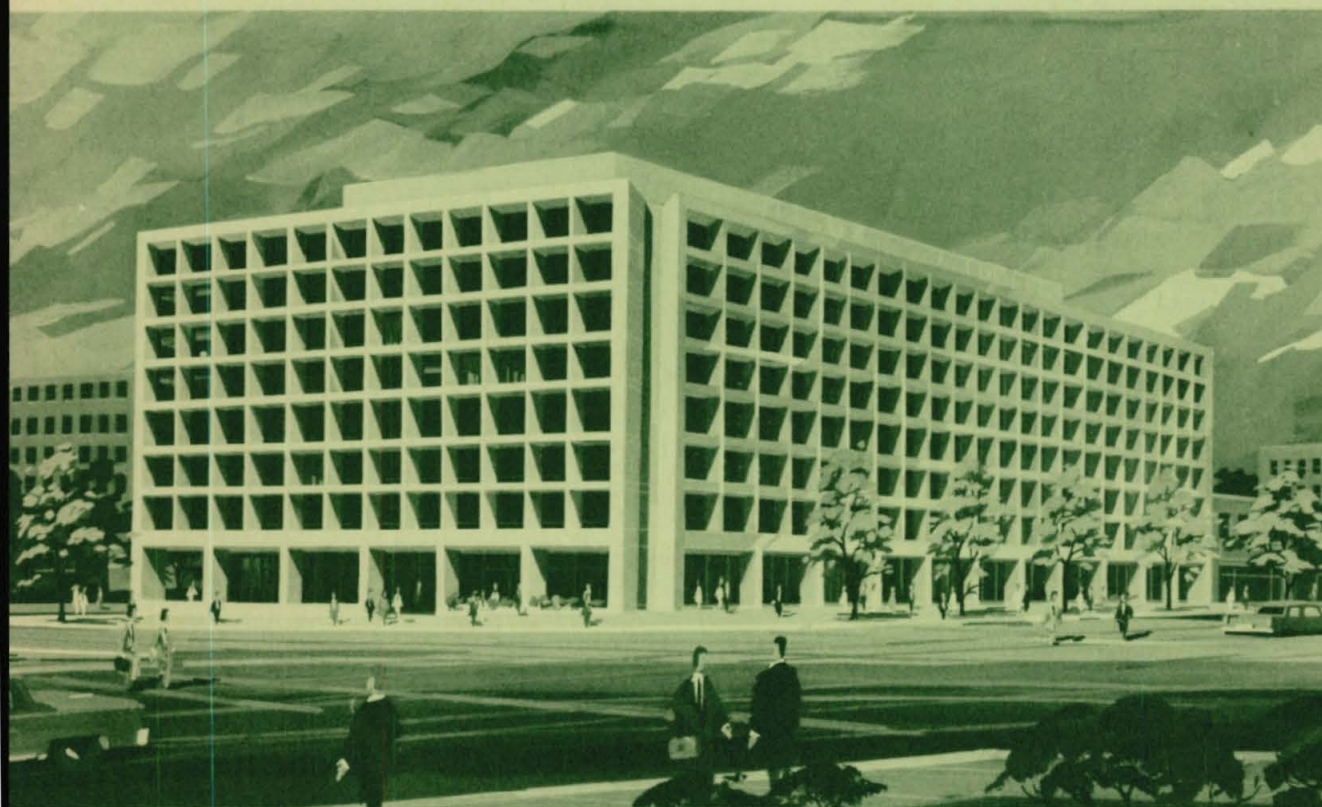


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ANNUAL REPORT

For the
Year
Ending
June
30
1967

NATIONAL RESEARCH COUNCIL

National Academy of Sciences-National Academy of Engineering

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ANNUAL REPORT for Fiscal Year 1967

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ON THE COVER: THE JOSEPH HENRY BUILDING

Early this fall, the Highway Research Board will move to new quarters at 2100 Pennsylvania Avenue, N. W., in Washington. The cover of this year's HRB Annual Report features the architect's conception of the eight-story building being constructed for the National Academy of Sciences on property owned by the George Washington University.

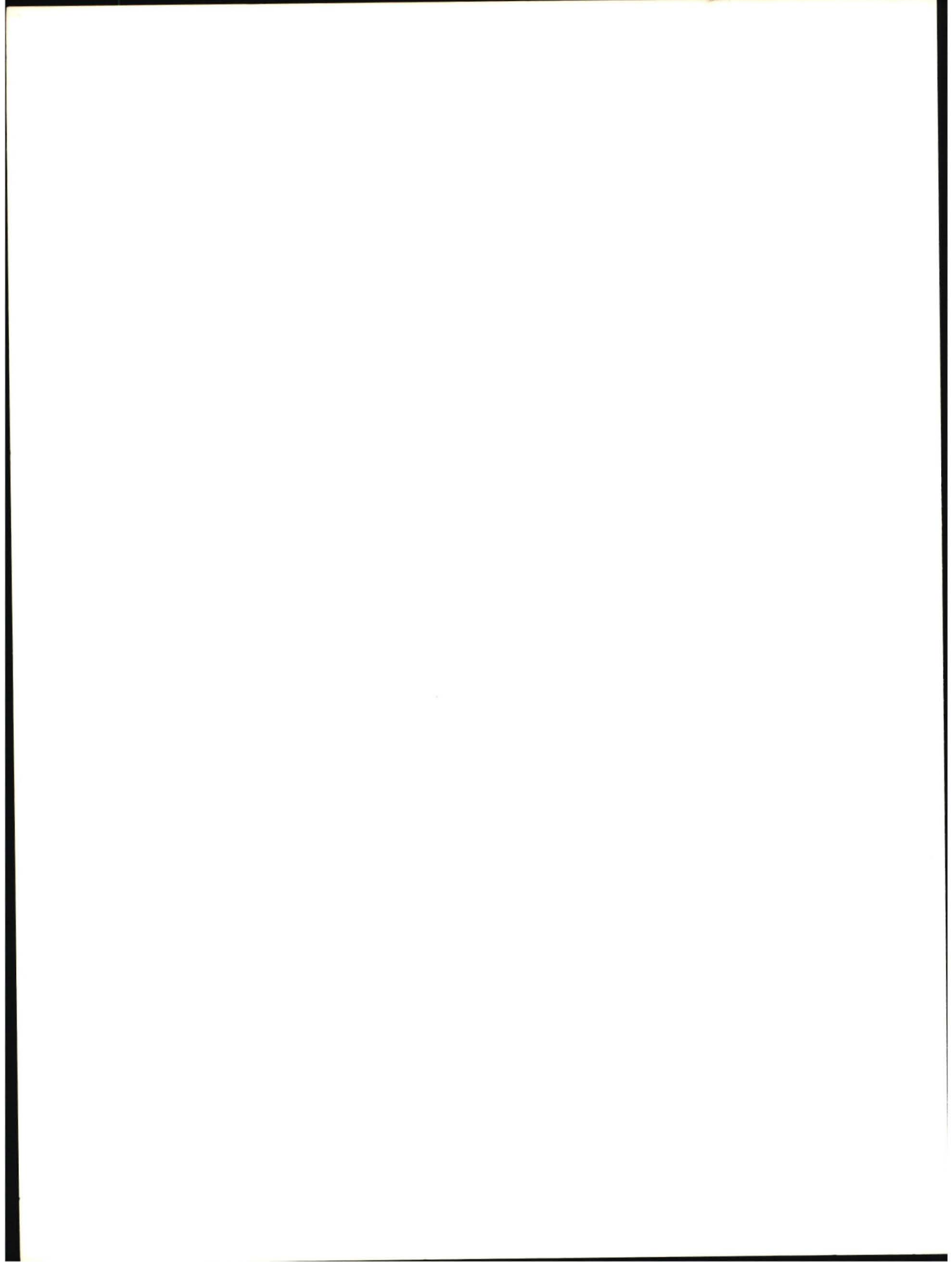
To be called the "Joseph Henry Building" in honor of the distinguished 19th century physicist who served as the second president of the Academy, the 253,000-square-foot structure will house not only the Highway Research Board, but a number of other sub-units of the Academy and National Research Council not quartered now in the main building at 2101 Constitution Avenue, N. W.

Under terms of a contract signed last year with the University, the Academy will lease the entire building for a 20-year period with options that could extend the lease for an additional ten years.



THE YEAR AT A GLANCE

GENERAL STATISTICS—July 1, 1966 to June 30, 1967	
<u>46th Annual Meeting</u>	
Registration	3,311
Papers and reports	357
Technical sessions	63
Committee and Department business meetings	152
<u>Field Activity</u>	
Visits to State Highway Departments	74
Visits to educational institutions	114
Visits to industry, government agencies and others	56
Attendance at professional conferences by staff	60
<u>Miscellaneous</u>	
Publications (total pages)	9,956
Committee and Department memberships	1,719
Individual Supporting Members	1,725
Organizational Supporting Members	200





LETTER TO SUPPORTING MEMBERS

The Highway Research Board devoted a great deal of time and effort during the past year to a program of "continuing self evaluation" in order to learn how well it is meeting its present objectives and to determine just what its role should be in view of the many changes taking place in the entire field of transportation.

At the beginning of the fiscal year in July 1966, the Executive Committee appointed a special subcommittee chaired by David H. Stevens of the Maine State Highway Commission to study the activities of the Board, particularly with regard to the present and future level and costs of services provided our sponsors. The Stevens Committee report found that the funds used to finance the Highway Research Board are being judiciously administered and that the Board's supporters are, in short, getting their money's worth.

Another major self-appraisal effort was made by the Board's Special Committee on Long Range Planning under the chairmanship of Edward Wetzel of the Port of New York Authority. The Committee recommended that there was "an urgent need for the Board to modify its objectives and scope with a view toward expanding its involvement in the general transportation field."

As a result, the HRB Executive Committee last January authorized the Board to somewhat modify its scope to permit the development of a broader program encompassing other modes of transportation as they relate to highways. This modified scope now permits the Board to give attention to all of those factors concerned with the understanding, design and function of systems for the safe and efficient movement of people and goods including:

- The planning, design, construction, operation, and maintenance of transportation facilities and their components;
- The economics, finance and administration of arrangements for providing transportation; and
- The interaction of transportation systems with the physical, economic, and social environment they are designed to serve.

It's important to stress, however, there will be no dilution of the Board's efforts in highway transportation that are supported by funds from the State Highway Departments and the Bureau of Public Roads. Any broadening in services and scope will be accompanied by equally broadened support from other quarters. Work is currently under way to attract this support.

A number of changes were made in the Board's administrative structure last year. D. Grant Mickle resigned the Executive Directorship in October 1966 to accept the vice-presidency of the Automotive Safety Foundation. The Board was indeed fortunate to have had Mr. Mickle as a member of the staff and will continue to have the benefit of his guidance as he is now a member of the Executive Committee.

When I assumed the post of Executive Director, it was felt that from a management standpoint it would be better to distribute appropriately the functions of the vacant Deputy Director's Office among an Assistant Director for Special Projects, an Assistant Director for Technical Activities, an Assistant Director for Administration and a Program Director for the National Cooperative Highway Research Program. These changes more efficiently spread out the Board's management responsibilities.

Another significant milestone reached during the past twelve months was the completion of the three-year development period for the Highway Research Information Service. The HRIS now becomes an integral part of the Board's regular technical activities and offers a new service of outstanding potential to the transportation research field.

The pages that follow in this Annual Report to the State Highway Departments, the Bureau of Public Roads and other HRB Supporting Members chronicle in some detail the Board's specific activities. They cover the Departments and committees, the staff's technical activities (including the Research Correlation Service), the National Cooperative Highway Research Program, the publications program, the Highway Research Information Service and the other components of the Board.

While this Annual Report serves primarily as a synopsis of the Board's work during the past year, in a very real sense it also provides a summary of highway research activity throughout the country, for the one reflects the other.

 -Executive Director



TECHNICAL ACTIVITIES

In 1945, the State Highway Departments and the Bureau of Public Roads recognized the need to step up the Board's activities to meet the burgeoning highway transportation problems generated by an accelerated post-war road building program.

It was in that year that they agreed to subscribe to a number of increased HRB activities referred to collectively as the "Research Correlation Service." The term still exists today in the contractual agreements among the Board, the several States, and the Bureau, although the original functions of the RCS and others that have been added over the years are now known as "technical activities" and are directed by the Board's Assistant Director for Technical Activities.

One of the most important of these activities has been and is the field visit program. This program permits a personal interchange of knowledge about research and research findings among the HRB staff and the engineers and administrators of the State Highway Departments, industry, governmental agencies, and the academic world. The HRB staff men who make the visits are at once specialists and generalists.

Each is a specialist in that he is technically highly competent in the area covered by the HRB Department which he serves as a full-time secretariat and advisor.

Each is a generalist because of his wide range of knowledge of areas outside of his specialty gained through contacts with other staff men and with the outstanding professionals he meets during the field visits and in his Department and committee activity.

During a typical field visit, the HRB staff representative sits down with highway administrators and researchers and discusses not only his own specialty, but many other transportation-oriented subjects as well. Basically there are two principal missions for each visit:

- To learn of problems facing the particular organization being visited and to pass on information pertinent to solving these problems—information that is based on research or experience.
- To learn fully of any research activity under way or contemplated. In this regard, the staff men are often able to prevent undesirable duplication by letting the organization they are visiting know what is going on elsewhere in the contemplated or existing area.

During his field visit, the HRB staff man also discusses HRB Department and committee activity, identifies personnel competent to serve on HRB committees, urges researchers to report on their work through papers prepared for the HRB Annual Meetings, and, of course, encourages the practical application of useful research findings.

In addition to this personal link among many of the organizations conducting highway transportation research today, there are a number of other technical activities regularly conducted by the HRB technical staff.

Among the most important are the staff duties associated with the year-long operation of the Departments and committees and the planning and execution of the HRB Annual Meetings. Each staff professional serves as a liaison representative on all of his departmental and special committees and frequently serves as a secretary of the Department. Among other responsibilities, he helps new committee

chairmen learn standard HRB procedures and assists the chairmen in the selection of members. Generally, the staff engineer also makes all the necessary Annual Meeting arrangements in cooperation with the committees concerned.

In addition, each staff man, during the course of the year, helps develop research projects, prepares special bibliographies, conducts literature searches, and prepares talks for delivery at technical conferences.



REPRESENTATIVES IN STATE HIGHWAY DEPARTMENTS

Listed below are the Highway Research Board Representatives in the State Highway Departments.* These men are appointed by the HRB Executive Director after they have been nominated by the Chief Administrative Officers of the respective State Highway Departments. They provide continuing liaison between the highway departments and the Highway Research Board.

The HRB Representative is actually an arm of the Board within his particular highway department and, as such, performs a number of important functions. He helps arrange the field visits made by the Board's professional staff. He works closely with the HRB staff in developing papers for the Annual Meeting and in finding qualified people to serve on HRB committees. He keeps his Department informed about the latest activities of the Board and acts as an "answer man" to handle questions pertaining to any HRB service.

ALABAMA	INDIANA	NEBRASKA	SOUTH CAROLINA
J. F. Tribble	F. B. Mendenhall	W. M. Carver	J. D. McMahan, Jr.
ALASKA	IOWA	NEVADA	SOUTH DAKOTA
Hobart H. Mahon	Stephen E. Roberts	Orvis E. Reil	Carleton P. Jorgenson
ARIZONA	KANSAS	NEW HAMPSHIRE	TENNESSEE
W. E. Willey	R. L. Peyton	Frederick M. Auer	C. S. Harmon
ARKANSAS	KENTUCKY	NEW JERSEY	TEXAS
Billy K. Cooper	W. B. Drake	Wesley R. Bellis	Talbot S. Huff
CALIFORNIA	LOUISIANA	NEW MEXICO	UTAH
C. G. Beer	Verdi Adam	H. S. Wiley	Gerald Matthews
COLORADO	MAINE	NEW YORK	VERMONT
T. C. Reseigh	Richard A. Luettich	George W. McAlpin	Richard J. Nicholls
CONNECTICUT	MARYLAND	NORTH CAROLINA	VIRGINIA
A. Earl Wood	Nathan L. Smith, Jr.	James S. Burch	Tilton E. Shelburne
DELAWARE	MASSACHUSETTS	NORTH DAKOTA	WASHINGTON
Robert D. Bewick	George L. Wey	Laverne L. Zink	Carl E. Minor
FLORIDA	MICHIGAN	OHIO	WEST VIRGINIA
P. W. Ekey	R. L. Greenman	C. R. Haines	George E. White, Jr.
GEORGIA	MINNESOTA	OKLAHOMA	WISCONSIN
W. F. Abercrombie	John H. Swanberg	Jack L. Noblitt	W. J. Burmeister
HAWAII	MISSISSIPPI	OREGON	WYOMING
Herbert T. Tateishi	Russell Brown	R. L. Porter	Alvin F. Bastron
IDAHO	MISSOURI	PENNSYLVANIA	DISTRICT OF COLUMBIA
L. F. Erickson	Roy M. Rucker	Leo D. Sandvig	T. V. Bohner
ILLINOIS	MONTANA	RHODE ISLAND	PUERTO RICO
T. F. Morf	Paul M. Johnson	Francis H. Dutra	Gilberto Lugo Torres

*As of May 22, 1967.



DEPARTMENTS AND COMMITTEES

DEPARTMENTS

The Highway Research Board has no laboratories or other physical research facilities and normally conducts relatively little research itself. Instead, most of the Board's research activity is carried on through a highly-developed system of technical committees logically grouped under eight major Departments which broadly encompass virtually every facet of highway transportation.

Each Department has a chairman who serves at the discretion of the Board's Executive Committee. The chairman, together with the HRB staff engineer and members of the departmental committees, is responsible for planning the overall research program, suggesting projects for research, providing counsel on research methods, screening and sponsoring papers that do not readily fall under committee responsibility, reviewing activities of the Department's committees, and providing an annual report to the Board on Department and committee accomplishments. The Board's Departments and Department chairmen are:

<u>Department</u>	<u>Chairman</u>
ECONOMICS, FINANCE AND ADMINISTRATION . .	Robert C. Blensly, Oregon State University
DESIGN	W. B. Drake, Kentucky Department of Highways
MATERIALS AND CONSTRUCTION	R. L. Peyton, Kansas State Highway Commission
MAINTENANCE	J. P. Murphy, California Division of Highways
TRAFFIC AND OPERATIONS	H. L. Michael, Purdue University
SOILS, GEOLOGY AND FOUNDATIONS.	E. J. Yoder, Purdue University
URBAN TRANSPORTATION PLANNING	Pyke Johnson, Consultant
LEGAL STUDIES	John P. Holloway, University of Colorado

COMMITTEES

The technical and special committees of the Board form the talent pool that actually conducts the Board's research activity and analyzes and correlates the results of completed work. There are currently 116 technical committees and seven special committees. Committee members, 1,719 of them, voluntarily fill 2,532 separate committee assignments (many men serve on more than one committee). Committee members are selected because of their abilities to contribute to the study of specific subjects under consideration. They are appointed from State Highway Departments, Federal agencies, educational institutions, govern-

ment, industry, trade associations and other organizations with qualified and appropriate personnel.

Committee appointments hinge upon a recommendation from the respective committee's chairman to the Department chairman. The recommendation is reviewed by the Department chairman, and if approved, is sent on to the Board for its approval and action. Official letters of appointment on behalf of the Chairman of the Board's Executive Committee are sent from the Executive Director's office. Each member is appointed for a three-year term, but is eligible for reappointment.

A complete listing of all the Board's Committees follows:

Committees of the Highway Research Board		
DEPARTMENT OF ECONOMICS, FINANCE AND ADMINISTRATION (198)*		
EFA-1	Land Acquisition	MC-A3 Bituminous Surface Treatments
EFA-2	Highway Organization and Administration	MC-A4 Mechanical Properties of Bituminous Paving Mixtures
EFA-3	Highway Taxation and Finance	MC-A6 Characteristics of Aggregates and Fillers for Bituminous Construction
EFA-4	Highway Costs and Programming	MC-A7 Bituminous Aggregate Bases
EFA-5	Highway Engineering Economy	
EFA-6	Economics of Motor Vehicle Size and Weight	Division B - Concrete Division
EFA-7	Socioeconomic Aspects of Highways	MC-B1 Performance of Concrete—Physical Aspects
EFA-8	Freight Transportation Economics	MC-B2 Performance of Concrete—Chemical Aspects
EFA-9	Passenger Transportation Economics	MC-B3 Mechanical Properties of Concrete
		MC-B4 Curing of Concrete
		MC-B5 Chemical Additions and Admixtures for Concrete
		MC-B6 Basic Research Pertaining to Portland Cement and Concrete
		MC-B7 Effect of Ice Control
		Division C - Construction Division
		MC-C1 Construction Practices—Rigid Pavement
		MC-C2 Construction Practices—Flexible Pavement
		MC-C3 Construction Practices—Earthwork
		MC-C4 Construction Practices—Structures
		Division D - General Materials Division
		MC-D1 Mineral Aggregates
		MC-D2 Coatings, Signing and Marking Materials
		MC-D3 Sealants and Fillers for Joints and Cracks in Pavements
		MC-D4 Culverts and Culvert Pipe
		MC-D5 Adhesives, Bonding Agents and Their Uses
		MC-D6 Metals in Highway Structures
		Division E
		MC-E1 Nuclear Principles and Applications
		DEPARTMENT OF MAINTENANCE (187)*
		M-1 Maintenance Management
		M-2 Maintenance Costs
		M-3 Maintenance Personnel—Joint with American Association of State Highway Officials
		M-4 Salvaging Old Pavements by Resurfacing
		M-5 Snow and Ice Control
		M-6 Maintenance of Devices for Safety and Traffic Services
		M-7 Maintenance of Bituminous Pavements
		M-9 Right-of-Way Maintenance
DEPARTMENT OF DESIGN (362)*		
A - General Design Division		
D-A1	Photogrammetry and Aerial Survey	
D-A2	Geometric Highway Design	
D-A3	Surface Drainage of Highways	
D-A4	Guardrail, Median Barriers and Sign, Signal and Lighting Supports	
D-A5	Roadside Development	
D-A6	Shoulder Design	
B - Pavement Division		
D-B1	Rigid Pavement Design	
D-B2	Flexible Pavement Design	
D-B3	Composite Pavement Design	
D-B4	Surface Properties—Vehicle Interaction	
D-B5	Pavement Condition Evaluation	
D-B6	Theory of Pavement Design	
C - Bridge Division		
D-C1	Bridge Design	
D-C2	Steel Superstructures	
D-C3	Concrete Superstructures	
D-C4	Substructures, Retaining Walls and Foundations	
D-C5	Field Testing of Bridges	
D-C6	Bridge Dynamics	
DEPARTMENT OF MATERIALS AND CONSTRUCTION (564)*		
Division A - Bituminous Division		
MC-A1	Characteristics of Bituminous Materials	
MC-A2	Effects of Natural Elements and Chemicals on Bitumen-Aggregate Combinations	

*Numbers in parentheses are numbers of committee assignments.

DEPARTMENT OF MAINTENANCE (continued)

M-10 Maintenance of Structures
M-11 Maintenance of Portland Cement Concrete Pavements
M-12 Maintenance Equipment
M-Ad Committee on Studded Tires
Hoc

DEPARTMENT OF TRAFFIC AND OPERATIONS (495)*

TO-1 Parking
TO-2 Origin and Destination
TO-3 Operational Effects of Geometrics
TO-4 Highway Capacity
TO-5 Traffic Control Devices
TO-6 Highway Safety
TO-7 Quality of Traffic Service
TO-8 Vehicle Characteristics
TO-9 Theory of Traffic Flow
TO-10 Freeway Operations
TO-11 Road User Characteristics
TO-12 Characteristics of Traffic Flow
TO-13 Night Visibility
TO-14 Driving Simulation

DEPARTMENT OF SOILS, GEOLOGY AND FOUNDATIONS (337)*

SGF Executive Committee
SGF Research Needs
SGF Programming and Publications

Division A

SGF-A1 Compaction
SGF-A2 Soil-Calcium Chloride Stabilization
SGF-A3 Soil-Sodium Chloride Stabilization
SGF-A4 Lime and Lime-Fly Ash Stabilization
SGF-A5 Soil-Portland Cement Stabilization
SGF-A6 Soil-Bituminous Stabilization

Division B

SGF-B1 Strength and Deformation Characteristics of Pavement Sections
SGF-B2 Embankments and Earth Slopes

SGF-B3 Foundations of Bridges and Other Structures
SGF-B4 Buried Structures
SGF-B5 Mechanics of Earth Masses and Layered Systems
SGF-B6 Sub-Surface Drainage

Division C

SGF-C1 Exploration and Classification of Earth Materials
SGF-C2 Soil and Rock Properties
SGF-C3 Physico-Chemical Phenomena in Soils
SGF-C4 Frost Action
SGF-C5 Environmental Factors Except Frost
SGF-C6 Engineering Geology

DEPARTMENT OF URBAN TRANSPORTATION PLANNING (170)*

UTP-1 Organization and Administration
UTP-2 Land Use Evaluation
UTP-3 Community Values
UTP-4 Transportation System Evaluation
UTP-5 Urban Information Systems and Measurements
UTP-6 Future Concepts

DEPARTMENT OF LEGAL STUDIES (75)*

LS-1 Condemnation and Land Use Control Law
LS-2 Urban-Metropolitan Transportation Law
LS-3 Motor Vehicle and Traffic Law
LS-4 State Highway Laws
LS-5 Highway Contract Law

SPECIAL COMMITTEES (144)*

SC-1 Special Committee to Review Safety Activities of the Highway Research Board
SC-2 Highway Equipment
SC-3 Electronic Research in the Highway Field
SC-5 Research Problems of Mutual Interest and Concern to Users and Producers of Asphaltic Materials
SC-6 Public Information
SC-7 International Cooperative Activities
SC-10 Long Range Planning

TOTAL NUMBER OF DEPARTMENT AND COMMITTEE ASSIGNMENTS: 2, 532



A YEAR IN REVIEW

INTRODUCTION

The pages to follow make no attempt to describe in complete detail the activities of the Highway Research Board's eight Departments or its 116 departmental committees and various special committees. To do so would require considerably more space than can be provided in this Annual Report.

What will be found are brief and general resumés of the work completed and projects begun as the result of efforts by over 1,700 dedicated individuals who form the core of the Board. But even in summary, a year of HRB activity is impressive and even more importantly, meaningful in terms of its contribution to highway transportation progress.

Even the most casual reading of the following synopses will make it very clear that much of the departmental and committee activity is tightly interwoven with other activities of the Board. For example, the 46th Annual Meeting was the most successful in the Board's history primarily because of the work of the Departments and their committees in stimulating the preparation of papers, reviewing those papers and selecting only the very best, planning technical sessions, conferences, and symposia, and much more.

It will be equally apparent, too, that the scope of the HRB staff engineers' work is highly diversified. In addition to the time they spend in working with the Department and committees and pursuing their technical activities, the staff engineers also help prepare "research in progress" information and "published report" material as Highway Research Information Service input. The staff engineers also often assume the role of "answer men" and reply to hundreds of queries from supporting members and others about every conceivable facet of highway transportation.

Following each Departmental activity synopsis is a statistical breakdown that includes information about the staff engineers' field visits and the Department's contributions to the 46th Annual Meeting.

In terms of time spent, field visits to educational institutions take about one day each, while the average visit to a State Highway Department is of several days' duration.



Department
of
Economics,
Finance
and
Administration



Robert C. Blensly
Department Chairman

HRB Staff Representative
Kenneth E. Cook

THE PAST fiscal year was a year of change for the Department of Economics, Finance and Administration as the Department underwent a major reorganization. The three divisions of Administration, Finance and Economics were discontinued and some 15 former committees were consolidated into eight new ones. The scopes of the Department as a whole and of each committee were reviewed to take into consideration the broadened scope of the Highway Research Board.

Reflecting the Department's attempt to widen its purview, approximately 20 new members representing modes of transportation other than highways have been asked to serve on Departmental committees. The Department has also fostered closer coordination with other HRB Departments.

The present Committee on Highway Organization and Administration now incorporates the Committee on Budgeting and the Committee on Education and Training. This committee has been encouraging "state-of-the-art" reports in the areas of: (1) education requirements for transportation engineering, (2) on-the-job and continuation training programs, (3) intergovernmental responsibilities and relationships for transportation, especially state-urban relationships, (4) administration of research, and (5) the transition of highway departments to departments of transportation.

The Committee on Highway Taxation and Finance spent considerable effort during the year trying to stimulate research in the areas of new concepts for measuring highway needs, user and non-user responsibilities, and the financial relationship of highways to other transportation systems.

The Committee on Engineering Economy is now in the process of developing a panel that will be concerned with the application of economic analyses to highway engineering.

The Committee on Indirect Effects of Highway Improvements and the Committee on Economic Forecasting were combined into a new committee renamed the Committee on Socio-Economic Aspects of Highways. The new committee last year considered such problems as highway locations in urban areas, motorists' needs for highway services, effects of highways on undeveloped regions and countries, air pollution and noise problems associated with highways, and access roads and their relationship to total transportation planning.

The Committee on Freight Transportation and the Committee on Passenger Transportation Economics were, respectively, concerned over the past year with the economics of freight movement and the problems of urban congestion cost.

An ad hoc Committee on New Subject Matter was created to review the activities of the Department and to suggest new subjects for research. The committee made a report at both its mid-summer meeting and at the Annual Meeting.

The former Committee on Budgeting, which is now incorporated in the Committee on Organization and Management, sponsored a panel discussion during the Annual Meeting on program and capital construction budgeting within State Highway Departments.

During the year, upon the resignation of R. C. Blensly from the staff of the Board, Kenneth E. Cook of the Virginia Highway Research Council accepted the staff representative position for the Department. His title is Highway Economist.

STATISTICAL SUMMARY	
DEPARTMENT OF ECONOMICS, FINANCE AND ADMINISTRATION	
(As of June 30, 1967)	
<u>Staff Travel</u>	
Visits to State Highway Departments	10
Visits to educational institutions	15
Visits to industry, government agencies and others	3
Attendance at professional conferences	1
<u>46th Annual Meeting</u>	
Formal papers or reports sponsored by Department	21
Informal papers or reports at conference sessions	9
Informal papers or reports given at Committee meetings	5
Formal sessions sponsored by Department	4
Conference sessions sponsored by Department	2
Committee meetings held	11



Department of Design



W. C. Drake
Department Chairman

HRB Staff Representative
L. F. Spaine

THE Department of Design has completed its second successful year of functioning under a three-divisional structure. Accompanying the improved efficiency of operation has been an increase in effort to more effectively accomplish the aims and objectives of the Department. Emphasis has been placed on increasing audience participation in Annual Meeting sessions, increasing committee activity and a general broadening of Department objectives and scope to keep pace with current trends.

A significant decision of the Department during the year was to seek means of reducing the formality of Annual Meeting paper sessions thereby increasing audience participation. The conference-type session was emphasized, and sessions on pavement-tire friction, structural design of pavements and bridge deck joints were presented. As a result, these sessions generated much discussion from the floor. Additionally, several committees sponsored conference-type committee meetings at which were presented informal reports and discussions.

In an effort to stimulate research and research-related activities, the Department last year decided to hold a series of mid-year committee meetings in the coming year in conjunction with the Department meeting. This will serve to encourage maximum committee member attendance at all meetings because it will involve a minimum of travel and expense. Invitations will be extended to the State Highway Departments, universities and other interested groups in areas reasonably close to the meeting site.

The Committee on Bridge Dynamics expanded its scope during the year to include psychological and physiological aspects of bridge vibrations and dynamic forces due to earthquake, wind and blast. Committee membership was also expanded to cover the new special areas of interest. Additionally, the new Committees on Shoulder Design and Theory of Pavement Design held organization meetings and are now fully operational.

The Department published a "Research Needs" circular containing 84 research problem statements. This Department-wide effort identifies research considered most needed in each committee's area of responsibility.

A state-of-the-art report on pavement design was prepared by five committees of the Pavement Division and submitted to the Board for publication in the Special Report series. When published, this report will outline more clearly what is known in the pavement design area.

The Department constantly seeks to maintain balanced and active committees. Over 50 percent of committee members are from State Highway Departments. Most of the members are actively engaged in aspects of highway design directly related to their committee assignments. The remaining committee members represent a broad range of related activities. One long-range objective of the Department is to include in its membership

individuals from the broad community of other-modal disciplines where active participation and mutual benefits can be expected.

A new Engineer of Design, Lawrence F. Spaine, took over the staff position for this Department in the fall of 1966 to fill the vacancy left by the promotion of R. C. Edgerton to Assistant Director for Technical Activities. Mr. Spaine had previously served as a projects engineer in the NCHRP.

STATISTICAL SUMMARY DEPARTMENT OF DESIGN (As of June 30, 1967)	
<u>Staff Travel</u>	
Visits to State Highway Departments	8
Visits to educational institutions	11
Visits to industries, government agencies and others	2
Attendance at professional conferences	7
<u>46th Annual Meeting</u>	
Formal papers or reports sponsored by the Department	29
Informal papers or reports at conference sessions	18
Informal papers or reports at Committee meetings	39
Formal sessions sponsored by the Department	6
Conference sessions sponsored by the Department	3
Committee meetings held	20



Department
of
Materials
and
Construction



R. L. Peyton
Department Chairman

HRB Staff Representatives
R. E. Bollen
W. G. Gunderman

THE subjects covered at a number of the sessions and committee meetings held at the 46th Annual Meeting give a strong indication of current interests in the field of highway materials and construction.

For example, quality control, quality assurance, use of statistics, and acceptance testing were highlighted in two of the Department of Materials and Construction's 8 formal paper sessions. One conference session was devoted solely to recent theory on frost action in rocks. Intense interest, too, was shown at a committee meeting in a sound motion picture dealing with a new light-reflective and extremely hard synthetic aggregate.

A meeting of the Committee on Marking Materials evoked considerable discussion regarding a survey on the use of traffic paint that indicated a 400 percent increase in the use of such paint in the last six years.

Another committee meeting heard a discussion of the use of underwater television and epoxies in evaluating and repairing bridge piers. Other topics of interest during the year were hot storage of bituminous mixes, the need for a construction control practices review and the use of microwave absorption to determine the compaction of concrete.

The past fiscal year also saw a number of administrative changes in the Department. A new chairman was named to the Department's Bituminous Division and to 10 of the Department's 24 committees.

Some 78 members were dropped from the committee rosters and 108 new members were added, for a net gain of 30. Continuing efforts were made to maintain balanced membership through representation from the State Highway Departments, industry, governmental agencies, and the academic world. Attention was given also to increasing the number of committee members representing other transportation modes.

The Departmental committees also made a number of important contributions to the Highway Research Board's publications program. Three Records, two Circulars, and a Bibliography were issued under the sponsorship of the Bituminous Division. The Concrete Division sponsored two Records, two Circulars, one Bibliography and the extremely important Special Report No. 90 dealing with the "Structure of Portland Cement Paste and Concrete."

The Committees of the Construction Division fostered three Records, two Circulars, and a Bibliography, while the General Materials Division sponsored six Records and three Circulars.

In other Departmental action during the year, an ad hoc committee made up of all of the Concrete Division's committee chairmen was established to review the structure of the Division and to make recommendations.

STATISTICAL SUMMARY
DEPARTMENT OF MATERIALS AND CONSTRUCTION
(As of June 30, 1967)

Staff Travel

Visits to State Highway Departments	14
Visits to universities	23
Visits to related agencies	15
Attendance at professional conferences	15

46th Annual Meeting

Formal papers and reports sponsored by Department	32
Informal papers and reports at conference sessions	37
Informal papers or reports given at Committee meetings	119
Formal sessions sponsored by Department	8
Conference sessions sponsored by Department	5
Committee meetings held	36



Department of Maintenance



J. P. Murphy
Department Chairman

HRB Staff Representative
A. G. Clary

THE continuously increasing mileage of highways to be maintained and the adoption of new programs—such as roadside rest areas—are having an impact measured in millions of dollars. This impact is being reflected in a rapid increase in maintenance costs. New methods and tighter controls, while being instituted, cannot in themselves provide offsetting economies.

A number of studies have been initiated in a widespread attempt to establish a functional cost control system and to increase productivity by the application of modern techniques in maintenance. In the United States, Illinois, Louisiana, Minnesota, Ohio, Virginia and other states are especially active in this area. In Canada, the work of the Province of Ontario is noteworthy. In Mexico, the Secretariat of Public Works has shown great interest and in Great Britain, the Ministry of Transport is about to set up a high-level, independent committee to investigate maintenance economics.

The Maintenance Department over the past year has responded to these activities, and has encouraged further work as well by establishing a new Committee on Maintenance Management. Further, the Department has redirected the efforts of its Committee on Maintenance Costs from collection of historical cost data to the theoretical aspects of management science as they may apply to maintenance.

Slippery pavements have long been an area of concern but newly-issued safety standards are focusing even sharper attention on the subject. Maintenance Department committees, naturally interested in effective correction action, have been investigating pavement grooving, acid etch treatments, open-graded resurfacing mixtures and other techniques.

Snow and ice control has been receiving continuing study, but even greater effort is needed. An exploratory conference session at the 46th Annual Meeting by the Committee on Snow and Ice Control indicated a need for study of the long-term effects of great tonnages of snow and ice removal chemicals on vegetation, concrete, metals and water supplies. Although suitable substitutes are not available, and safety aspects far outweigh any damage that might occur, it cannot be denied that the chemicals are causing a number of problems. The whole subject will, in the future, receive increased attention due to public interest in highway beautification and water pollution. Highway authorities should initiate research programs in equipment development or other snow removal procedures.

STATISTICAL SUMMARY
DEPARTMENT OF MAINTENANCE
(As of June 30, 1967)

Staff Travel

Visits to State Highway Departments	14
Visits to educational institutions	13
Visits to industry, government agencies and others	4
Attendance at professional conferences	6

46th Annual Meeting

Formal papers or reports sponsored by the Department	10
Informal papers or reports at conference sessions	4
Informal papers or reports at Committee meetings	38
Formal sessions sponsored by Department	3
Conference sessions sponsored by Department	1
Committee meetings held	12



Department
of
Traffic
and
Operations



H. L. Michael
Department Chairman

HRB Staff Representative
E. A. Mueller

BECAUSE of the increasing national concern directed toward highway safety and because it is part and parcel of the field of traffic and operations, the subject last year received a great deal of attention throughout the Department of Traffic and Operations.

The focal point, of course, for the Department's efforts in this area was the Committee on Highway Safety, but certainly the other committees, too, played a key role.

A new subcommittee of the Committee on Road User Characteristics was formed to deal with driver education research, and plans are being developed by the parent committee for a "human factors workshop" to study the subject as it relates to the design and operation of the highway system.

In order to provide a better definition of the driving task on freeways, a subcommittee of the Committee on Quality of Traffic Service was established and is now engaged in studies of the proper use of acceleration, deceleration and through lanes, merging, and ramps.

The HRB Committee on Traffic Control Devices, in cooperation with other interested groups, last year began to stimulate research interest directed at developing a new and improved uniform manual on such devices.

One source of considerable gratification to the Committee on Highway Capacity and to the Board itself was the outstanding reception given to the new edition of the Highway Capacity Manual. The book has already been the basis of over 20 training conferences conducted in a number of the States.

Seven T and O Department committees held mid-year meetings. One of the most important of these was the two-day session sponsored by the Committee on Origin and Destination.

Parking problems, too, were given considerable thought. The Committee on Parking fostered a comprehensive summary of information dealing with municipal provisions for parking facilities and was engaged during the year with a number of parking-oriented projects.

Four new Departmental committee chairmen were named in February and all new committee membership appointments also made at that time were based on an increased awareness of the importance to include more representatives from other modes and disciplines. Work also began within each committee to examine its scope to insure that, when appropriate, its efforts embrace research into those areas concerned with the interface of highways with other modes.

A three-day conference on "Improved Street Utilization Through Traffic Engineering" was held in Washington, D.C., in May. The chief purpose of the symposium was to gather information—mostly from the experience of the participants—on the effects of traffic engineering improvements in city streets. The information that resulted will be published soon in a technical

"Proceedings" and will also form the backbone of a layman's guidebook designed to show public officials and administrators how traffic engineering techniques can make their city streets safer and more efficient. This activity, while under the purview of the Department of Traffic and Operations, is being conducted as an HRB Special Project because of funding arrangements.

STATISTICAL SUMMARY DEPARTMENT OF TRAFFIC AND OPERATIONS (As of June 30, 1967)	
<u>Staff Travel</u>	
Visits to State Highway Departments	9
Visits to educational institutions	13
Visits to industry, government agencies and others	8
Attendance at professional conferences	12
<u>46th Annual Meeting</u>	
Formal papers or reports sponsored by Department	48
Prepared discussions	21
Informal papers or reports at conference sessions.	4
Informal papers or reports at Committee meetings	60
Formal sessions sponsored by Department	11
Conference sessions sponsored by Department	1
Committee meetings held	20



Department
of
Soils,
Geology
and
Foundations



E. J. Yoder
Department Chairman

HRB Staff Representative
J. W. Guinnee

THIS past year much of the attention of the Department of Soils, Geology and Foundations and its various committees was focused on the preparation of bulletins for the application of research findings. Several of the committees are actively preparing these bulletins, while others are continuing their accumulation of "state-of-the-art" information in order to develop the necessary background information. These bulletins are aimed at providing useful information to the highway profession so that research findings may be applied more quickly and efficiently.

The 46th Annual Meeting featured a SGF Department-sponsored Symposium on Subsurface Drainage which was presented in honor of the late Edward S. Barber. Another symposium on Compaction of Earthwork and Granular Bases was held in cooperation with the Department of Materials and Construction and the Special Committee on Nuclear Principles and Applications. The proceedings of both symposia should contribute greatly to the understanding and use of the available knowledge in these fields.

A Conference Session, also presented at the 46th Annual Meeting, on "Control Procedures for Soil-Cement Construction," incorporated informal reports by highway engineers, equipment manufacturers, contractors, and others. This meeting was extremely useful in bringing together the viewpoints from the various participants and provided a forum for mutual understanding of each other's problems. The exchange also opened the way for a more widespread consultation between the various participants' interests (i.e., design, equipment, and construction) which should lead to more efficient and effective soil-cement construction in the future.

The HRB requirement that, starting in 1961, no committee chairman should serve more than two consecutive three-year terms, has brought about the retirement of two of the most active SGF committee chairmen. Preston C. Smith has retired after 11 years as chairman of the Committee on Exploration and Classification of Earth Materials. Dr. Hans F. Winterkorn retired as chairman of the Committee on Physico-Chemical Phenomena in Soils. As organizing chairman of this Committee he has continued to direct its activities for more than 30 years. The Department will hold an International Symposium on the Effects of Temperature and Heat on the Engineering Behavior of Soils in January 1969 in honor of Dr. Winterkorn's many years of service to this committee and to the scientific field.

During the 46th Annual Meeting, 150 friends and associates of Mr. A. W. Johnson gathered at dinner to show their appreciation for the years of service which he has given to the Department. Mr. Johnson, who has been HRB Staff Representative since 1946, retired from this position as of July 1967. Dr. Miles S. Kersten, University of Minnesota, was master of ceremonies; and Dr. Robert F. Legget, Director of the Division of Building Research,

National Research Council of Canada, was the speaker of the evening. John W. Guinnee, Mr. Johnson's active and effective assistant for several years, was named Engineer of Soils, Geology and Foundations on July 1, 1967.

STATISTICAL SUMMARY DEPARTMENT OF SOILS, GEOLOGY AND FOUNDATIONS (As of June 30, 1967)	
<u>Staff Travel</u>	
Visits to State Highway Departments	12
Visits to educational institutions	28
Visits to industry, government agencies and others	8
Attendance at professional conferences	5
<u>46th Annual Meeting</u>	
Formal papers or reports sponsored by Department	45
Informal papers or reports at conference sessions	6
Informal papers or reports at Committee meetings	30
Formal sessions sponsored by Department	7
Conference sessions sponsored by Department	1
Committee meetings held	24



Department
of
Urban
Transportation
Planning



Pyke Johnson
Department Chairman

HRB Staff Representative
J. A. Scott

THE Department of Urban Transportation Planning began last year to give major emphasis to a review and clarification of the scope of each of its committees. At the 46th Annual Meeting, the Department approved the formation of an advisory committee that would review, evaluate, and recommend appropriate changes designated to improve the Department's operation.

The advisory committee will review member appointment procedures, identify gaps in the overall framework of Departmental responsibilities, and review in a broad manner trends and development in urban research needing further clarification and emphasis within the Department.

Every Departmental committee held a mid-year meeting in addition to those held at the 46th Annual Meeting. The Department itself held a mid-year meeting in New York City and, following the transaction of current business, received an excellent briefing on the Tri-State Transportation Study by Dr. J. Douglas Carroll, Executive Director, and his competent staff members. This was the second year in which the Department's mid-year meeting devoted a full day to learning more about a major transportation study.

At the beginning of the fiscal year the Department began exploring the idea of an urban land use model conference. A conference advisory committee, chaired by Professor Britton Harris, has now been appointed by the National Academy of Sciences to plan, structure, and develop the conference.

The conference will review broadly and in depth the present state-of-the-art in modeling metropolitan and urban development and will evaluate future research directions. It will also provide for an exchange of experience and opinion among specialists in the field. The conference concept was originated by the UTP Department's Land Use Evaluation Committee and will be directly supported by grants from the Department of Housing and Urban Development, Department of Transportation, Bureau of Public Roads, and the Automotive Safety Foundation. The conference reports and findings will be published by the Highway Research Board.

The Department also endorsed last year a recommendation of of its ad hoc Advisory Committee to sponsor a "Conference on Community Values" to delineate the current "state of knowledge" in the broad area of community values, and to define in precise terms the research needed to improve our understanding of the relationship of community values to urban growth and development, especially in terms of urban transportation.

At the 46th Annual Meeting, the Department sponsored three formal paper sessions, three conference sessions, and jointly participated with the Traffic and Operations Department in the sponsorship of one session.

STATISTICAL SUMMARY
DEPARTMENT OF URBAN TRANSPORTATION PLANNING
(As of June 30, 1967)

Staff Travel

Visits to State Highway Departments	5
Visits to educational institutions	6
Visits to industry, government agencies and others	15
Attendance at professional conferences	5

46th Annual Meeting

Formal papers or reports sponsored by Department	18
Informal papers or reports at conference sessions	2
Informal papers or reports at Committee meetings	7
Formal sessions sponsored by Department	4*
Conference sessions sponsored by Department	3
Committee meetings held	12

*One session jointly sponsored with the Traffic and Operations Department.



Department
of
Legal
Studies



J. P. Holloway
Department Chairman

HRB Staff Representative
R. D. Netherton

TIMELY expansion of its activities in order to implement major new public decisions in the transportation field through legal research characterizes the work of the Department of Legal Studies during the past year.

The Department's new Committee on Highway Contract Law, approved in June 1966, completed its organization and held its first meeting in January 1967. Its pending projects consist of a study of state procedures for settlement of contractors' claims, and compilation of a series of papers on selected aspects of contract law for publication later in 1967.

Highlighting the need for research in support of state programs implementing the Highway Safety Act of 1966, the Committee on Motor Vehicle and Traffic Law held two meetings to develop proposals for development of multi-disciplinary assistance to motor vehicle administrators in driver licensing.

Shortly before Congress commenced hearings on proposed revisions in the Highway Beautification Act of 1965, a series of nine papers on planning and land acquisition aspects of highway corridors was published as Highway Research Record 166. At the request of the House Committee on Public Works, copies of this Record were furnished for each member of the Subcommittee on Roads.

The Department's fifth annual Workshop on Highway Law for legal counsel of State Highway Departments was held at the University of Colorado Law School in July 1966, and attended by participants from 34 states, the Bureau of Public Roads, and several transportation and research organizations. Topics discussed included contract law, new Federal legislation, legal aspects of highway beautification, condemnation law trends, use of air space, and coordination of transportation planning in urban areas. The Department's sixth annual workshop for state highway lawyers will be held at the University of Wisconsin.

Work by the Department's professional staff continues to update the Board's series of special reports on state highway law. During 1966 the Board published Special Report 91, "Relocation of Public Utilities: 1956-1966." A special report dealing with state law and procedures relating to highway user tax revenue is in preparation and due to be completed in 1967.

At the 46th Annual Meeting of the Highway Research Board the Department sponsored two sessions. One included papers on compensability in eminent domain law and legal techniques for achievement of aesthetic objectives in roadside areas. In conference discussions, recent research under the National Cooperative Highway Research Program dealing with transportation aspects of land use controls was commented on by speakers from the legal and urban transportation planning professions.

The Department's second session was a symposium of informal papers commemorating the 50th anniversary of the Federal-

aid highway program. The participants discussed the significance of this program in the areas of land acquisition and control, contract administration, and inter-governmental relations.

Reappointment of Departmental committee membership in February 1967 brought a new chairman to the Department of Legal Studies. Professor J. H. Beuscher of the University of Wisconsin Law School retired after having served as chairman of the Special Committee on Highway Law from 1961-1964 and Department chairman from 1965-1967. His successor is John P. Holloway, Resident Counsel of the University of Colorado.

STATISTICAL SUMMARY
DEPARTMENT OF LEGAL STUDIES
(As of June 30, 1967)

Staff Travel

Visits to State Highway Departments	2
Visits to educational institutions	5
Visits to industry, governmental agencies and others	1
Attendance at professional conferences	9

46th Annual Meeting

Formal papers or reports sponsored by Department	2
Informal papers or reports at conference sessions	8
Informal papers or reports at Committee meetings	5
Formal sessions sponsored by Department	2
Committee meetings held.	5



Activities of HRB Special Committees

Special Committee on Highway Equipment (SC-2)

Although recognizing the need for faster highway equipment field testing procedures, the members of the Special Committee on Highway Equipment last year discussed an alternative approach. New designs in construction plant equipment, the members feel, can reduce field test requirements by insuring positive quality control of material during processing at the plant.

Air pollution control measures were also studied by the Special Committee. While agreeing that it is possible to control effectively dust emission and fumes from plant operations at almost any cleanliness level desired, the members also considered the effect on consumer prices brought about by the cost of such controls.

Special Committee on Research Problems of Mutual Interest and Concern to Users and Producers of Asphaltic Materials (SC-5)

The members of this Special Committee represent various asphalt producers and users, as well as The Asphalt Institute, the AASHO Materials Committee and the National Asphalt Pavement Association. The members of the committee met for a two-day conference in April to consider research needs and priorities in the field and to begin the development of standard nomenclature for asphalt emulsions.

The Special Committee also recommended that the AASHO Committee on Materials adopt the "Asphalt Institute Viscosity Control Specifications of August 1965." It recommended, too, that field studies of asphalt selected under such viscosity control specifications be made by the State Highway Departments. California, Idaho, Louisiana, Missouri, New Jersey, Texas, and Wisconsin were the sites preferred by the committee for such studies.

Special Committee on Public Information (SC-6)

The Special Committee on Public Information serves to advise the HRB Public Information Office on long-range programs designed to insure broad dissemination of Highway Research Board activity to both the general public and to those more directly interested in highway transportation research. In addition, the committee helps solve specific problems that arise from time to time in carrying out the public information program of the Board.

The committee, made up of 28 public information specialists representing government and industry, met last fall to help plan and execute the public information activities attendant to the 46th Annual Meeting. In February, a new chairman, Edwin H. Spencer, and vice-chairman, L. J. McEnnis, Jr., were appointed to three-year terms.

Special Committee on International Cooperative Activities (SC-7)

This two-year-old Special Committee is primarily concerned with developing a free-flowing means of communicating highway ideas and information between the United States and other countries. Recognizing that the highway profession in the United States and the highway profession in other countries have many common problems, the committee strongly feels that research findings and research efforts can be profitably shared.

Thus, the committee has been seeking to find new ways to coordinate the research effort of the Board's 22 counterpart organizations around the world, to add the findings from research abroad to our storehouse of knowledge and to disseminate this information to 148 countries.

The committee engaged in several activities during the year. A brochure entitled "The HRB and Its Role in International Cooperative Activities," was produced and is available upon request. Four papers were written for an international session at the 46th Annual Meeting. The committee secretary also arranged for ten papers for the Tenth Pan American Highway Congress and helped process a dozen papers for the 46th Annual Meeting which were submitted from other countries. Some 200 international visitors from 17 countries attended the 46th Annual Meeting and an International Guest Hour was held for them.

The committee chairman appointed three subcommittees to explore the role of the Board in long-range planning, traffic safety and technological needs in transportation. Reports to the full committee will be given at its meeting next January. A fourth subcommittee subsequently appointed will concern itself with the needs and functions of a National U.S. Committee on Transportation Research and explore the feasibility of establishing such a committee in the framework of the National Research Council.

On June 6 the committee met for an annual business meeting to give further consideration to the next HRB Annual Meeting and to discuss research problems of common worldwide interest and the means of gathering and disseminating research information on an international basis. Preliminary reports of progress were made by all subcommittee chairman in which these observations were made:

- There is a notable potential for sharing of efforts and usable ideas.
- There is need for constant sharing in the accelerating evolution in technology here and abroad, particularly in traffic and safety research.
- There is need for identification of subject areas of appropriate concern for cooperative efforts.
- There is need to review and chart the unique direction in which the Board can make its best thrust.

Special Committee on Nuclear Principles and Applications (SC-8)

This Special Committee, at its January 1967 meeting, asked the Highway Research Board to incorporate it into one of the existing HRB Departments as a regular technical committee.

By special ballot of the Executive Committee this action was approved and it became Committee MC-E1 of the Department of Materials and Construction.

Special Committee on Long Range Planning (SC-10)

A new Special Committee authorized by the Executive Committee in July 1965 was appointed December 17, 1965. The committee's objectives are:

- To examine the broad emerging concepts and needs of total transportation relating to new technology and methodology and identify those for which Highway Research Board activity would be appropriate.
- To review the functions, structure and finances of the Highway Research Board with the object of defining desirable changes.
- To evaluate existing research activities and programs from the viewpoint of future needs for transportation research.

In July 1966, the HRB Executive Committee responded to several Special Committee recommendations by authorizing the committee to begin an immediate in-

tensive study to be reported for consideration at its next meeting in January 1967. The Special Committee was charged with:

- Formulating a statement of objectives and scope of a research board which encompasses study and research in transportation, regardless of mode, in addition to current activities of the Highway Research Board.
- Initiating studies of the organization of the Board so as to provide a logical framework for effective conduct of activities coming within the new scope and continuing existing activities. This portion of the study was conducted by the Executive Director and reviewed by the Long Range Planning Committee.
- Outlining possibilities for widened financial support and developing a set of guidelines which would govern the allocation of funds in support of present and possible future activities.

In accordance with this action by the Executive Committee, the Special Committee submitted statements and recommendations. As a result, the Executive Committee in January recommended that the following modified statement of purpose and scope be approved by the National Academy of Sciences:

- Purpose—The purpose of the Board is to advance knowledge concerning the nature and performance of transportation systems, through the stimulation of research and dissemination of information derived therefrom.
- Scope—The Board may give attention to all factors pertinent to the understanding, devising and functioning of systems for the safe and efficient movement of persons and goods, including: the planning, design, construction, operation and maintenance of transportation facilities and their components; the economics, financing and administration of arrangements for providing transportation; and the interaction of transportation systems with the physical, economic and social environment they are designed to serve.



46th ANNUAL MEETING

The Highway Research Board's Annual Meeting is considered to be the Board's most important single function. Held each January in Washington's Sheraton-Park Hotel, the Annual Meeting serves as a unique forum for the dissemination of highway transportation research findings from around the world.

Over 3,300 highway researchers, administrators, engineers, and others with an interest in highway transportation from the United States and 17 other countries attended the 46th Annual Meeting during the week of January 16-20, 1967. For the third consecutive year, a new attendance record was set.

From a statistical standpoint, some 357 authors and co-authors presented formal and informal papers at 63 technical sessions. In addition, 152 HRB Departments, committees, and special committees held meetings during the week. The table below gives the 46th Annual Meeting registration statistics:

REGISTRATION AT THE 46TH ANNUAL MEETING	
State Highway Departments	646 ^a
Colleges and Universities:	
Staff	380
Students	141
Industry	563
Trade Associations, Technical Societies, Institutes, and Similar Groups	269
State Governments	63
County and City Highway Departments	114
Turnpike Authorities	48
Bureau of Public Roads	356
Federal Government Agencies (including Armed Forces)	207
Press	58
Others	17
Consultants	240
Foreign Governmental	90 ^b
Foreign - Others	119 ^b
	<u>209</u>
Total	<u><u>3,311</u></u>

^a49 departments ^b17 countries

On Wednesday of the Annual Meeting week, over 600 attended the Chairman's Luncheon, one of the highlights of the five-day parley. At the luncheon, Edward G. Wetzel assumed the chairmanship of the HRB Executive Committee, succeeding J. Burch McMorran. The keynote address was delivered by Morrough P. O'Brien, Dean Emeritus of Engineering, University of California at Berkeley.

The luncheon served, too, as an appropriate time for award presentations. The Roy W. Crum Award for Distinguished Service was given to Mr. Bryant Mather of the Waterways Experiment Station. The HRB Award for the outstanding paper delivered at the previous year's Annual Meeting was shared by Conrad L. Dudek of the Bureau of Public Roads, and Charles J. Keese and Donald R. Drew of Texas A and M University.

Remarks were also made during the luncheon by Dr. Frederick Seitz, President of the National Academy of Sciences and Dr. Eric Walker, President of the National Academy of Engineering.



"The Expanding Responsibilities of the Design Profession" was the topic of the keynote address delivered at the Chairman's Luncheon by Morrrough P. O'Brien, Dean Emeritus of Engineering, University of California at Berkeley.



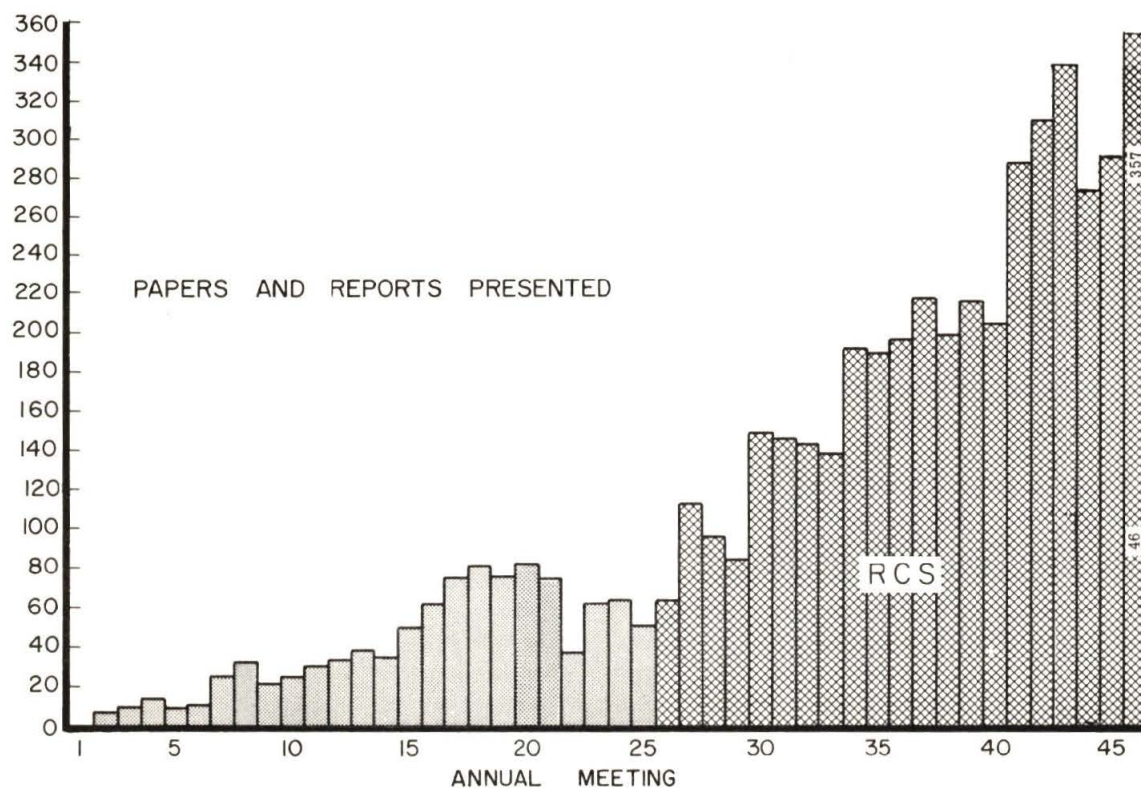
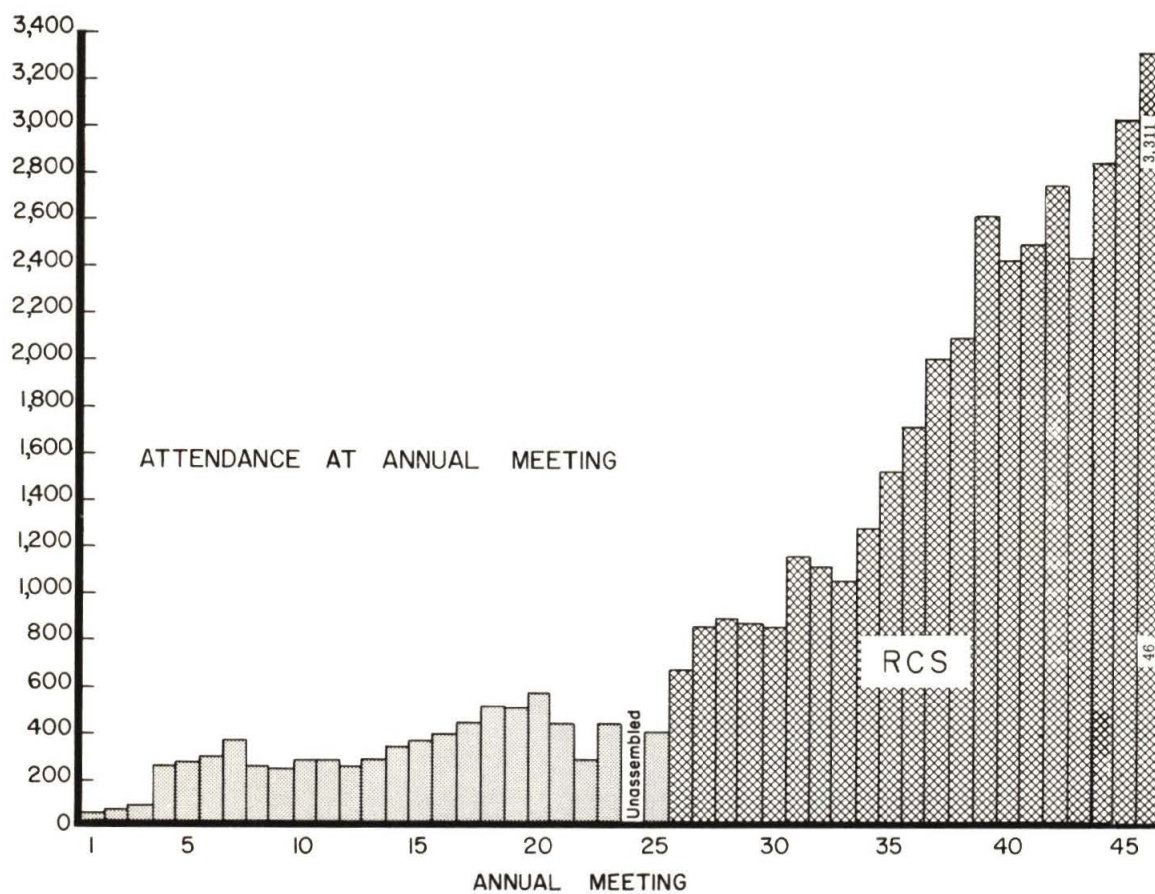
HRB Executive Committee Chairman, J. Burch McMorran, presents the coveted Roy W. Crum Award for Distinguished Service to Mr. Bryant Mather of the Waterways Experiment Station. The Award is given annually to recognize outstanding achievement in the field of highway research.



Three co-authors display the HRB Award certificates given them for having written the most outstanding paper delivered at the 45th Annual Meeting in January 1966. From left to right: Conrad L. Dudek, Bureau of Public Roads; Charles J. Keese, Texas A & M University; HRB Executive Committee Chairman, J. Burch McMorran; and Donald R. Drew, Texas A & M University.



The stewardship of the Highway Research Board changes hands as Edward G. Wetzel (right) accepts the chairmanship of the Executive Committee. Outgoing Chairman, J. Burch McMorran, takes obvious pleasure from the certificate of appreciation just given him by Mr. Wetzel.





PUBLICATIONS PROGRAM

Over the years the Highway Research Board has gained an enviable reputation as an agency that consistently reports useful results based on highway transportation research conducted in the United States and in other countries. The Board's ambitious publications program is the primary mechanism for getting this information into the hands of those who can best use it.

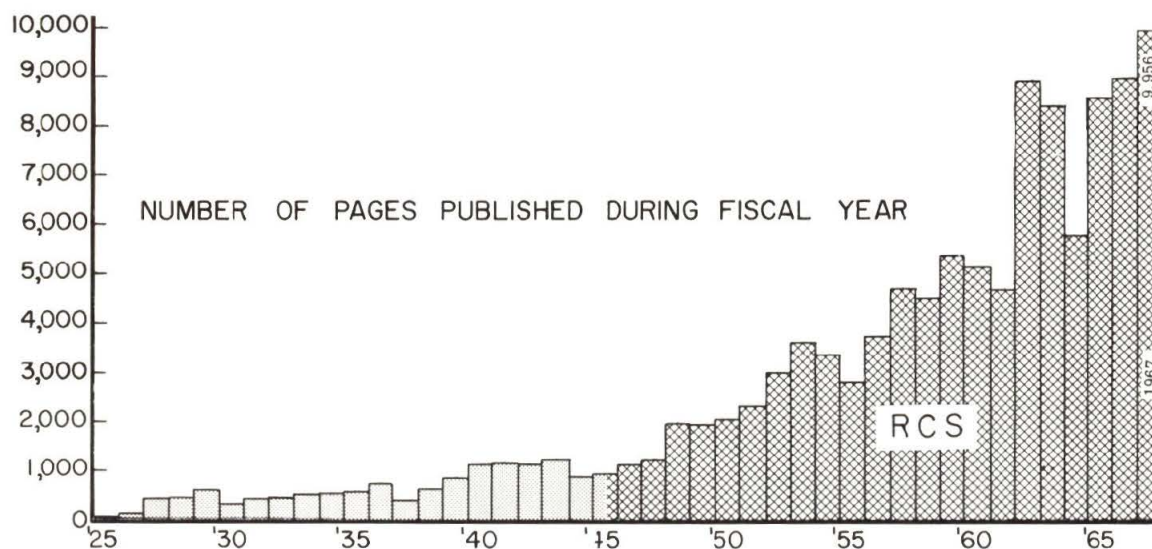
Papers that are originally presented at the HRB Annual Meetings and that are accepted for publication (following a stringent review) generally appear in the Board's **HIGHWAY RESEARCH RECORD** series. Reports of research in which the HRB staff or committees actively participate are published in the **SPECIAL REPORT** series.

Research conducted through the National Cooperative Highway Research Program is reported in a series called **NCHRP REPORTS**. The Board also publishes the widely-read monthly **HIGHWAY RESEARCH ABSTRACTS** and the quarterly **HIGHWAY RESEARCH NEWS**. The results of special committee activities are often disseminated through the **CIRCULAR** series of publications. In addition, the Board also publishes a **YEARBOOK**, a **BIBLIOGRAPHY** series, several indexes to HRB publications, and, as output from the Highway Research Information Service, a series known as **HIGHWAY RESEARCH IN PROGRESS**.

Through a recently initiated system of "selective distribution," subscribers to HRB publications may elect to receive books in up to 33 different subject areas. During fiscal year 1967, the Board published nearly 10,000 pages of technical literature under 128 separate titles. Over a quarter of a million copies of these publications were distributed to Supporting Members of the Board in the United States and in 73 foreign countries.

While most HRB publications are furnished to regular Board sponsors as one of the services rendered in consideration of their support, "over-the-counter" sales to book-sellers and interested individuals also contribute to wide circulation.

Summary of Publication Program (Fiscal Year 1967)



NUMBER AND TYPE OF PUBLICATIONS				
Type of Publication	Designated Numbers	Number Published	Number of Incorporated Papers or Reports	Number of Pages
Highway Research Abstracts	Vol. 36:7 Vol. 37:6	12	574	392
Special Reports	90-92	3	41	736
Yearbook	1967	1	—	248
Highway Research Circulars	26-63	40	42	881
Highway Research Records	125-173	49	254	4,630
Highway Research News	24-27	4	4	294
NCHRP Reports	23-33	11	11	832
Bibliographies	41-45	5	9	436
Index to H-R Abstracts	1966	1	—	24
Publication Index	1966	1	—	100
Highway Research in Progress		1	—	1,158
Miscellaneous (brochures, programs, etc.)	1966-67	5	—	225
		133	361 Reports 574 Abstracts	9,956

PUBLICATIONS BY SOURCE				
Sponsoring Department or Special Committee	Number of Papers, Committee Reports, Special Project Reports, by Method of Publication			
	Record	Special Reports	News	Other Series
Economics, Finance and Administration	21	—	—	11-Circulars
Design	47	—	1	1-Circular
Materials and Construction	35	39	—	10-Circulars 7-Bibliography
Maintenance	20	—	—	7-Circulars
Traffic and Operations	55	—	2	10-Circulars 2-Bibliography
Soils, Geology and Foundations	34	—	1	
Urban Transportation Planning	15	1	—	
Legal Studies	14	1	—	2-Circulars
Special Committee on Highway Equipment	1	—	—	
Special Committee on International Cooperative Activities	12	—	—	
National Cooperative Highway Research Program	—	—	—	11-NCHRP Reports



NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

Now entering its sixth year of operation, the Highway Research Board-administered National Cooperative Highway Research Program (NCHRP) continued during fiscal year 1967 to be a major force in solving extremely critical problems concerning highway design, construction, maintenance, and operation.

The NCHRP is the result of an agreement among the American Association of State Highway Officials, the Bureau of Public Roads, and the National Academy of Sciences. The Program is supported on a continuing basis by funds from participating member highway departments of AASHO, and it receives the full cooperation and support of the Bureau of Public Roads of the Federal Highway Administration.

Each year the participating State Highway Departments, through AASHO, submit new research problems to the NCHRP after they have been approved by a two-thirds vote of the departments. The Academy accepts the problems for administration based on recommendations by the NCHRP Advisory Committee. The acceptable research problems are then divided among appropriate broad-based Advisory Panels, each having a number of sections established to advise on the technical aspects of the various projects. (See the diagram of NCHRP organizational structure.)

The Advisory Panels draft project statements to serve as the basis for proposals from research agencies seeking contracts. These Panels also recommend awards of the contracts, provide counsel for contract administration by the Program's professional staff, and review the final reports for acceptability.

The research projects placed under contract during the past five fiscal years to date total 101 with obligated funds of about \$10.5 million. The contracts have been let to agencies headquartered in 21 states and the District of Columbia. Universities have received 44 percent of the contracts, nonprofit institutions have 28 percent, consulting and commercial firms have 27 percent, and industry has 1 percent.

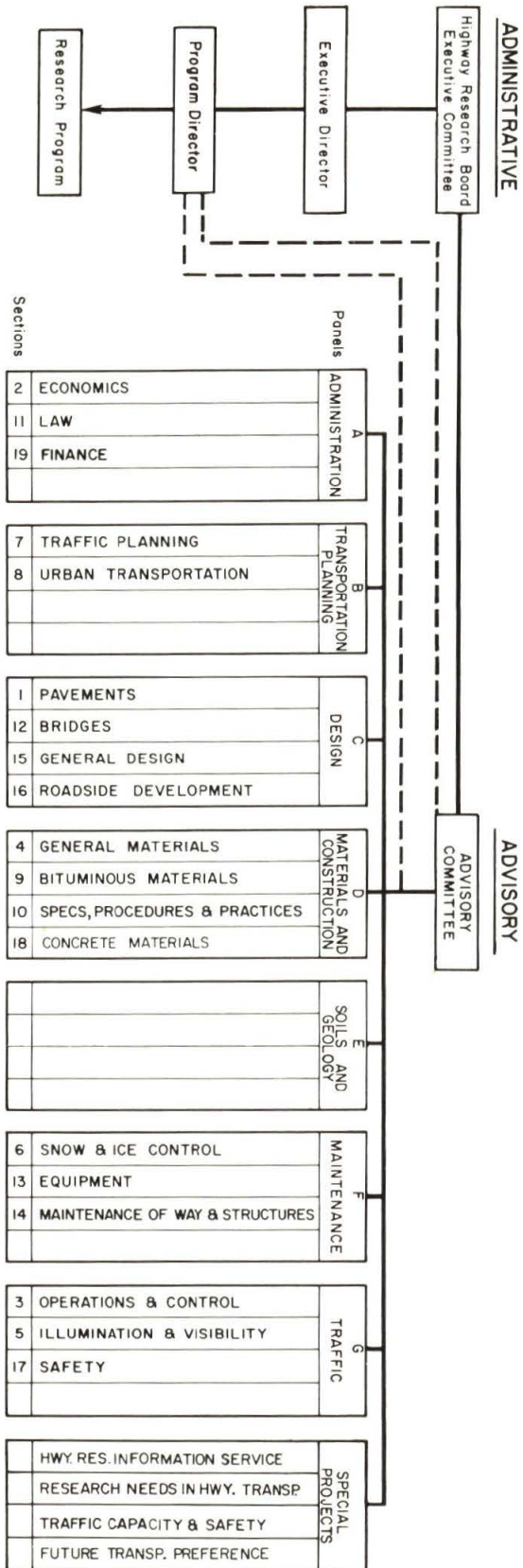
A total of 37 interim or final research reports has been published documenting the research findings of the contracting agencies. These reports, a list of which may be found on pages 37, 38 and 39, are distributed through the Board's "selective distribution" system.

Next year's Program will see at least 17 new projects signed to contract totaling about \$2.8 million. A list of those projects is on pages 40 and 41.

To keep AASHO informed throughout the year of the status of each project, as well as of the Program as a whole, four quarterly status reports covering the periods ending in June 1966, September 1966, December 1966 and March 1967, were distributed. A Summary of Progress to June 30, 1966, in which the Program was described along with the status of the projects, was printed and given wide distribution.

In addition, a rather comprehensive report on Program status and recommendations was presented to AASHO's Committee on Continuing Research Program Evaluation at its meeting on April 20 and 21, 1967.

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM Organizational Structure



Published NCHRP Reports

(As of June 30, 1967)

NCHRP Report No.	Title
*	A Critical Review of Literature Treating Methods of Identifying Aggregates Subject to Destructive Volume Change When Frozen in Concrete and a Proposed Program of Research—Intermediate Report (Project 4-3(2)) 81 pp. \$1.80
1	Evaluation of Methods of Replacement of Deteriorated Concrete in Structures (Project 6-8) 56 pp. \$2.80
2	An Introduction to Guidelines for Satellite Studies of Pavement Performance (Project 1-1) 19 pp. \$1.80
2A	Guidelines for Satellite Studies of Pavement Performance 85 pp. + 9 figs., 26 tables, 4 app. \$3.00
3	Improved Criteria for Traffic Signals at Individual Intersections—Interim Report (Project 3-5) 36 pp. \$1.60
4	Non-Chemical Methods of Snow and Ice Control on Highway Structures (Project 6-2) 74 pp. \$3.20
5	Effects of Different Methods of Stockpiling Aggregates—Interim Report (Project 10-3) 48 pp. \$2.00
6	Means of Locating and Communicating with Disabled Vehicles—Interim Report (Project 3-4) 56 pp. \$3.20
7	Comparison of Different Methods of Measuring Pavement Condition—Interim Report (Project 1-2) 29 pp. \$1.80
8	Synthetic Aggregates for Highway Construction (Project 4-4) 13 pp. \$1.00
9	Traffic Surveillance and Means of Communicating with Drivers—Interim Report (Project 3-2) 28 pp. \$1.60
10	Theoretical Analysis of Structural Behavior of Road Test Flexible Pavements (Project 1-4) 31 pp. \$2.80
11	Effect of Control Devices on Traffic Operations—Interim Report (Project 3-6) 107 pp. \$5.80
12	Identification of Aggregates Causing Poor Concrete Performance When Frozen—Interim Report (Project 4-3) 47 pp. \$3.00
13	Running Cost of Motor Vehicles as Affected by Highway Design—Interim Report (Project 2-5) 43 pp. \$2.80
14	Density and Moisture Content Measurements by Nuclear Methods—Interim Report (Project 10-5) 32 pp. \$3.00
15	Identification of Concrete Aggregates Exhibiting Frost Susceptibility—Interim Report (Project 4-3) 66 pp. \$4.00

*Highway Research Board Special Report 80.

NCHRP Report No.	Title
16	Protective Coatings To Prevent Deterioration of Concrete by Deicing Chemicals (Project 6-3) 21 pp. \$1.60
17	Development of Guidelines for Practical and Realistic Construction Specifications (Project 10-1) 109 pp. \$6.00
18	Community Consequences of Highway Improvement (Project 2-2) 37 pp. \$2.80
19	Economical and Effective Deicing Agents for Use on Highway Structures (Project 6-1) 19 pp. \$1.20
20	Economic Study of Roadway Lighting (Project 5-4) 77 pp. \$3.20
21	Detecting Variations in Load-Carrying Capacity of Flexible Pavements (Project 1-5) 30 pp. \$1.40
22	Factors Influencing Flexible Pavement Performance (Project 1-3(2)) 69 pp. \$2.60
23	Methods for Reducing Corrosion of Reinforcing Steel (Project 6-4) 22 pp. \$1.40
24	Urban Travel Patterns for Airports, Shopping Centers, and Industrial Plants (Project 7-1) 116 pp. \$5.20
25	Potential Uses of Sonic and Ultrasonic Devices in Highway Construction (Project 10-7) 48 pp. \$2.00
26	Development of Uniform Procedures for Establishing Construction Equipment Rental Rates (Project 13-1) 33 pp. \$1.60
27	Physical Factors Influencing Resistance of Concrete to Deicing Agents (Project 6-5) 41 pp. \$2.00
28	Surveillance Methods and Ways and Means of Communicating with Drivers (Project 3-2) 66 pp. \$2.60
29	Digital-Computer-Controlled Traffic Signal System for a Small City (Project 3-2) 82 pp. \$4.00
30	Extension of AASHO Road Test Performance Concepts (Project 1-4(2)) 33 pp. \$1.60
31	A Review of Transportation Aspects of Land-Use Control (Project 8-5) 41 pp. \$2.00
32	Improved Criteria for Traffic Signals at Individual Intersections (Project 3-5) 134 pp. \$5.00
33	Values of Time Savings of Commercial Vehicles (Project 2-4) 74 pp. \$3.60
34	Evaluation of Construction Control Procedures—Interim Report (Project 10-2) 117 pp. \$5.00

NCHRP Report No.	Title
35	Laboratory Repeated Load Tests (Project 1-3(3))
36	Highway Guardrails: A Review of Current Practices (Project 15-1)
37	Tentative Skid Resistance Requirements for Main Rural Highways (Project 1-7)

Summary of Research Projects in the Fiscal Year 1968 Program

Area and Title		Project No.	Allocated Amount
ONE:	<u>DESIGN—PAVEMENTS</u>		
	Project 1-11 Evaluation of AASHO Interim Guides for Design of Pavement Structures	1-11	\$ 64,400.00
THREE:	<u>TRAFFIC—OPERATIONS AND CONTROL</u>		
	Project 3-13 Guidelines for Medial and Marginal Access Control of Major Roadways	3-13	\$ 150,000.00
	Project 3-14 Optimizing Flow on Existing Street Networks	3-14	\$1,000,000.00
FOUR:	<u>MATERIALS AND CONSTRUCTION—GENERAL MATERIALS</u>		
	Project 4-7 Fatigue Strength of High Yield Reinforcing Bars	4-7	\$ 100,000.00
	Project 4-8 Research Needs Relating to Performance of Aggregates in Highway Construction	4-8	\$ 60,000.00
FIVE:	<u>TRAFFIC—ILLUMINATION AND VISIBILITY</u>		
	Project 5-6 Highway Fog	5-6	\$ 100,000.00
SIX:	<u>MAINTENANCE—SNOW AND ICE CONTROL</u>		
	Project 6-10 Develop Improved Snow Removal and Ice Control Techniques at Interchanges	6-10	\$ 50,000.00
TWELVE:	<u>DESIGN—BRIDGES</u>		
	Project 12-8 Bridge Rail Service Requirements as a Basis for Design Criteria	12-8	\$ 30,000.00
	Project 12-9 Elastomeric Bearing Research	12-9	\$ 85,000.00

Area and Title			Project No.	Allocated Amount
FIFTEEN:	<u>DESIGN—GENERAL DESIGN</u>			
	Project 15-3	Rational Structural Analysis and Design of Pipe Culverts	15-3	\$ 50,000.00
	Project 15-4	Estimating Runoff Rates from Small Rural Watersheds	15-4	\$ 300,000.00
	Project 15-5	Dynamic Characteristics of Heavy Highway Vehicles	15-5	\$ 150,000.00
	Project 15-6	Development of Criteria for Safer Luminaire Supports	15-6	\$ 150,000.00
SIXTEEN:	<u>DESIGN—ROADSIDE DEVELOPMENT</u>			
	Project 16-2	Evaluation of Research on Roadside Development	16-2	\$ 100,000.00
EIGHTEEN:	<u>MATERIALS AND CONSTRUCTION—CONCRETE MATERIALS</u>			
	Project 18-1	Revibration of Retarded Concrete for Continuous Bridge Decks	18-1	\$ 100,000.00
NINETEEN:	<u>ADMINISTRATION—FINANCE</u>			
	Project 19-1	Budgeting for State Highway Departments	19-1	\$ 45,000.00
TWENTY:	<u>SPECIAL PROJECTS</u>			
	Project 20-4	Public Preference for Future Individual Transportation	20-4	\$ 285,000.00
			GRAND TOTAL	\$2,819,400.00



HIGHWAY RESEARCH INFORMATION SERVICE

The Highway Research Board's computer-based Highway Research Information Service (HRIS) officially went into operation on July 1, 1967.

With 16,000 references now stored on the computer's tapes, and 10,000 new items expected to be added each year, the HRIS represents one of the most complete collections of information on highway-related research available in this country.

As such, it augments the traditional research correlation and dissemination functions of the Board. Along with the other services offered by the Board, this automated information storage and retrieval system will help practicing highway engineers and administrators make the best possible use of research findings. It should also save time, money and duplication in future highway research.

The scope of the subjects covered in the system is as broad as the problems of planning, building, maintaining and operating transportation systems. Subjects range from parking regulation to soil stabilization, from aggregates to aesthetics, from hydrology to psychology—anything having to do with highway travel or its interaction with other modes of transportation.

Both ongoing and completed research projects are cataloged. Research projects that are in progress are entered onto the computer's tapes as summaries of the facts and objectives of each project. These summaries will be updated at least once a year. Completed research reports, representing about two-thirds of the items in the HRIS, are entered as abstracts. Comprehensive coverage of these reports dates from 1967. Several thousand pre-1967 references to works of major and lasting importance were selected for entry by HRB staff engineers and committees.

The documents represented in the system come from some 2,000 domestic and foreign sources, including private and governmental research agencies, colleges and universities, and periodicals and technical journals. Major contributors are the U. S. Bureau of Public Roads (BPR), other information services—both foreign and domestic—with which the Board has made exchange agreements, and the Board itself.

The HRIS was developed over a three-year period at a cost of over \$800,000. Design and development of the system was under the direction of Dr. Paul E. Irick, HRB Assistant Director for Special Projects. Operation of the service is under HRIS Manager Arthur B. Mobley.

As a project in the HRB-administered National Cooperative Highway Research Program, development of the system was financed by the state highway departments and the BPR. These are the two groups which are also expected to be the biggest users of the system, but anyone with an interest may participate.

Three kinds of service will be provided. One type is a published listing of a specific block of references in the system. To date, four major publications have been issued using this mode; the latest, released in May, was a second edition of Highway Research In Progress, which contains some 5,000 summaries of research projects from here and abroad for the period 1964-1967.

"Current awareness" reporting, the second type of service, provides a periodic up-to-date report on specific subjects. Users who request this service specify their interests and these are matched against recent HRIS acquisitions.

The third type of service involves searching the system to find research references that will answer a particular question posed by a user. HRB staff men review and refine the questions before matching them against the complete HRIS

files. Staff engineers also review the computer printout to make sure the user will receive the information he is looking for. They may supplement the printout with documents, reference lists or other material supplied by the professional and library resources of the Board.

Seldom does this include full research reports, unless they have been printed by the HRB. Users may obtain copies of the full reports from the agency conducting the research, the sponsor of the project or the publication source.

Costs for the various types of service will be announced in the near future.



SUPPORTING MEMBERS OF THE HIGHWAY RESEARCH BOARD

Organizations may apply for Supporting Membership in the Highway Research Board, if they are engaged in research related to highways or highway transportation, if their activities are educational in character, or if they are interested in technical development relating to highways within an industry or group of industries.

There are thirteen Organizational Supporting Membership categories consisting of government units, educational institutions, professional societies, service organizations, transportation agencies, trade associations, industrial concerns, and consulting engineers. Although there was an adjustment in the fee structure effective January 1, 1966, accompanied by a more selective publication distribution, there has been no appreciable loss in the number of organizational supporting memberships. The estimated total income from such membership fees has actually increased. Within these thirteen categories there are, at the present time, approximately 200 organizations affiliated with the Board.

In addition to organizational members, the Board invites application for Individual Supporting Membership from persons interested in its activities who desire to further the work of the Board. There are three classes of Individual Supporting Memberships: General, Student, and Academic. Beginning with the calendar year 1966 special subscription plans were offered Individual Supporting Members which gear their annual membership fee to publications desired.

The new subscription plans have proved very popular with the Board's Individual Supporting Members. Over 75 percent have selected a plan under which they receive technical publications in five or more areas of interest. Even with adjustment of membership fees the number of Individual Supporting Members is now above that of previous years and totals approximately 1,700. Estimated income from Individual Supporting Members has, under the new membership fee structure, increased over 20 percent, but, more important, the Board's publications are going to the people who want them.



SUMMARY FINANCIAL STATEMENT*

(For Fiscal Year Ending June 30, 1967¹)

Income During Fiscal Year 1967		
State Highway Departments (Research Correlation Service)	\$ 658,000	
Bureau of Public Roads	156,400	
Dues from Supporting Members	148,500	
Library Subscriptions	28,900	
Publication Sales	120,000 ²	
Registration Fees	17,300	
Miscellaneous	9,800 ³	
Total Collections	<u>\$1,138,900</u>	
Plus Reprogramming of Savings	20,200	
Plus Deferred Income from Fiscal Year 1966	72,800	
Less Unearned Income to Fiscal Year 1968	<u>88,700</u>	
Income Applicable to Fiscal Year 1967		<u>\$1,143,200</u>
Expenses During Fiscal Year 1967		
Salaries	\$ 540,920	
Travel	69,300	
Communications and Shipping	39,100	
Services and Supplies	31,300	
Furniture and Equipment	37,000	
Printing and Duplicating	202,000	
Indirect Cost	<u>223,580</u>	
Expenses Applicable to Fiscal Year 1967		<u><u>\$1,143,200</u></u>

¹ Estimates.

² Orders for publications in addition to selective distribution.

³ Includes special grants and contributions in the total amount of \$9,500 from Automotive Safety Foundation, ENO Foundation and The Asphalt Institute for support of publications and committees of the Board. (See page 46.)

*The statement does not include fiscal information regarding the National Cooperative Highway Research Program or the Highway Research Information Service, both of which were independently financed during FY '67.



SPECIAL GRANTS AND CONTRIBUTIONS

During the fiscal year the Board was fortunate in receiving special grants and contributions totaling \$9,500 in addition to budgeted income which provided partial support for a number of publications and the activities of several committees.

Specifically, the Automotive Safety Foundation provided a grant of \$3,500 to assist in the financing of the cost of committee travel of the Department of Urban Transportation Planning.

The Eno Foundation for Highway Traffic Control, Inc., contributed \$5,000 as financial support in publishing HIGHWAY RESEARCH RECORD No. 163, "Highway Safety," and No. 164, "Night Visibility."

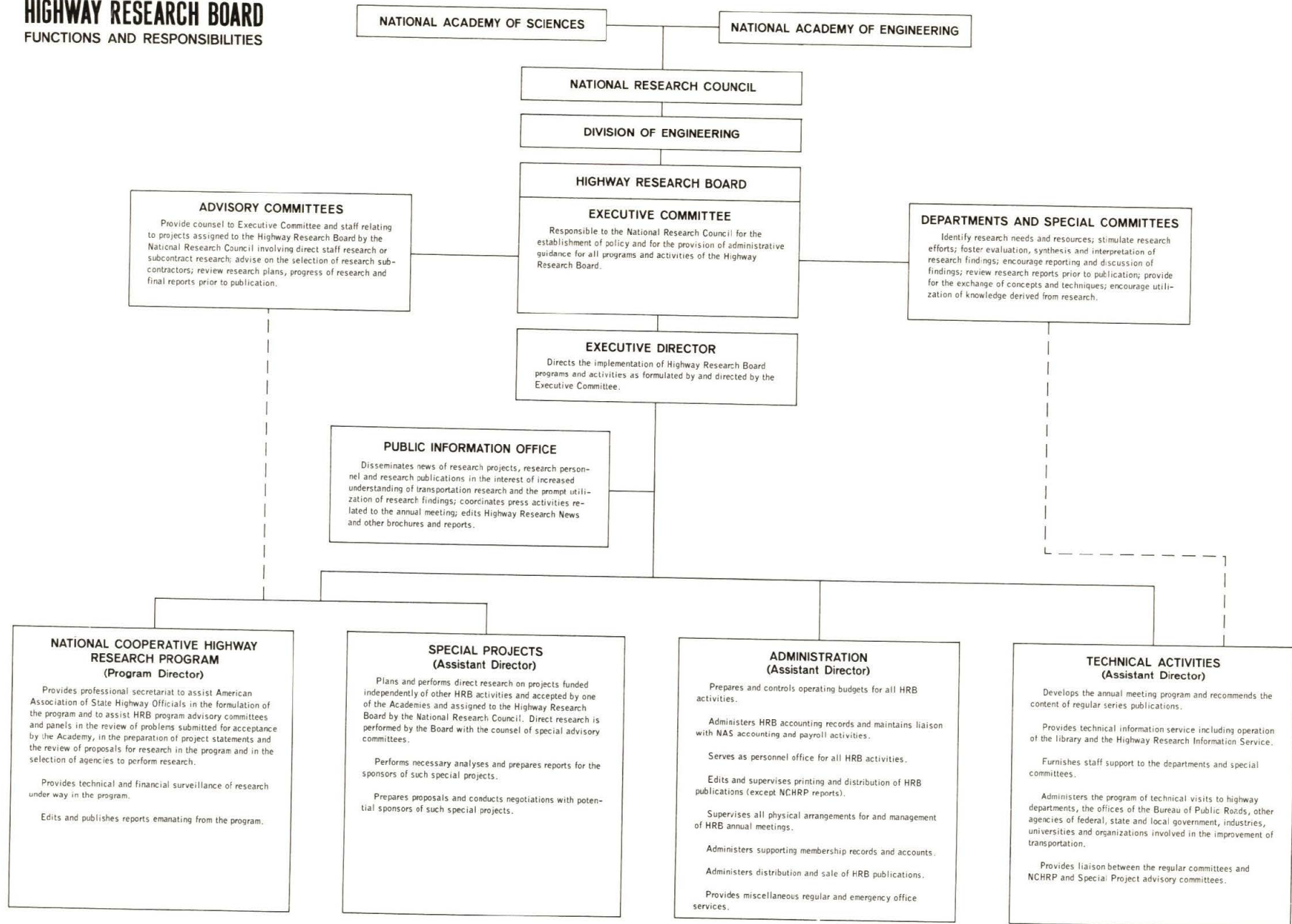
The Asphalt Institute continued its support of the Special Committee on Research Problems of Mutual Interest and Concern to Users and Producers of Asphaltic Materials with a contribution of \$1,000 toward committee activities.

Funds contributed by the Calcium Chloride Institute were available from prior years to continue the work of the Soil-Calcium Chloride Stabilization Committee of the Department of Soils, Geology and Foundations.

In addition to the above, contributions were received from the International Municipal Parking Congress and the National Parking Association to help defray the publication costs of BIBLIOGRAPHY 44, "Parking."

HIGHWAY RESEARCH BOARD

FUNCTIONS AND RESPONSIBILITIES





PROFESSIONAL STAFF 1967

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Assistant Director for Administration

Public Information Officer

Engineer, Special Assignments

Administrative Officer

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J. C. Allen

D. H. Buswell

M. E. Campbell

E. C. Squires

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Assistant Director for Technical Activities

Engineer, Special Assignments

Highway Economist

Engineer of Design

Engineer of Materials and Construction

Assistant Engineer of Materials and Construction

Engineer of Maintenance

Engineer of Traffic and Operations

Engineer of Soils, Geology and Foundations

Urban Transportation Planning Specialist

Counsel for Legal Research

Librarian

Manager, Highway Research Information Service

Information Engineer

Information Specialist

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E. A. Mueller

J. W. Guinee

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Mrs. D. Bright

A. B. Mobley

R. C. Peden

Mrs. V. A. Carbauh

SPECIAL PROJECTS

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Principal Investigator

Principal Investigator

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B. A. Bledsoe

G. P. St. Clair

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

Program Director

Assistant Program Director

Projects Engineer

Projects Engineer

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K. W. Henderson, Jr.

H. H. Bissell

H. A. Smith

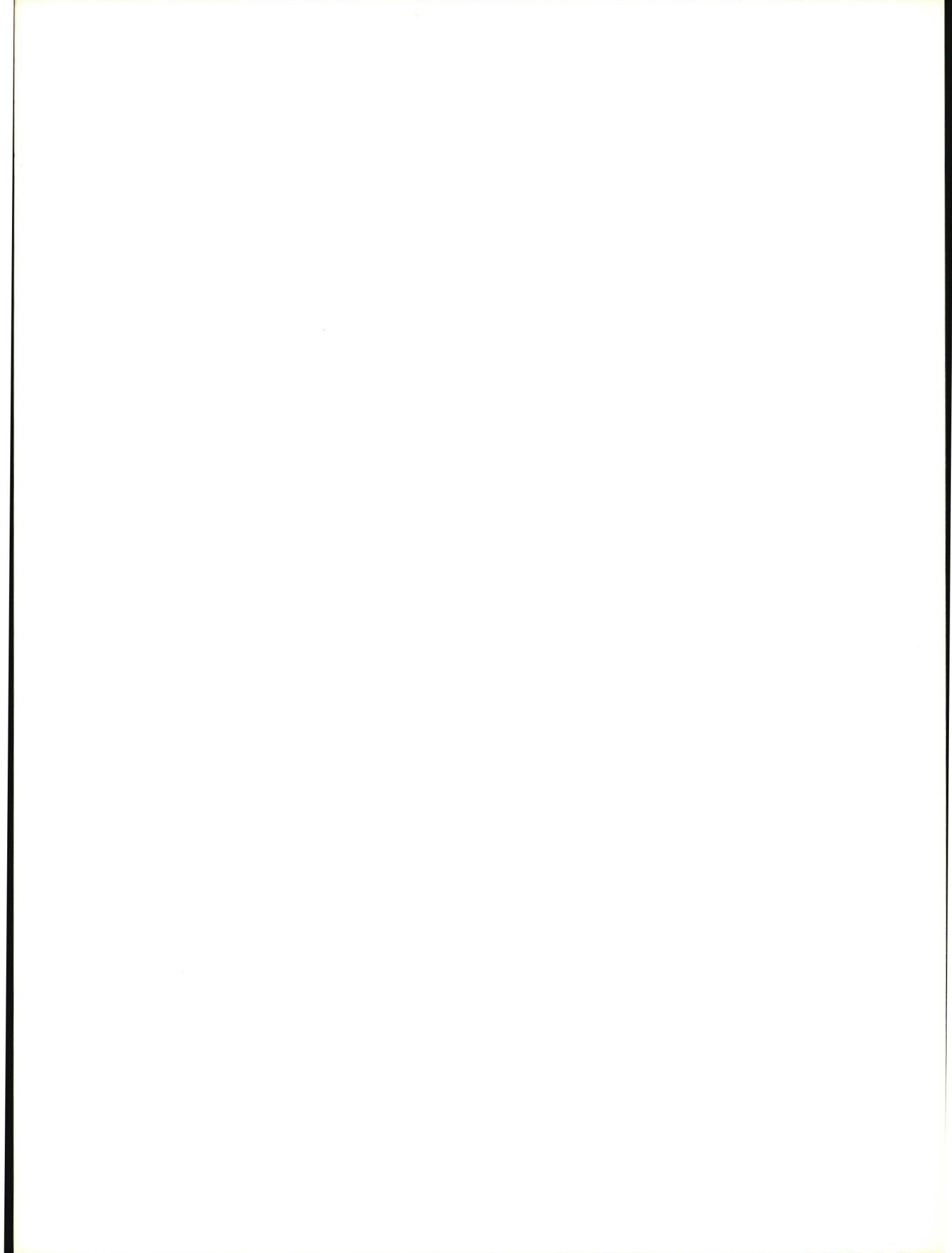
Projects Engineer
Editor

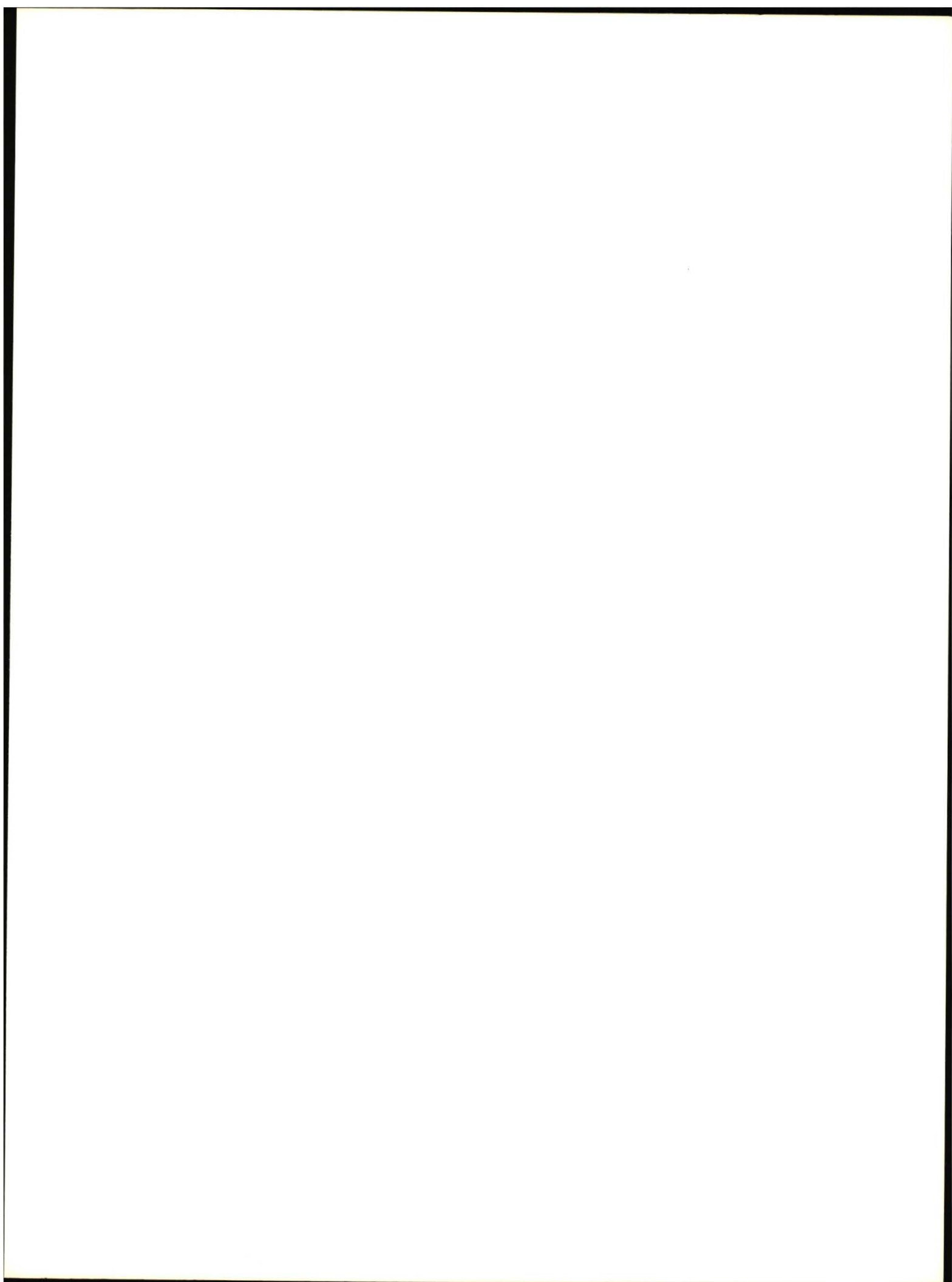
W. L. Williams
H. P. Orland

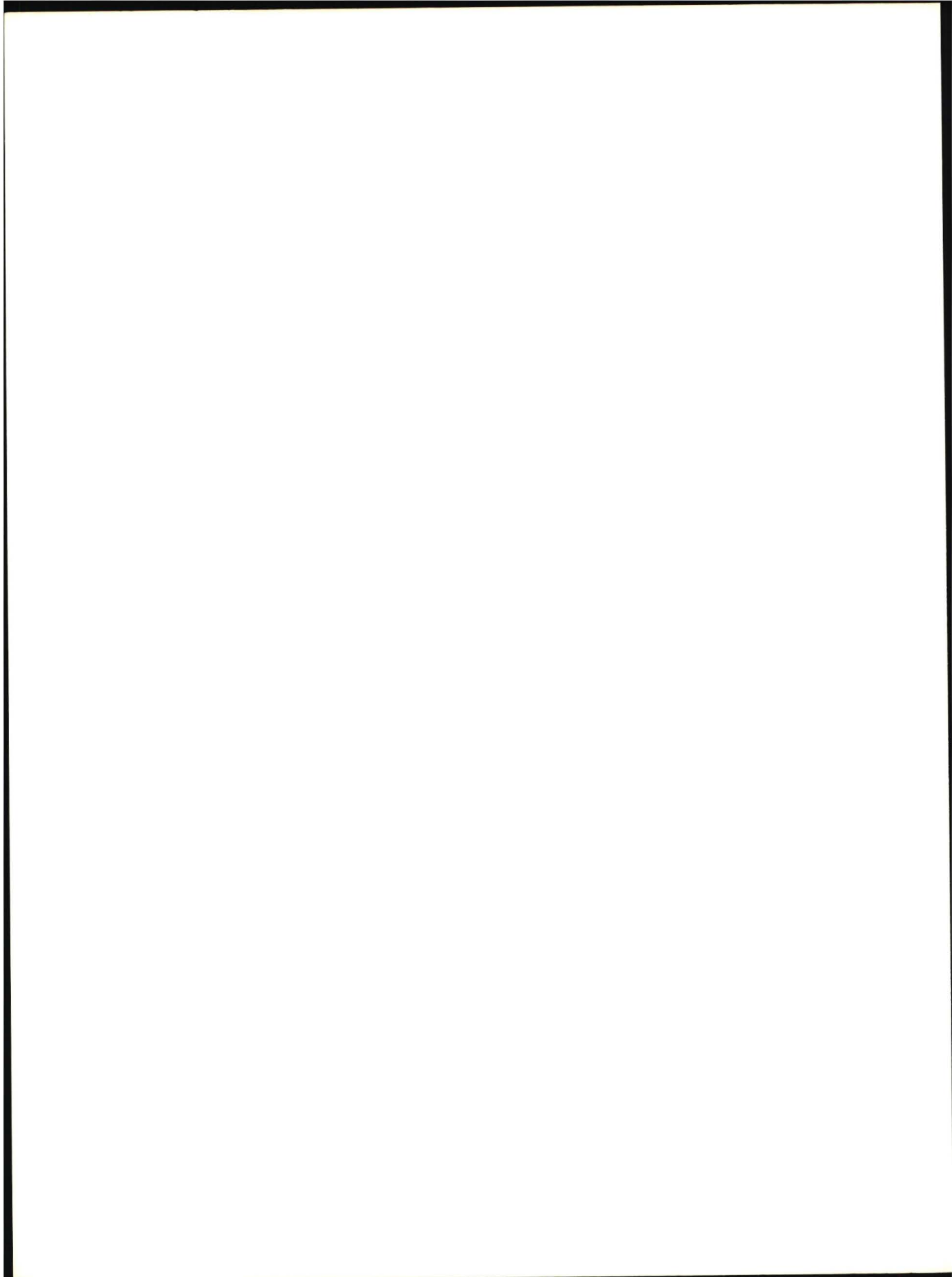
PUBLICATIONS OFFICE

Senior Editor
Production Manager

E. W. Jackson
Mrs. B. G. Crofoot







THE NATIONAL ACADEMY OF SCIENCES is a private, honorary organization of more than 700 scientists and engineers elected on the basis of outstanding contributions to knowledge. Established by a Congressional Act of Incorporation signed by Abraham Lincoln on March 3, 1863, and supported by private and public funds, the Academy works to further science and its use for the general welfare by bringing together the most qualified individuals to deal with scientific and technological problems of broad significance.

Under the terms of its Congressional charter, the Academy is also called upon to act as an official—yet independent—adviser to the Federal Government in any matter of science and technology. This provision accounts for the close ties that have always existed between the Academy and the Government, although the Academy is not a governmental agency and its activities are not limited to those on behalf of the Government.

The NATIONAL ACADEMY OF ENGINEERING was established on December 5, 1964. On that date the Council of the National Academy of Sciences, under the authority of its Act of Incorporation, adopted Articles of Organization bringing the National Academy of Engineering into being, independent and autonomous in its organization and the election of its members, and closely coordinated with the National Academy of Sciences in its advisory activities. The two Academies join in the furtherance of science and engineering and share the responsibility of advising the Federal Government, upon request, on any subject of science or technology.

The NATIONAL RESEARCH COUNCIL was organized as an agency of the National Academy of Sciences in 1916, at the request of President Wilson, to enable the broad community of U.S. scientists and engineers to associate their efforts with the limited membership of the Academy in service to science and the nation. Its members, who receive their appointments from the President of the National Academy of Sciences, are drawn from academic, industrial and government organizations throughout the country. The National Research Council serves both Academies in the discharge of their responsibilities.

Supported by private and public contributions, grants, and contracts, and voluntary contributions of time and effort by several thousand of the nation's leading scientists and engineers, the Academies and their Research Council thus work to serve the national interest, to foster the sound development of science and engineering, and to promote their effective application for the benefit of society.

The DIVISION OF ENGINEERING is one of the eight major Divisions into which the National Research Council is organized for the conduct of its work. Its membership includes representatives of the nation's leading technical societies as well as a number of members-at-large. Its Chairman is appointed by the Council of the Academy of Sciences upon nomination by the Council of the Academy of Engineering.

The HIGHWAY RESEARCH BOARD, an agency of the Division of Engineering, was established November 11, 1920, as a cooperative organization of the highway technologists of America operating under the auspices of the National Research Council and with the support of the several highway departments, the Bureau of Public Roads, and many other organizations interested in the development of highway transportation. The purposes of the Board are to encourage research and to provide a national clearinghouse and correlation service for research activities and information on highway administration and technology.

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JUL 14 1967

DIVISION OF RESEARCH
AND EVALUATION