source is given, the project summary represents a merger of the information from the sources shown.

**Accession References**
The name of the information source. Abbreviations are the same as those for abstracts.

**HRIS Accession Reference**
Cross reference to other records that includes a 2-character alpha-numeric prefix, the 2-digit subject area number, and the 6-digit HRIS accession number, which was used before the TRIS accession numbering system was adopted.

**Sample Research Summary**
The following example identifies the items of information in a research project summary.
The causes of settlement of bridge approaches are being determined and methods of design and construction are being developed whereby settlement may be prevented. Long term data are being collected from settlement platforms, mercury-filled settlement gages, profile measurements and slope indicators at some ten bridge sites. Based on a preliminary analysis of data obtained along with data obtained from two general surveys of many approaches, the major causes of post-construction settlement of many bridge approaches appears to be (1) slope instability due to progressive failure and (2) secondary compression of approach embankment foundations. Confirmation of these observations is in progress.

References

- Mercury-Filled Settlement Gauge Hopkins, TC; Deen, RC, Kentucky Bureau of Highways, Research Division. HRB Record, Dec. 1972
- Bluegrass Parkway Bridges over Chaplin River Hopkins, TC, Kentucky Bureau of Highways, Research Division. Feb. 1973
The items of information contained in each abstract of published technical papers, articles, and reports are described below. Some abstracts are incomplete with respect to one or more items of information. The omitted information was not known to HRIS at the time of processing for this volume.

**Document Record Number**
An eight-digit number by which document records are listed. The first two digits identify the HRIS subject area used to classify the document record. The subject area number is given at the top of each page. The last 6 digits identify the TRIS accession number that is used to arrange the document records within a subject area. In general there are gaps between the numbers of successive document records.

**Title**
Title of the document record, given immediately after the accession number.

**Abstract**
A summary of the information in the source document. Informative abstracts generally have 200 to 250 words and contain details about the important elements of the document. Indicative abstracts usually have 100 to 150 words and describe what is discussed but in less detail. Articles selected from the open literature are published in full length if they are very short (200 words or less). HRIS document records of bibliographies have no abstracts, or they may include one or two summary statements indicating the content of the bibliography. Abstracts prepared by the author of the paper, article, or report are identified by the word Author at the end of the abstract. If HRIS did not know who prepared the abstract, the agency from which the abstract was acquired is indicated at the end. If no indication is given, the abstract was prepared by HRIS.

**Supplemental Notes**
Additional information about the source of the document such as the name, location, and date of the conference where the paper was presented.

**Authors, Publication Data, Document Data**
Surname and initials of the personal author and coauthors of the paper; name of the source document, and the name of the publisher or corporate author; data that further identify the specific issue number of a serial publication, locate the particular paper within the publication by page number, and provide bibliographic data about the paper, such as the number of figures, tables, references, appendices, and date of publication.

**HRIS Information Source**
Name of the agency furnishing the information to HRIS. This line is included on HRIS document records when only the abstract of a full paper, report, or article was furnished HRIS by another agency or information system. It is an additional aid to the reader in locating and acquiring the complete document.

**Availability**
Name and address of the center where full-text copies of the document may be purchased or borrowed.

**Accession References**
Document record numbers for abstracts obtained from other information systems, prefixed by the initials of the information system that provided HRIS the information. The following initials are used:

- CRIS: Current Research Information System, U.S. Department of Agriculture
- DOT: U.S. Department of Transportation
- EI: Engineering Index
- FSL: Engineering Societies Library
- FHWA: Federal Highway Administration, U.S. Department of Transportation
- HRIS: Highway Research Information Service, Transportation Research Board
- HSRI: Highway Safety Research Institute
- HUD: U.S. Department of Housing and Urban Development
- IPR: Institute of Road Research, Brazil
- IRF: International Road Federation
- IRRD: International Road Research Documentation, Organisation for Economic Co-operation and Development
- ITTE: Institute of Transportation and Traffic Engineering
- NCHRP: National Cooperative Highway Research Program
- NHTSA: National Highway Traffic Safety Administration, U.S. Department of Transportation
- NTIS: National Technical Information Service
- NUTCL: Northwestern University Transportation Center Library
- RTAC: Roads and Transportation Association of Canada
- SAE: Society of Automotive Engineers
- SSIE: Smithsonian Science Information Exchange
- SRIS: Safety Research Information Service, National Safety Council
- TRAIS: Transportation Research Activities Information Service, U.S. Department of Transportation
- TRB: Transportation Research Board, National Academy of Sciences
- TRIS: Transportation Research Information System
- TSC: Transportation Systems Center, Technical Information Center
- TRRL: U.K. Transport and Road Research Laboratory
- UMTA: Urban Mass Transportation Administration, U.S. Department of Transportation
- XUM: Xerox University Microfilms
Sample Abstracts
The following examples identify the items of information in abstracts of an article and a report.

Abstract of an article

Document Record Number
TRIS Accession Number
HRIS Subject Area Number

Title

Abstract of a report

Document Record Number
TRIS Accession Number
HRIS Subject Area Number

Title

Abstract

Authors, Publication Data, Document Data

Abstract of a report

Document Record Number
TRIS Accession Number
HRIS Subject Area Number

Title

Abstract

Authors, Publication Data, Document Data

TRIS Accession Number

HRIS Information Source

Availability

Document Order Data

ACKNOWLEDGMENT Federal Highway Administration (P-0066)
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