CALIFORNIA Highways and Public Works

SEPTEMBER–OCTOBER
1963

State Reorganization Changes Department, Commission

The 1963 Legislature made several changes in organization which affect the state highway program. Generally, they are further steps which implement Governor Brown's executive reorganization program and carry forward the activation of the Highway Transportation Agency.

The two most important changes are (1) Division of Architecture leaves the Department of Public Works, and (2) the Highway Transportation Agency Administrator becomes chairman of the California Highway Commission and a member of the California Toll Bridge Authority.

A Department of General Services comes into existence on October 1, 1963 (A.B. 2006, Marks and Knox, coauthors: Senators Miller and Sturgeon). As long studied and often recommended, the department will be responsible for central business management functions and other central services for the operation of state government. While most of these services are transferred from the Department of Finance, the Division of Architecture, which is the central design and construction service for state government, will move from the Department of Public Works to the new department. The Department of Finance retains its central fiscal and management planning responsibilities.

All employees of the Division of Architecture are automatically transferred to the new department on October 1, with no change in status.

In another important area, the Legislature and the Governor moved to strengthen the Highway Transportation Agency, which had been created in 1961 as a major element in the executive reorganization program. In S.B. 1019 (Collier) the following changes were made, effective September 21, 1963:

(1) The Administrator of the Highway Transportation Agency becomes ex officio member and chairman of the California Highway Commission in place of the Director of Public Works.

The Director of Public Works now becomes the administrative officer to the California Highway Commission.

(2) Similarly, the Administrator replaces the Director of Public Works as a member of the California Toll Bridge Authority, and the director becomes administrative officer to the authority.

(3) The Division of Contracts and Rights-of-way and the Division of Bay Toll Crossings are established by statute as major components of the department, in addition to the Division of Highways, which had already been created by law. Until now, the Divisions of Contracts and Rights-of-way and Bay Toll Crossings had been created by administrative order of the director.

The Director of Public Works, however, still organizes the work of the Department, assigns functions and responsibilities to the divisions, and has the authority to create additional divisions by administrative action, with the approval of the Governor, if they should be required.

(4) There is a slight change in the name of one division: the Division of San Francisco Bay Toll Crossings becomes the Division of Bay Toll Crossings.

(5) The appointments of the Director of Public Works and the Administrator of the Highway Transportation Agency are made subject to confirmation by the Senate.

(6) The Administrator of the Highway Transportation Agency is given the authority to exercise any power or jurisdiction, or to assume or discharge any responsibility, or to carry out or effect any of the purposes vested by law in any department in the agency. The three departments which make up the Highway Transportation Agency are the Departments of Public Works, California Highway Patrol, and Motor Vehicles.

(Editor's note: For report on other 1963 legislative actions affecting the Division of Highways, see page 12.)

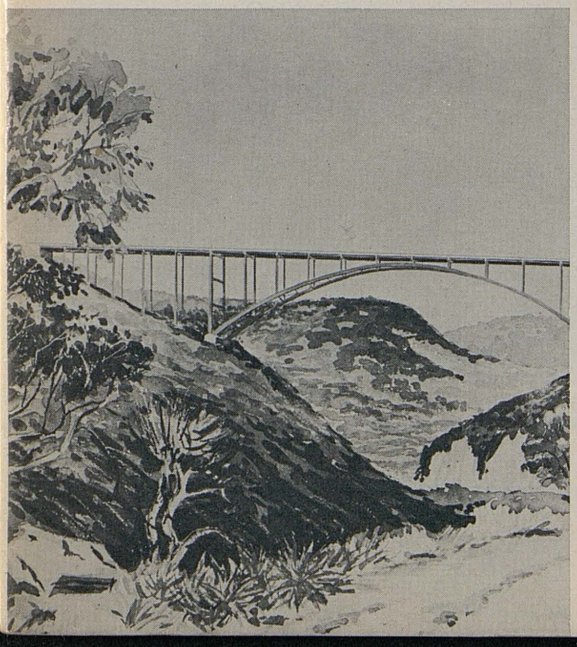
California Highways and Public Works

Official Journal of the Division of Highways, Department of Public Works, State of California

Vol. 42 September-October Nos. 9-10

FRONT COVER: Division of Highways Employee Clifford Ahnlund, District VIII, demonstrates correct flagging procedure for controlling traffic when road is obstructed by equipment. Skip loader is picking up debris from slide on Rim of the World Highway near Big Bear Lake, San Bernardino County. Photograph by Lyman Rich, Claims Investigator, District VIII. See story on page 32.

BACK COVER: Artist's painting of new Cold Springs Canyon Bridge on State Sign Route 150, Santa Barbara County. See story on page 14 this issue. Painting by William Tuthill, Bridge Architecture Section, Headquarters.



CONTENTS

LESTER S. KORITZ, *Editor*

STEWART MITCHELL, *Associate Editor* JOHN C. ROBINSON, *Associate Editor*

WILLIAM R. CHANEY, *Chief Photographer*

Editors are invited to use information contained herein and to request prints of any black and white photographs.

Address communications to: EDITOR,

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

P.O. Box 1499

SACRAMENTO, CALIFORNIA

Collier Tunnel

New Project on U.S. 199 Is Officially Dedicated

By FREDERICK GRAEBE, Associate Bridge Engineer and
RICHARD C. WARNER, Associate Highway Engineer

The Randolph Collier Tunnel and approaches, located two miles south of the California-Oregon border on U.S. 199, was dedicated and opened to traffic on July 20, 1963, after nearly 3½ years of construction. The dedication ceremonies, which were attended by dignitaries from California, Oregon and Nevada, honored veteran State Senator Randolph Collier, who represents Del Norte and Siskiyou Counties and is nationally known as a leader in highway legislation. United States Senator Clair Engle unveiled the dedication plaque and aided Senator Collier in the ribbon cutting ceremony.

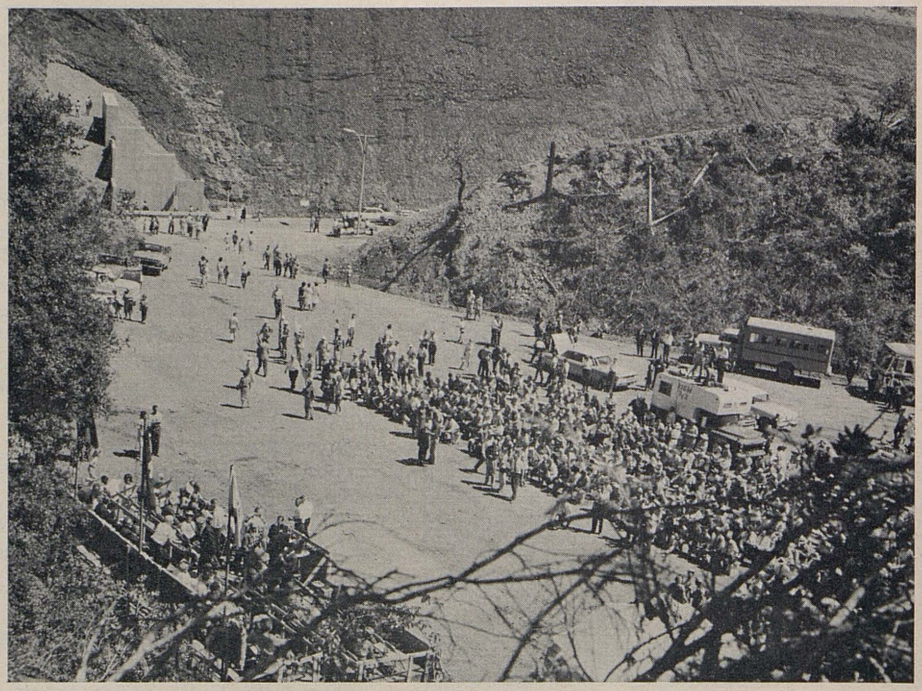
The tunnel project, with its approaches, was completed at a cost of nearly $7,500,000, in four separate contracts.

The initial contract provided for grading of the north approach; this work was accomplished by the Gibbons and Reed Construction Company at a cost of $446,000. A second contract, awarded to Morrison-Knudsen for $2,440,000 covered construction of the south approach as well as surfacing of the north approach. The tunnel portion of the project was built by the Grafe-Callahan Construction Company at a cost of $4,350,000. The fourth and final contract was awarded to Meyers Industrial Electric Company for installation of tunnel lighting and ventilating equipment—total cost $150,000.

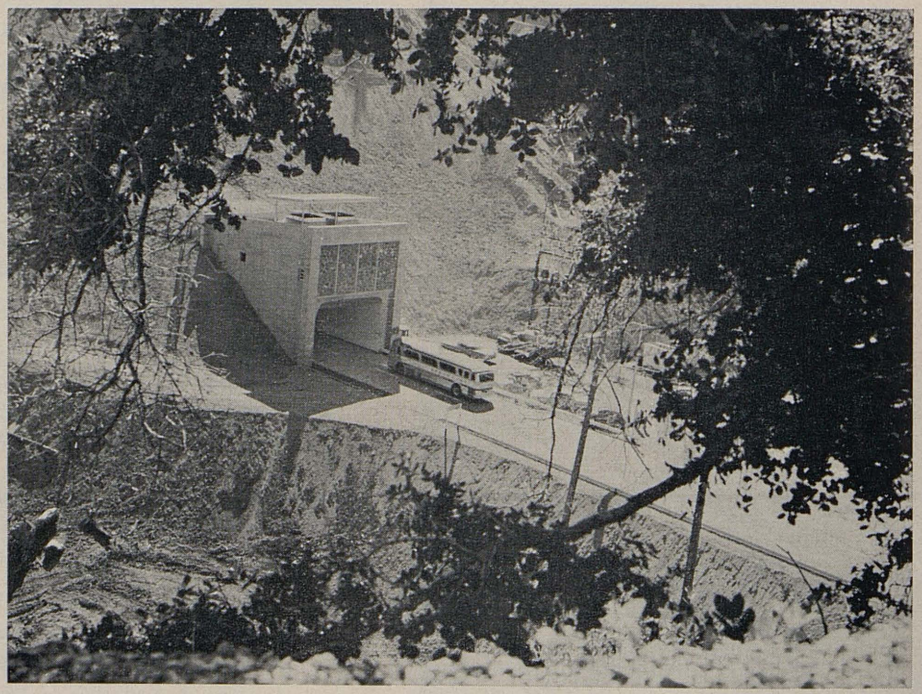
Freeway Standards

The completed project has a total length of 4.3 miles of modern two-lane highway constructed to freeway standards of grade and alignment. It

(Editor's Note: Previous articles on this project were published in the September-October 1960 and May-June 1961 issues.)



Dedication of the tunnel on July 20 drew hundreds of people and many dignitaries from California, Oregon and Nevada to honor veteran State Senator Randolph Collier in ceremonies near the south portal.



Traffic began to use the new tunnel immediately after its dedication. Here a bus enters the north portal. Note the covered ventilation structure on top of the portal.

replaces more than seven miles of narrow, twisting mountain road which formerly snaked its way over the Hazelview Summit of Oregon Mountain. On the old road over the summit a motorist was required to negotiate five steep switchbacks and make a total of 144 turns, many of which were posted for speeds of 25 mph and less.

As a contrast, the new road has been designed for 60-mph speeds and has but 16 curves. In addition, the new highway is some 350 feet lower in elevation at its highest point—a factor which materially reduces the snow removal problem during the winter months.

The key to the appreciable saving in distance and time which the new project affords is the Randolph Collier Tunnel. This structure has a portal-to-portal length of 1,835 feet and provides two 13-foot traffic lanes and two 2′6″-wide safety curbs.

A northward view of heavy grading operations last year near the south tunnel approach.

An aerial of the project looking toward the south portal of the tunnel. The old highway (left) winds through the Oregon Mountain forest and Hazelview Summit

A welder attaches a brace to a steel support of the east footing drift.

Began at North Portal

Tunnel construction began at the north portal, where the contractor first excavated two parallel footing drifts, each with a horseshoe-shaped cross section about 15 feet high and 15 feet wide at the base. Excavation for these two drifts was accomplished by the shield method. Fitted with a cutting edge in the front, the shield was forced into the mountain by six 45-ton jacks mounted at the rear of the shield. Arch-shaped steel drift supports were placed under protection of the shield and were blocked and lagged with timbers to support the excavated tunnel bore. After both drifts had been excavated some 600 feet into the mountain, the footing sections of the permanent arch lining were constructed.

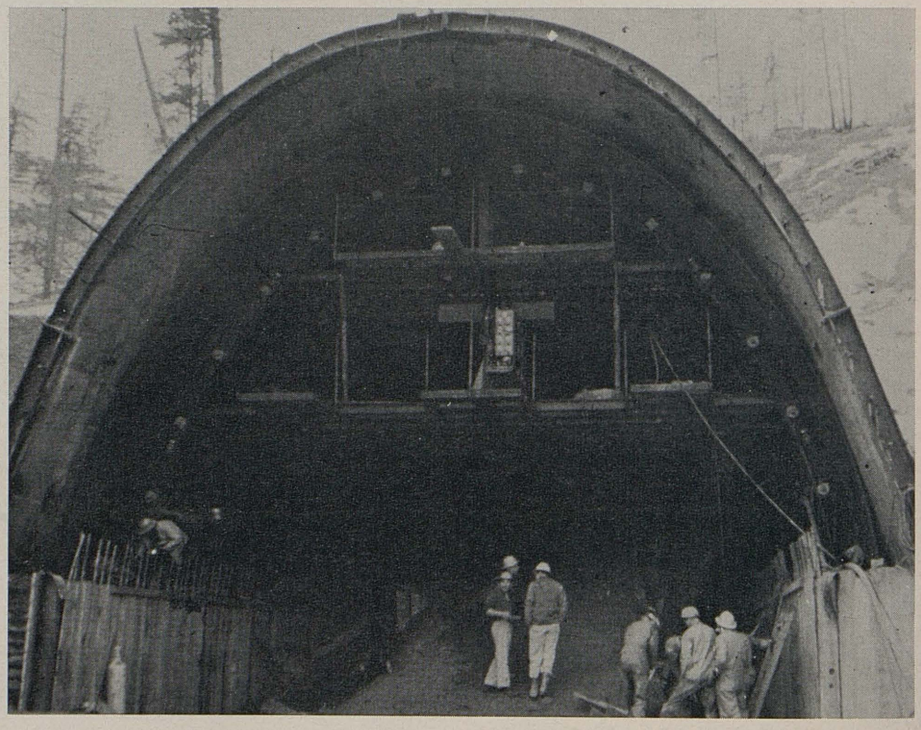
After completion of the arch footings, a second larger shield was used to complete excavation of the north portal heading. Skidding on rails cast into the concrete footing walls, the top heading shield was forced into the mountain by a battery of 20 jacks capable of a maximum jacking force in excess of 1,000 tons. Excavation and support of the top heading followed the same pattern—except on a larger scale—as established during the footing drift operation. Top heading shield mining was discontinued when the end of the arch footings was reached—600 feet in from the north portal.

Larger Bore Used

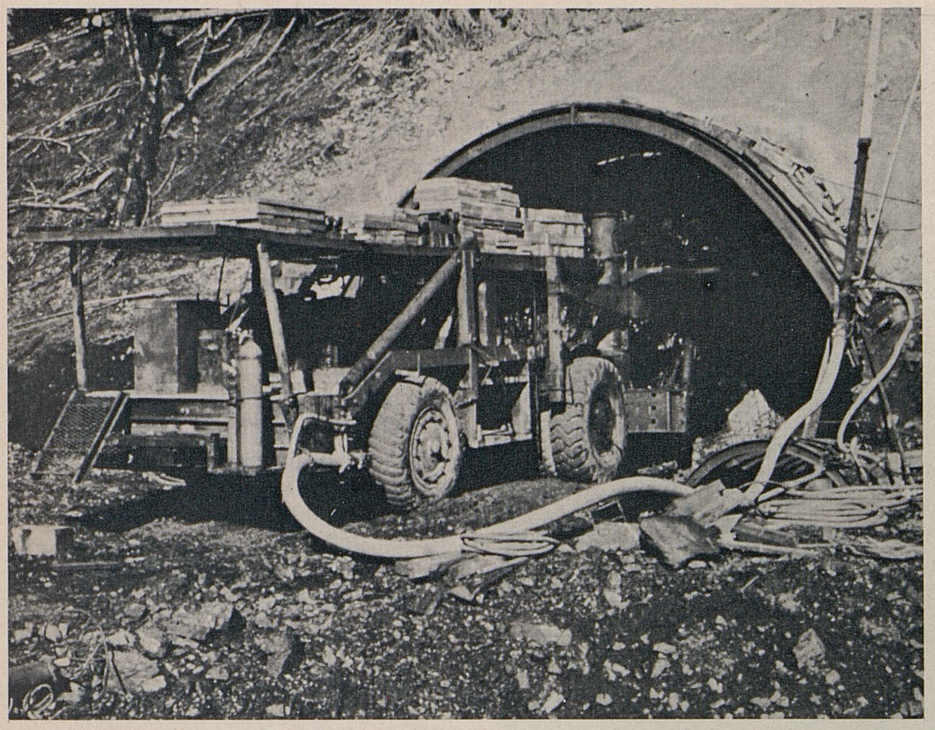
Simultaneously with the north portal excavation, the remaining 1,200 feet of tunnel were driven from the south portal. More favorable rock conditions at the south portal allowed the contractor to proceed initially with the excavation of a much larger bore.

The first excavation phase consisted of an arch-shaped top heading 15 feet high and 30 feet wide at the base. Two subsequent bench excavation operations lowered the floor of the initial heading 7 feet and 10 feet, respectively, until the full size of the bore was excavated. As the steel supports were undermined by the successive bench operations, additional support posts were installed as underpinning to transfer the rock load to the new heading floor.

As the various excavation stages permitted, portions of the concrete arch lining were constructed. As mentioned above, arch footings were constructed in the north footing drifts after completion of drift excavation. After completion of the north bore top heading excavation, the remaining concrete lining above the footings was poured in 25-foot sections, beginning



The north portal top heading shield, supported upon footing wells, enters into the mountain beyond.



The excavation jumbo enters the bore at the south portal top heading excavation area.

600 feet underground and proceeding toward the north.

In the south heading 25 100-foot sections of arch footing were constructed in sequence with the bottom bench excavation. The remainder of the arch lining was completed in 50-foot sections beginning at the south portal and proceeding toward the center of the tunnel.

Regulated Electroliers

The tunnel is continuously illuminated by electroliers regulated by outside photoelectric cells. Tunnel lighting is aided by a luminous epoxy paint on the walls and ceiling.

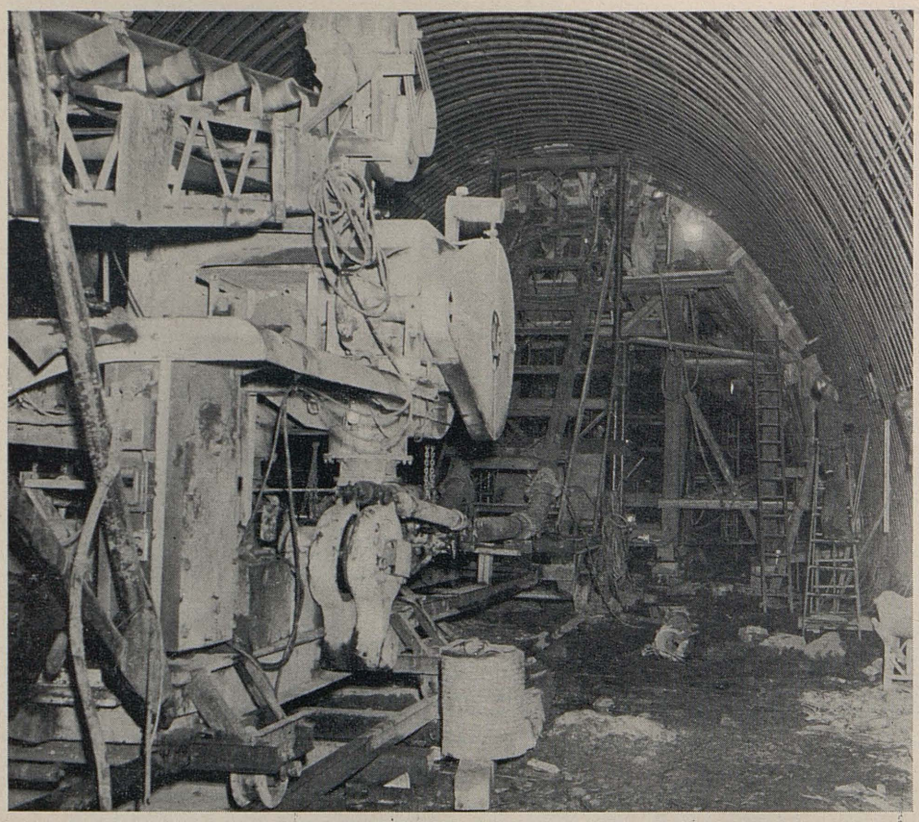
In addition to the tunnel, the completed project required the construction of over four miles of new highway. Grading was perhaps the most challenging feature of the road contracts, particularly at the south approach where the new alignment traverses extremely rugged terrain within the Six Rivers National Forest. This section of highway required the excavation of more than 2,400,000 cubic yards of earth and rock, with more than 600,000 cubic yards being excavated from the cut adjacent to the south tunnel portal. This cut is 438 feet in depth, and there are more than a dozen other cuts on the south approach which exceed 100 feet in depth. Fill construction was equally impressive, there being 10 fills exceeding 100 feet in height with the highest over 250 feet.

Grading work was preceded by staking and clearing, which presented many problems and hard work. The rugged terrain traversed by the south approach is cut with many small streams in deep side canyons, all covered with a heavy growth of medium-size Douglas fir trees and thick brush. Heavy rain during February and March 1961 hampered staking progress. During one 30-day period, the survey crews worked in continuous rain. Ninety to 100 inches of rain normally fall in this area in one season.

Forest Beauty Preserved

To preserve the beauty of the national forest, access to the work area was limited to within the slope limits of the job and to four access points granted by the Forest Service. During some of the early grading stages, the only means of getting to the work areas was walking or by tractors. Fuel was brought into the equipment area on a special trailer towed by a tractor. After some of the fills had been partially completed, a road suitable for four-wheel-drive vehicles was con-

South portal top heading excavation—a bench jumbo drills vertical holes preparatory to lowering the floor of the initial excavation.



Correcting the arch lining—a pump and pipelines, carrying concrete under pressure, places concrete between the form (background) and the excavated rock surface.

Grading and backfilling over the tunnel at the north portal.

structed and opened at intervals during the day.

Almost all the excavated material was moved by a fleet of nine all-wheel drive scrapers. This type of scraper unit was very effective on this job because of the exceedingly steep roads required to get from bottom of fills to top of cuts. Many of these roads had 50 percent grades. These machines were able to get on the cuts and start excavation with a minimum of pioneering.

The new roadway has a basic all-paved width of 32 feet, with an added 12-foot passing lane on steep grades. The total length of passing lanes is 2.5 miles. The roadway is paved with three inches of asphalt concrete on eight inches of plant-mixed cement treated base.

All contracts were administered by the California Division of Highways. Representing the division as resident engineer were:

Fred Smith—Grading north approach

George A. Jochim—Tunnel contract; lighting and ventilation contract

Richard C. Warner—Grading south approach and surfacing contract.

Toll Bridge Opens To Traffic Nov. 15

The new $21,000,000 Vincent Thomas Bridge, Southern California's first major suspension span, was scheduled for opening to traffic at 12.01 a.m. on November 15, 1963.

Dedication ceremonies for the new four-lane crossing from San Pedro to Terminal Island were held on September 28, in connection with the annual Fishermen's Fiesta.

The toll for privately owned passenger vehicles will be 25 cents. The ferry *Islander*, which has been operated by the Los Angeles Harbor Department, will be superseded by the new bridge.

Associate Bridge Engineer Richard L. Hathaway has been assigned as manager of the structure.

Total length of the bridge is 6,060 feet, with a clearance above the harbor channel of 185 feet. The central suspension span is 1,500 feet long.

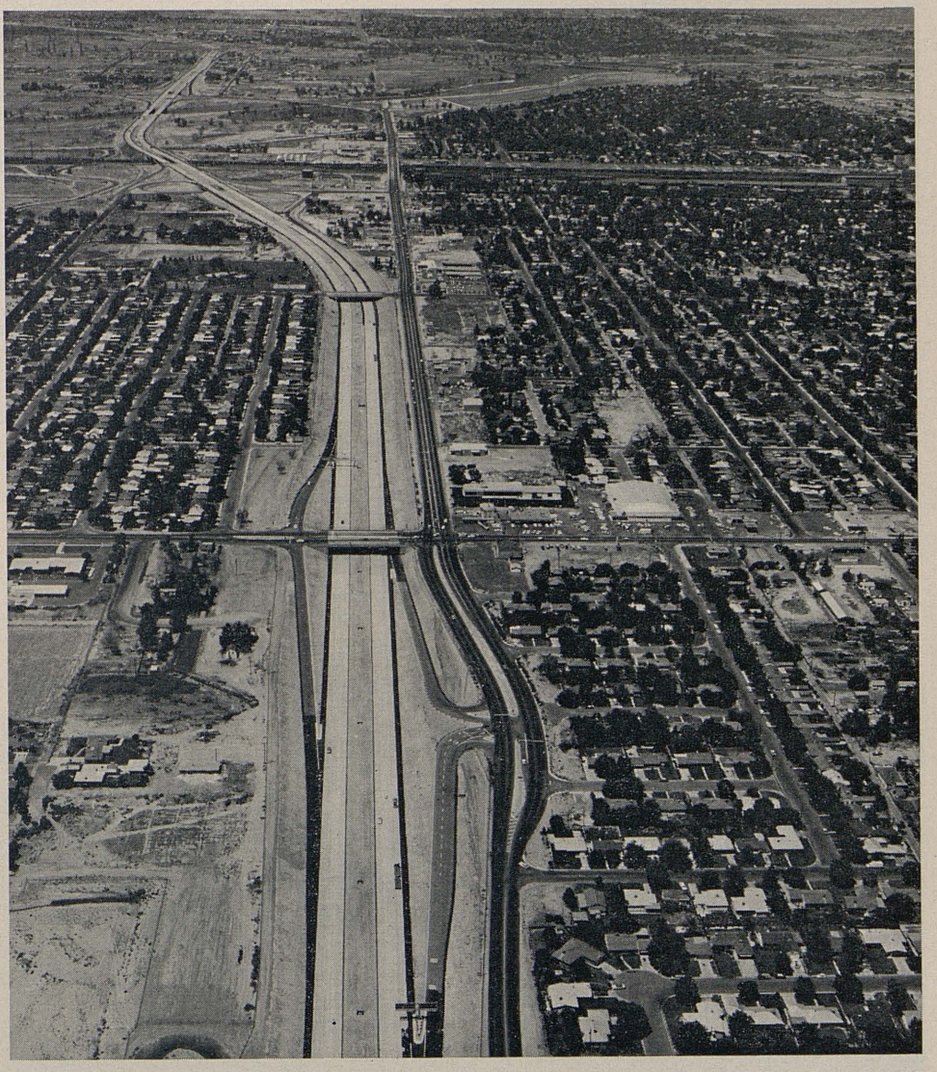
U.S. 99-Bakersfield

Completion Marks 10 Years of Planning, Construction

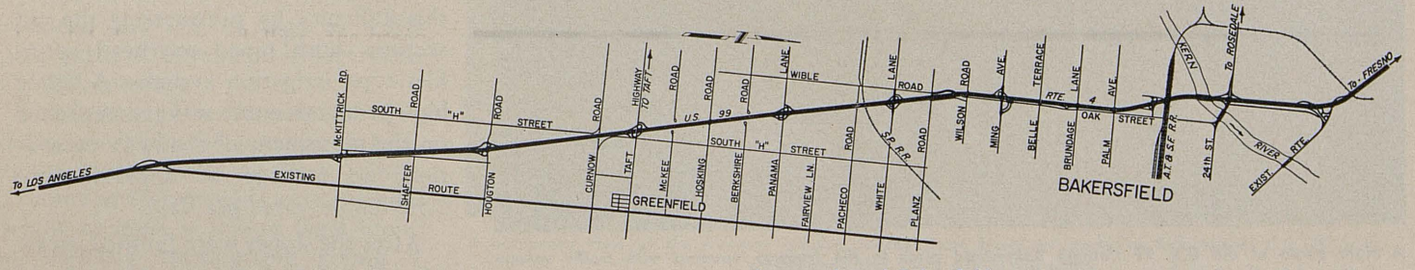
By J. E. ROBERTS, M. F. SILVA and N. L. LAMBETH, Resident Engineers

On July 23, 1963, 10 years of planning, right-of-way acquisition, and construction were culminated with the dedication and opening of the West Bakersfield Freeway. Henceforth, the north-south traveler on U.S. 99 between Fresno and Los Angeles will be able to bypass the City of Bakersfield and avoid the congestion on the old route over Union Avenue, Golden State Highway and the much publicized Garces Circle. Moreover, the route provides signal-free motoring between the City of Kingsburg and Castaic Junction, a distance of some 155 miles.

The freeway, which extends between approximately 13 miles south and 1 mile north of the City of Bakersfield, is 18½ miles in length over completely new alignment. It provides a four-lane divided facility through the rural section of its course and six lanes in the urban area where higher traffic volume dictated the need for additional capacity. Included in its length are 10 complete interchanges, 10 separations, 1 river crossing, 1 railroad underpass and 2 railroad overheads, all of which required the building of 43 structures at 27 locations and the widening of 2 existing ones. Three years in building, the fa-

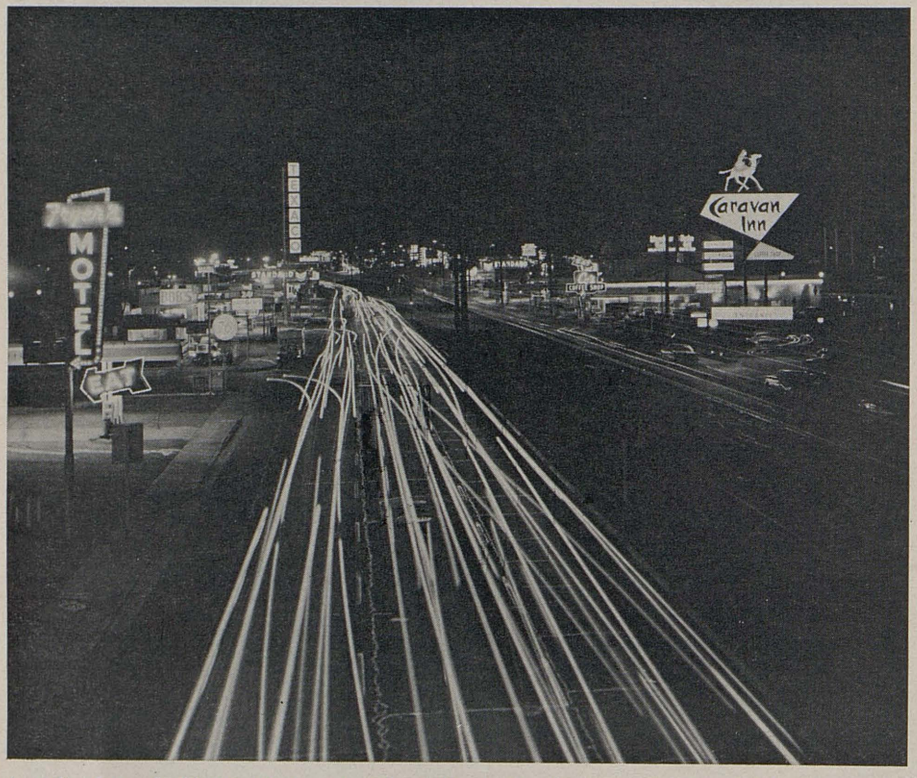


Northerly view of the West Bakersfield Freeway shortly after its completion.



This map shows the routing of the new freeway through Bakersfield.

Heavy congestion on old U.S. 99 through Bakersfield prior to the opening of the freeway.



A night photo of old U.S. 99 through Bakersfield prior to the freeway opening with traffic volume indicated by the lines from oncoming headlights (left) and the fainter tracery of taillights (right).

cility was constructed at a total cost of $21,500,000, including rights-of-way.

Three Contracts

Construction was performed under three separate contracts; the first of which was awarded to Fredericksen & Kasler of Sacramento on September 17, 1960, at a cost of $7,093,320 for the southern 13.3 miles and completed on August 9, 1962. This was followed on September 1, 1960, by award of a $923,372 contract to Tumblin Company of Bakersfield for the construction of the Bakersfield Yard Overhead and the Kern River Bridge which are within the limits and would facilitate the work on the northern 5.3 miles. This contract was completed on October 26, 1961. The third contract, which would complete the freeway, was awarded to Gordon H. Ball of Danville on October 23, 1961, at a cost of $6,036,000 and completed in July, 1963.

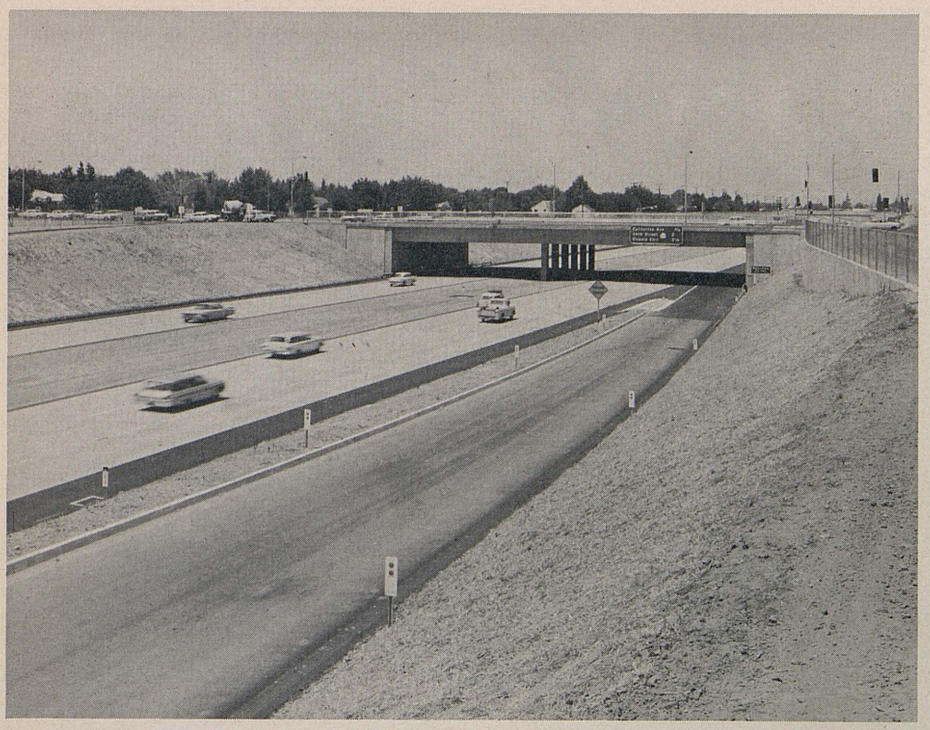
Major items of work consisted of 3,100,000 cubic yards of roadway excavation; 1,365,000 tons of imported borrow; 730,000 tons of various base materials; 132,300 cubic yards of portland cement concrete pavement and 150,000 tons of asphalt concrete pavement.

Long Cut Section

The major portion of the roadway excavation was concentrated in one cut section, approximately three miles long at the southwest edge of Bakersfield. Some of this material was moved with scrapers but due to the length of the haul, most was moved with a portable belt loader and bottom dump trucks. The major portion of the roadway excavation consisted of cohesionless sand, which created numerous problems in making and holding grades and in the movement of hauling equipment.

The contractors overcame some of this difficulty by prewatering the cut sections with piped overhead sprinkler-type irrigation systems. A fairly high productive rate was accomplished on the movement of roadway excavation; an average of approximately 7,500 cubic yards per day.

After the slopes were finished, straw was applied to both embankment and



A view northward along the new freeway at Brundage Lane overcrossing near the Bakersfield city limits.

cut slopes in order to maintain stability in the sandy material.

Three Mixers Used

Fredericksen & Kasler placed the first 13.3 miles of PCC pavement using conventional side forms and traveling concrete mixer methods. The normal 24-foot-wide paving train uses two concrete mixers, but the contractor elected to use three dual drum mixers. By using three mixers the contractor attained a maximum production of 2,865 cubic yards in 9½ hours and an average of 1,880 cubic yards per day for the project.

On the Ball contract a relatively new concept in concrete paving was utilized. The spread consisted of a slip form paver, eighteen 7½-cubic-yard tilting-body transit mixers, and a new "low profile" portable batch plant. Paving was single pass 24-foot and 36-foot widths. This combination produced and laid as high as 4,350 cubic yards of pavement 36 feet wide in a 10-hour day.

The batch plant consists of five trailer-mounted components which can be towed by truck from jobsite to jobsite as 10-feet-wide permit loads. Height of each is within legal limits for highway transporting giving a completely mobile assembly. The plant derives its name from the fact that all components operate at ground level. As such, a very minimum of foundation work is required for a setup. Under ideal conditions operating under fully automatic control, this plant is capable of batching all ingredients for 450 to 500 cubic yards per hour.

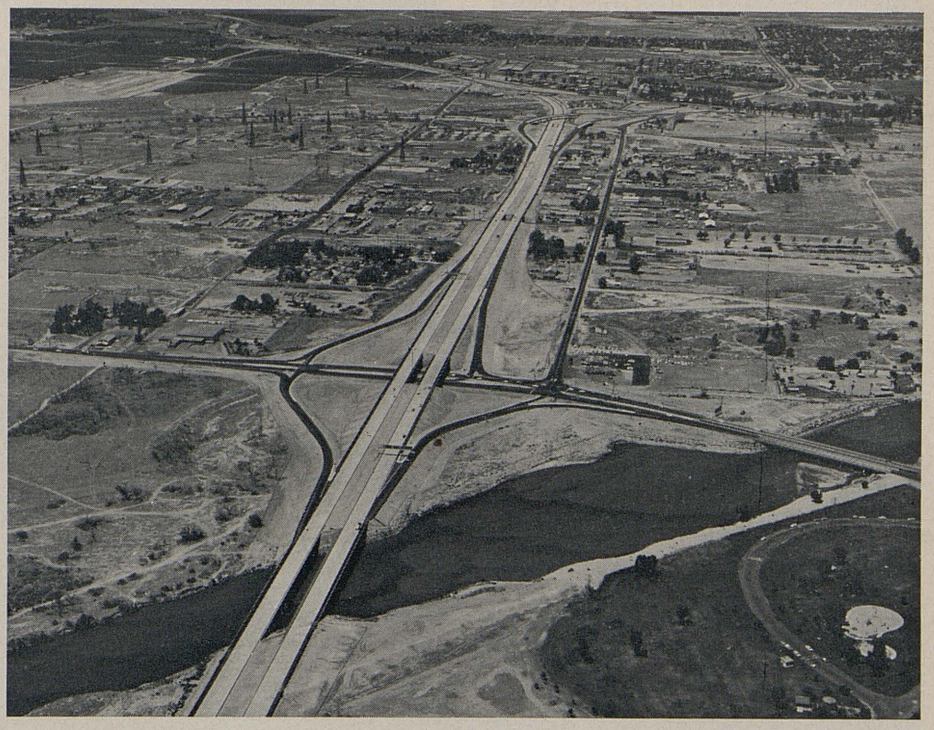
More Mobile Operation

The use of transitmixers in lieu of onsite mixers presented no exceptional problems while resulting in a cleaner and more mobile operation on the street. No difficulty was experienced in discharging 1½-inch- to 2-inch-slump concrete with a satisfactory degree of uniformity.

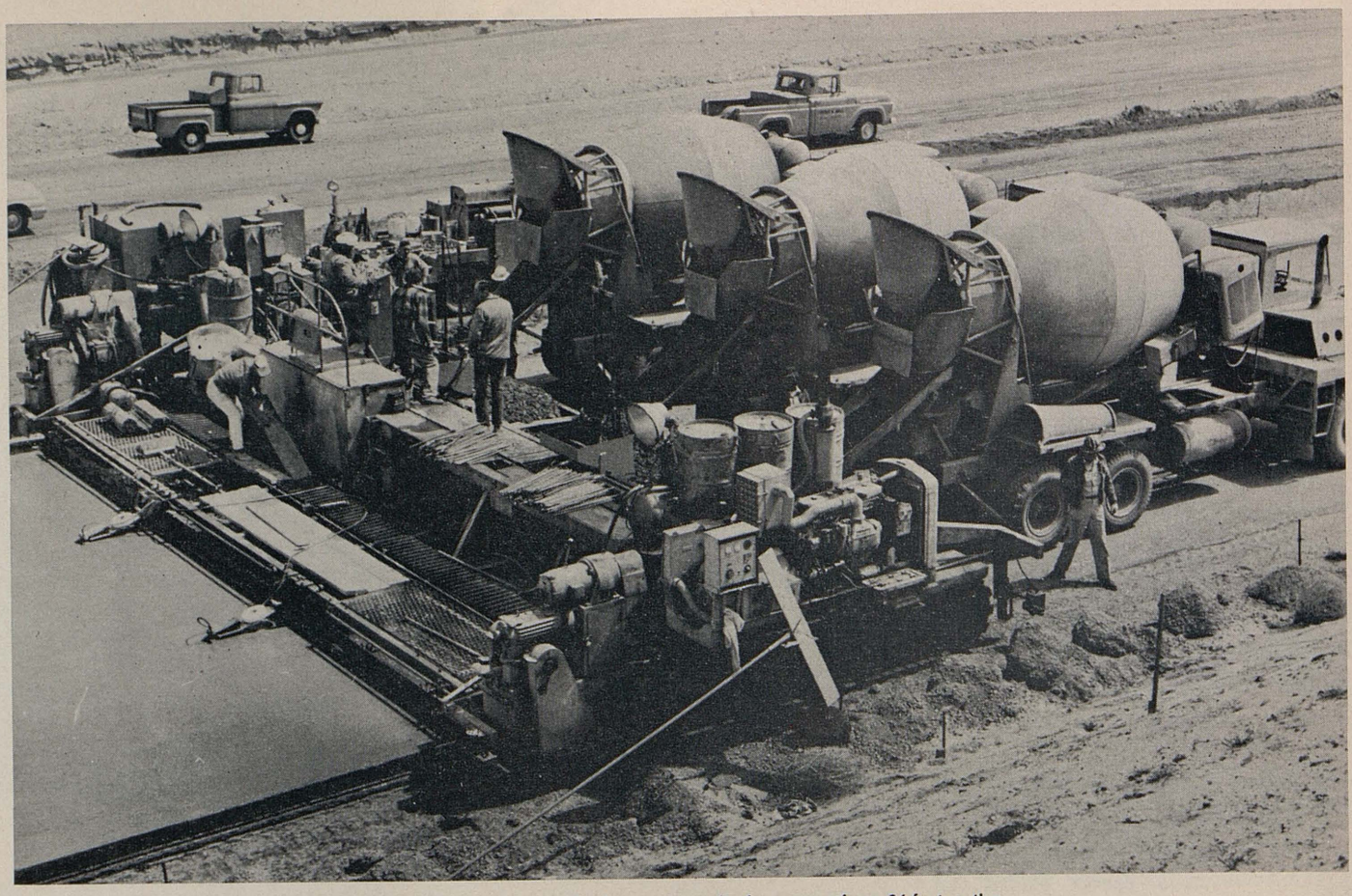
Longitudinal joints between lanes were constructed by inserting a polyethylene strip fed directly from the trailing edge of the paver. Use of this procedure in the past and during the early stages of this project sometimes resulted in a slight depression in the slab. To overcome this condition, the vibrating knife edge that fed the strip was moved ahead of the final pan float. With this change no further difficulty was experienced.

Ram-activated Arms

Another innovation was the use of a ram-activated set of parallel arms for inserting the tie bars in each of the longitudinal joints. Notches at the bot-



A northward view of the freeway crossing of the Kern River just north of Bakersfield. U.S. 99 also crosses over Sign Route 178 at this point.



Tilting body transit mixers feed concrete to slip form paver for a 36-foot section.

The new low profile portable batch plant is capable of batching all ingredients for 450 to 500 cubic yards per hour.

A northward view of the new freeway about 13 miles south of Bakersfield. Old U.S. 99 angles off to the right.

tom ends of the arms hold the tie bars in place and the device is synchronized with the speed of the paver so that the bars are driven to the required depth at 30-inch intervals.

A 1.9-inch-per-mile average profile index for the project reflects the degree of perfection now possible with slip form paving.

The major portion of class B PCC curb and gutter was placed with an extrusion type automatic curb and gutter machine. This was the first time that this type of machine was used in this area. Some difficulties were encountered in design and control of a mix that would work properly in this machine.

Experiments With Mixes

The contractor set the machine at a local commercial concrete batch plant and experimented with various mixes to obtain a mix that would work and he also added an augur to the machine to obtain satisfactory density. This machine utilized angle iron rails to control line and grade. With reasonable care in setting the rails the machine produced a nice appearing curb.

The 43 bridges and minor structures required 44,000 cubic yards of structure concrete, 10,280,000 pounds of bar reinforcing steel and 71,600 linear feet of piling.

All three contracts were characterized by high rates of production with an average of 1.8 million dollars in structures completed in a calendar year. The most spectacular operation was on the Wible Road Overcrossing where the contractor, Fredericksen & Kasler Corporation, poured 1,480 cubic yards of concrete during daylight hours by utilizing seven cranes and seven separate pouring crews. At the time this was a record structure pour.

Two Parallel Overheads

The Tumblin contract included two parallel 450-foot overheads spanning Santa Fe Railroad's Bakersfield Yard. These structures utilized 98 precast, prestressed concrete girders of 70- to 90-foot length. All 98 girders were built at the jobsite on temporary casting beds constructed adjacent to the railroad yards. Casting and stressing of girders was a continuous operation throughout this contract. A unique feature of this operation was the use of steel forms for the girders. It is believed that this was a "first" for a jobsite casting yard.

The Gordon Ball contract included a complex interchange at the north end of Bakersfield requiring eight structures within a quarter-mile area. Another interesting feature on this contract was the foundations for the center pier at the Minkler Underpass. In order to construct the new bridge without interference with existing traffic, 72-inch cast-in-drilled-hole concrete piles were used to eliminate excavation in the median adjacent to the traveled way. The "pile columns," as they are commonly called, are similar to those used extensively throughout Southern California but this was the first use in the State of 72-inch size.

The superintendents for the various contracts were M. H. Sandlin for Fredericksen & Kasler, Mike Saporetti for Gordon H. Ball and Jeff Manning for Tumblin Company.

SECOND LONGEST FREEWAY

A 16-mile section of the Antelope Valley Freeway, which ultimately will extend from the Golden State Freeway north of San Fernando via Soledad Canyon, Escondido Canyon, Palmdale and Lancaster to the Kern county line, was dedicated on August 23. The longest single freeway section ever completed in the State's history was a 21-mile segment between Barstow and Victorville, opened to traffic almost three years ago.

This new four-lane freeway, with provision for widening to six and eight lanes when future traffic requires, was constructed under two contracts.

New Legislation

More Funds for Local Roads; Scenic Highway Bills Passed

Additional revenue for city streets and county roads in California, based primarily on a 1-cent-per-gallon increase in the tax on gasoline, was provided by the California Legislature at its regular 1963 session.

The Legislature also passed, and Governor Edmund G. Brown signed into law, a substantial number of other measures which deal directly or indirectly with the state highway program and traffic operation.

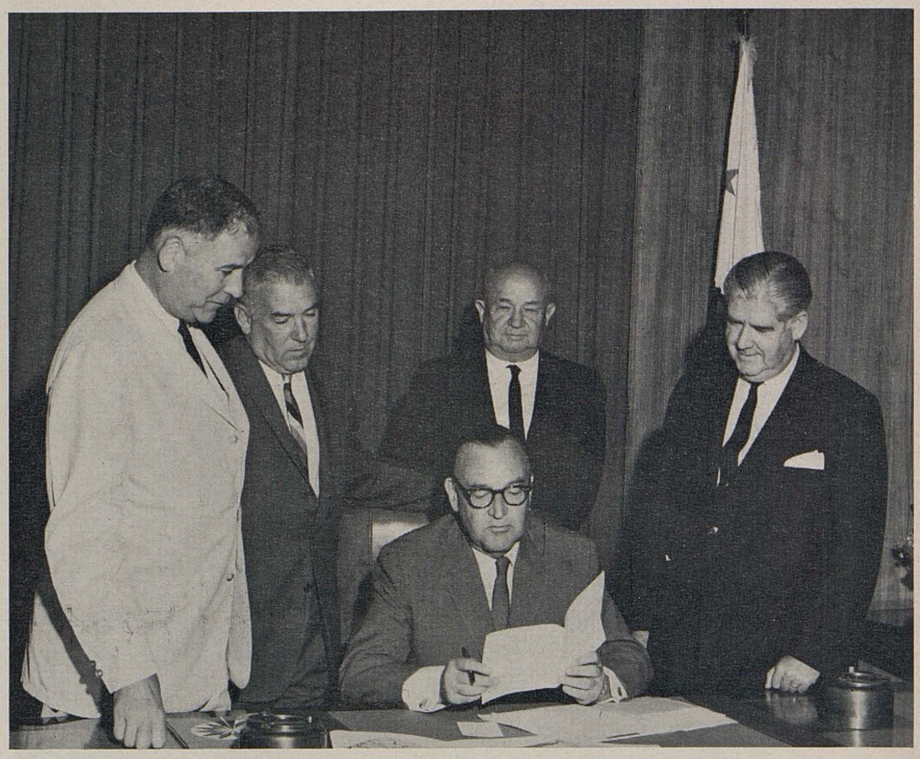
From an organizational standpoint, the most significant enactment was Senate Bill 1019 (Chapter 1364), providing for reorganization of the Highway Transportation Agency and the Department of Public Works. (*See inside front cover of this issue for explanation of the changes involved.*)

The Legislature also manifested a stronger concern than ever with aesthetics in connection with the State's roads and highways, and passed a series of "scenic highway" bills and a plan for a system of roadside rests.

The "local transportation" measure (S.B. 344, Chapter 1852) was based on a series of studies which showed that cities and counties needed more revenue to keep up with their local street and road needs. By adding the 1 cent to the gasoline tax, effective October 1, 1963, and increasing weight fees 19 percent, effective January 1, 1964, this legislation is expected to provide about $70,000,000 a year to begin with, in addition to the revenue now apportioned to the cities and counties respectively from ⅝ of a cent and 1⅜ cents per gallon of the established gasoline tax.

Formulas Are Complex

The distribution formulas governing the extra 1 cent per gallon are somewhat complex, but the net effect is to make a little more than two-thirds of the new revenue available to the cities and just under one-third to the counties. Under the provisions of the bill, this new money must be expended on a select system of local roads and streets. Other provisions govern structural and geometric standards and various accounting procedures, including auditing and inspection by the State.



"This is a very important bill," said Governor Edmund G. Brown as he prepared to sign Senate Bill 1467, establishing a state system of scenic highways. "People will begin to appreciate its value when we put it into effect." Watching the Governor, left to right, are: State Senator Fred S. Farr of Monterey County, principal author of the bill; State Director of Public Works John Erreca; State Highway Engineer J. C. Womack; and Francis J. Carr, representing the California State Automobile Association.

Another feature of this bill involves rapid transit, enabling counties to increase the present in-lieu tax on motor vehicles (2 percent of market value) by one-half of 1 percent, the resulting revenue to be devoted to planning, constructing or operating a rapid transit system.

The scenic highway bills (S.B. 1467, 1468, 1469, Chapters 1788, 1793, 1794), were the outgrowth of studies by the Department of Public Works with the assistance of an advisory committee. They provide for a master plan of scenic highways comprising about 5,000 miles of state highway; for county scenic highways; and for memorial sites on scenic highways.

The roadside rest legislation (S.B. 173, Chapter 992), is also the result of interim study and a master plan drafted by the Division of Highways for an eventual total of over 250 highway safety rest areas. It will require an estimated $5,000,000 to construct these rest areas and about $1,000,000 a year to maintain them when the system has been completed. The legislation also transfers responsibility for maintaining 10 existing roadside rests from the Division of Beaches and Parks to the Division of Highways, effective September 20, 1963.

Measure Combines Policies

Both roadside rest and scenic highways policies are incorporated in a measure dealing specifically with the Westside Freeway (Interstate 5), with provision for co-ordinating the activi-

ties of several state agencies in developing both the highway and adjacent facilities (S.B. 581, Chapter 1758).

As reported in the May-June issue of *California Highways and Public Works*, the renumbering bill (S.B. 64, Chapter 385) was passed early in the session. It provides for streamlining the numbering system for state highways, and will involve some changes in long-established route markers between now and mid-1964.

A 70-mile-per-hour speed limit on full freeways was authorized by the Legislature in A.B. 2449 (Chapter 1735), contingent on approval by the Administrator of Highway Transportation of recommendations by the Division of Highways after conferring with the California Highway Patrol.

The steadily increasing cost of maintaining landscaping and other plantings on state highways was recognized by the Legislature when it passed S.B. 412 (Chapter 982). This measure excludes the cost of planting maintenance, currently estimated at $5,000,000 a year, from the 1-cent-per-gallon revenue limitation which applies to overall administration and maintenance expenditures of the state highway program. The same legislation places a ceiling of $7,500,000 a year on expenditures for maintaining plantings.

Two bills make two highway projects eligible for toll bridge revenue financing by defining them as bridge approaches. One (A.B. 1723, Chapter 1570) involves a connection to Grand Avenue in Oakland from the San Francisco-Oakland Bay Bridge; and the other (S.B. 50, Chapter 157), the state highway from Cordelia to the Benicia end of the Benicia-Martinez Bridge. Both projects require action by the California Toll Bridge Authority.

Fund for Research

The Budget Act of 1963 contained an appropriation of $150,000 from the State Highway Fund for research on highway safety to be conducted jointly by the Division of Highways, the Department of Motor Vehicles and the California Highway Patrol. These funds will permit continuation of a joint research program undertaken in 1961 under a $100,000 appropriation.

The annual state subvention for small boat harbors, hitherto $750,000, was increased to $2,000,000 under A.B. 239 (Chapter 2102). The money is appropriated from the Motor Vehicle Fuel Fund.

The Legislature passed only a few bills adding mileage to the state highway system. These were the sections between Eureka and the Samoa Peninsula; between Boonville and Ukiah; and between Mokelumne Hill and West Point. The Legislature also assured continued state responsibility for the Avenue of the Giants scenic route in Humboldt County by including it in the state highway system.

HELEN KLAUSER LEAVES; SERVED SIX DIRECTORS

Helen Klauser, administrative assistant to six State Directors of Public Works during the past 20 years, retired from state service at the end of August.

Mrs. Klauser's career with the State began in 1930 in Redding, where she joined the Division of Highways district office as a junior stenographer. Before that she had worked as secretary to the district attorney and as a deputy auditor for Tehama County for two years.

HELEN KLAUSER

A native of Packard, Iowa (the town was named for her paternal grandfather), Mrs. Klauser was brought to California as a child and grew up in Corning.

After graduation from high school there, she went on to graduate from Armstrong College in Berkeley and to attend the University of California.

In 1935 Mrs. Klauser transferred from Redding to the Division of Highways headquarters office in Sacramento, and the same year became a stenographer and personnel clerk in San Francisco for the late Charles H. Purcell, at that time engaged in the construction of the San Francisco-Oakland Bay Bridge in addition to his duties as State Highway Engineer. She continued to work for Purcell in his job of executive officer for the Golden Gate International Exposition, and returned with him to Sacramento in 1939.

She moved to the office of the Director of Public Works when Purcell was appointed to that position in 1943, and was promoted to administrative assistant in 1951.

In succeeding years she served in the same capacity for Directors Frank B. Durkee, C. M. Gilliss, T. F. Bagshaw, Robert B. Bradford and John Erreca, the present director.

Her responsibilities have included supervision of the secretarial and clerical staff of the director's office; the processing of a wide variety of legal and policy documents between the director's office and the various divisions of the department; and the scheduling of appointments for the director.

In the later capacity she has dealt with thousands of public officials and civic leaders from all parts of the State interested in the State's highway, bridge and building construction programs.

Mrs. Klauser is a member of Redding Chapter, Order of the Eastern Star, and of Alpha Omicron Pi.

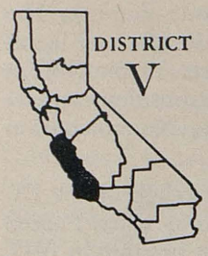
Contractors' Bids Average 4.3 Per Job

The Department of Public Works advertised for bids in August on 41 highway projects with an estimated cost of $40,882,400. There were 52 contracts for $30,572,200 awarded during the month and 53 contracts for $17,447,000 completed.

Bids from 295 contractors were opened on 68 projects, an average of 4.3 bidders per project.

Cold Spring Canyon Arch

By F. H. YOSHINO, Resident Engineer, and R. L. WHITAKER, Project Designer



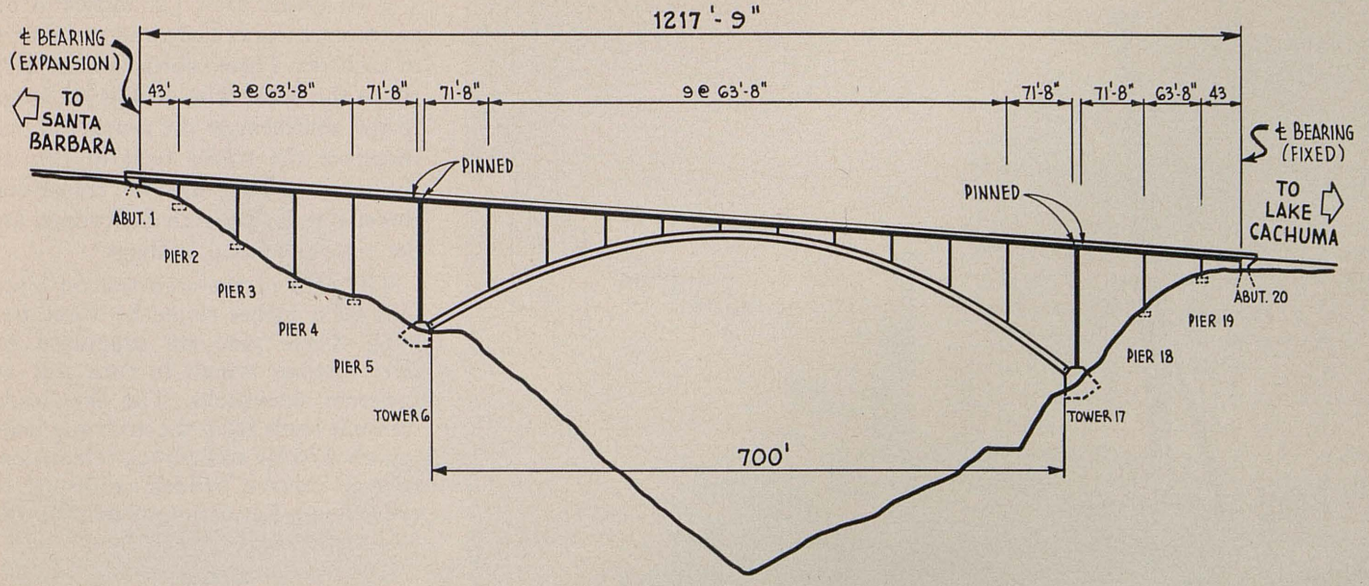
Motorists driving from Santa Barbara to Lake Cachuma and Santa Ynez by way of San Marcos Pass (State Sign Route 150) will soon be traveling across one of the 10 longest* steel arch bridges in the United States.

* Reference World Almanac, 1963.

Route 150 follows in general a trail used by early-day travelers between Mission Santa Barbara and Mission Santa Ynez. In 1846 Lt. John Fremont and his troop crossed San Marcos Pass to surprise a Mexican Army contingent waiting in ambush at Gaviota Pass to the north. The trail was later used as a stagecoach route. Cold Spring Tavern, one of the original coach stops, is at the side of the present route about one-half mile upstream from the bridge site. The original trail intersects the new alignment near the north end of the bridge. The trail is clearly defined and was used by survey crews to gain access to the bridge site.

Traffic on this scenic and historic route has increased over the years as the attractions of the Missions, Solvang, the quaint Danish community, and the recreational facilities of Lake Cachuma became more widely known.

The final segment of the arch is placed at the crown. Flags are attached to the closing segment in the traditional way of signifying the successful completion of the job. The arch was lowered until bearing was obtained at the crown by releasing pressure from the jacks at the base of the temporary towers.



A profile of the bridge showing some general dimensions and the numbering of the towers and piers.

The present road no longer provides adequate service for the traffic volume.

Part of Major Improvement

The bridge, which is located about 13.5 miles north of Santa Barbara, is part of a major improvement in alignment and grade of Route 150. About seven miles of road are presently under construction in the vicinity of San Marcos Pass summit. The bridge eliminates approximately one mile of road which would otherwise curve in and out of the canyon. Savings in time and money were thus achieved. The panoramic view of the canyon and surrounding countryside from the bridge and approaches will surely rank as one of the more beautiful and impressive of California's many scenic splendors.

The bridge and road work are being performed under two separate contracts. At the time this article was written it was anticipated that the road work would be completed in February 1964. The bridge is scheduled to be completed in November 1963.

The bridge is 28 feet wide between curbs and 1,218 feet long overall. Welded steel girders, floor beams, columns and two main towers support the concrete deck. The 700-foot arch span which rises 400 feet above the canyon floor carries 11 girder spans. Eight side spans flank the main span. The arch and main towers are supported by concrete skewbacks. The approach columns rest on concrete piers. Concrete abutments support the end spans.

Curved Box-shaped Arches

All structural steel for this bridge was A-7 or A-373 type. One thousand four hundred forty tons of steel plate were formed into two gracefully curved box-shaped arch rib sections each nine feet deep by three feet wide. The box shape is made up of 2 web plates 15/16 inch thick joined by 2 flange plates of different thicknesses

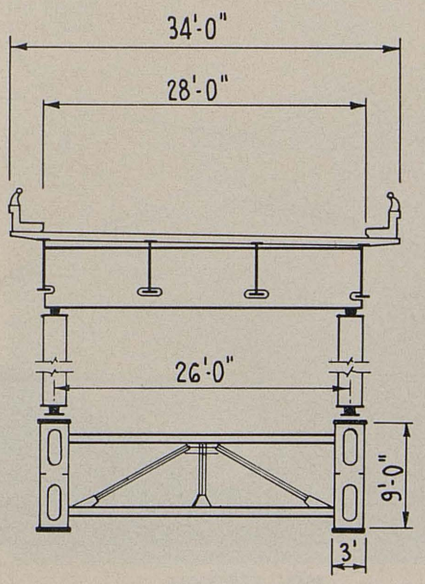


Diagram of a typical section of the bridge.

ranging from 1½ to 3½ inches. Welding was specified for all shop splices and high-strength bolts were required for all field connections. The 2 ribs 26 feet apart are connected by trussed steel bracing. Steel pedestals were welded to the ribs to form column bases.

The arch was designed to be erected as three-hinged with provision for conversion to two-hinged following placing of girder steel. Deck concrete for the arch spans was required to be placed in a particular sequence which was designed to minimize unbalanced loadings during construction.

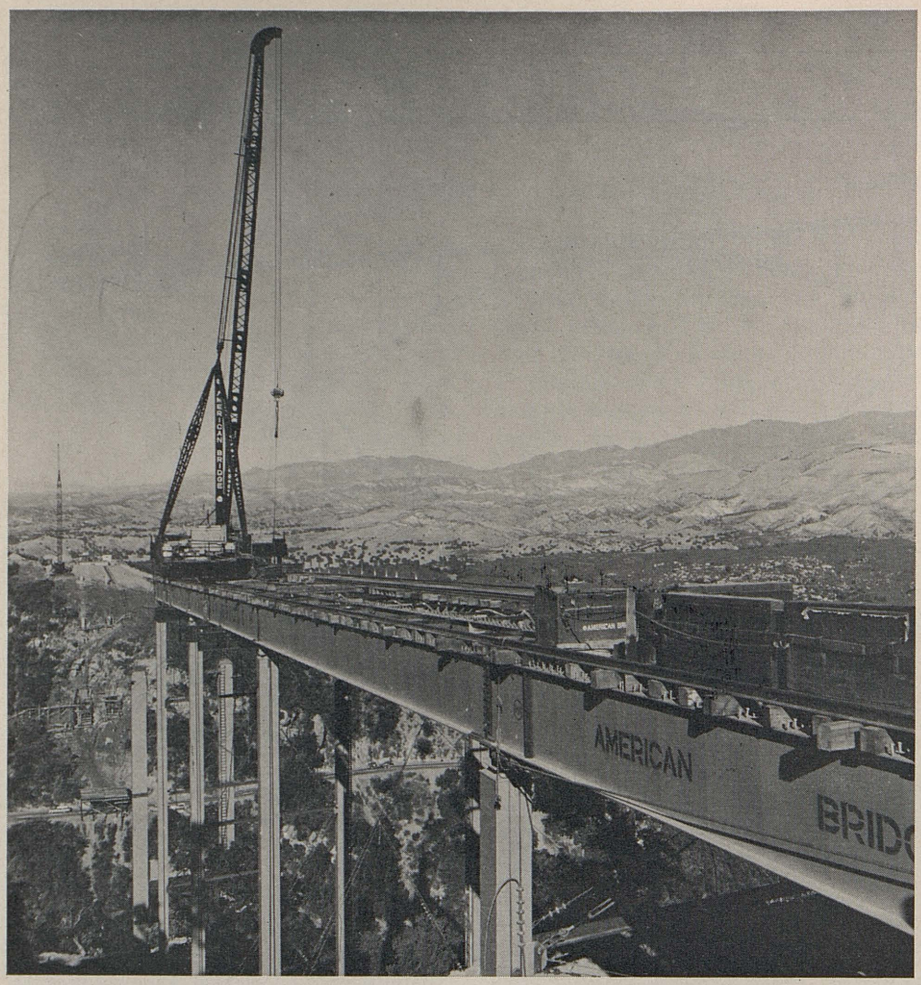
Design live loading was A.A.S.H.O. H20-S16 classification without reduction due to the length of span.

Each rib carries a dead load thrust of 2,600,000 pounds which increases to 3,000,000 pounds under design vehicle loads. The maximum design moment on each arch rib is about 12,000 foot-kips.

The arch is capable of carrying loads equal to 1.8 times design dead load plus live load, without permanent distortion of any member.

Arch Deflection

Under maximum uniform design loading the deflection of the arch at the crown will be approximately three inches and under unsymmetrical loading the maximum deflection will be approximately six inches at the one-quarter point.

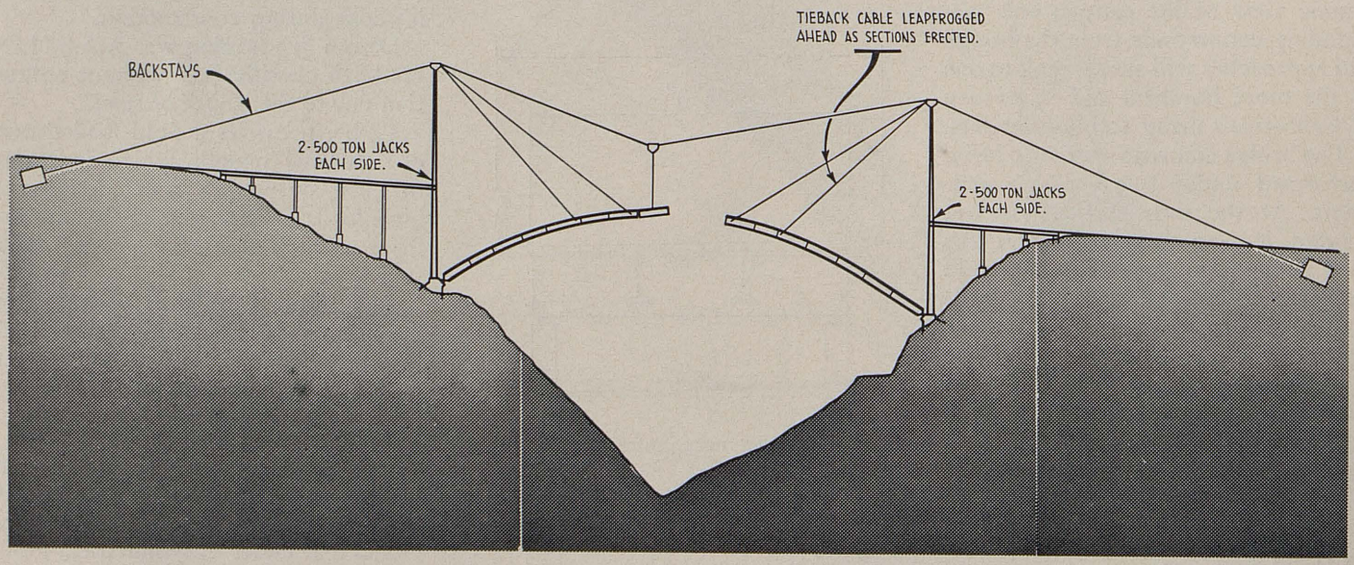


A view from Abutment No. 1 (toward Santa Barbara) showing spans 1 through 4 and the traveler crane in position to set steel for main tower 6 and the girders of span 5.

Two cables each 1⅞ inches in diameter are concealed near the crown of each rib. These cables connect each rib to the deck. The deck is anchored to the abutment at the north end and therefore the cables tend to restrain the arch crown against translation thereby reducing arch deflections under unsymmetrical loadings.

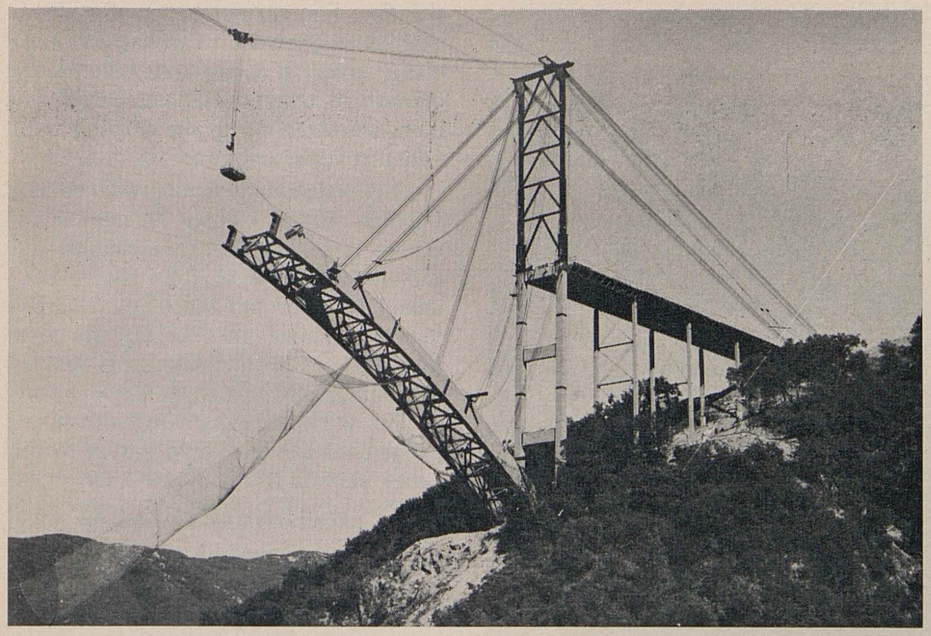
The ends of the arch rest on hinge pins eight inches round by three feet long. These pins are supported by steel castings which in turn rest on concrete skewbacks. The skewbacks transmit loads from the arch and main towers directly to bedrock which consists of massive bedded sandstone of the Gaviota Formation of the Eocene-Oligocene age.

Eight hundred ninety tons of steel plates were formed by welding into shapes for towers, columns, floorbeams, and girders. Each main tower is 134 feet high consisting of two four-foot square legs connected by one cross strut at the roadway level and two struts at about the one-third points. Each leg is anchored to the skewbacks by 29 1⅜-inch round prestressing rods. The rods are about 25 feet long. Each rod was required to be preloaded to 131,000 pounds in order to secure the tower to the base and prevent uplift under all design loadings. The towers act to support



ARCH ERECTION

This diagram shows a profile of the arch erection technique used on the bridge.



The four photos on this and the next page show a time sequence of the arch erection procedure.

girder loads and to carry lateral loads from the deck system to the foundation.

Columns Are Hinged

Twelve columns support the approach spans and 20 columns carry the spans on the arch. Each column is a two-foot square, sealed, welded box section which is hinged at the floor beam and at the footing or top of arch to permit relative movement of the deck due to temperature changes or arch translation due to unsymetrical loadings.

A slender column effect is obtained because of the column height which reaches 93 feet at pier 5.

The columns were designed with no bracing of any kind and were required to be fabricated full length without field splices to further enhance the effect of slenderness.

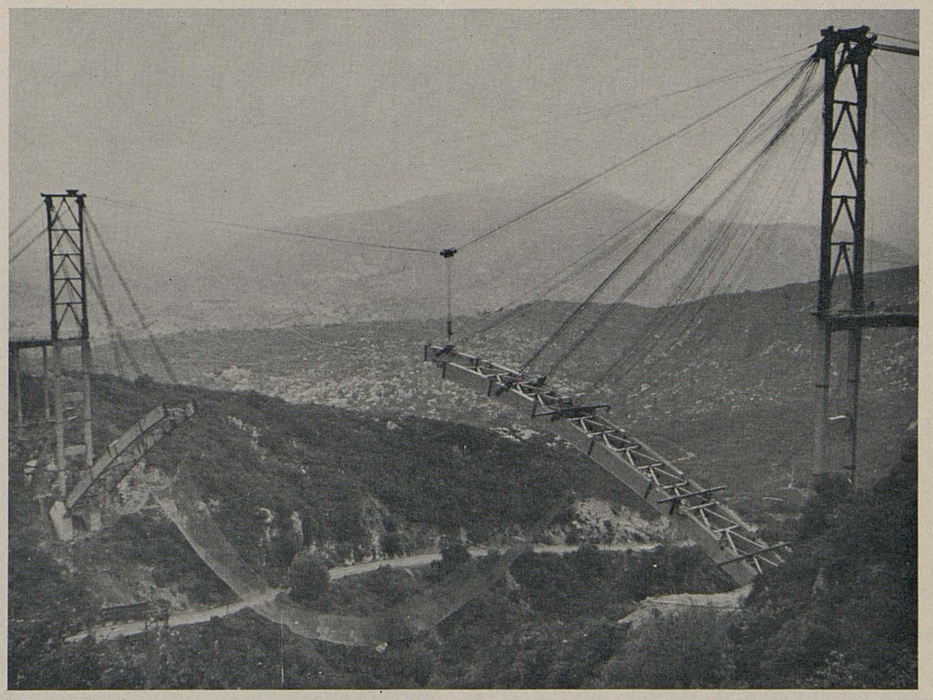
Each approach span column is supported on an individual concrete footing which in turn rests on bedrock similar to the material at the main arch support.

Four girders four feet four inches deep spaced nine feet four inches apart support the concrete deck. The deck and girders have joints at the abutments and towers only. Girder spans are continuous for vertical loadings for each approach span group and for the group of spans between towers. The entire deck was made continuous from abutment to abutment by utilizing a hinge detail at each tower which permits vertical rotation of the deck and girders but not horizontal rotations. Shear is transferred across the joints by a key detail, thus the deck and girders act as a horizontal continuous beam with the abutments, main towers and arch ribs acting as supports to resist horizontal loads from wind or earthquakes.

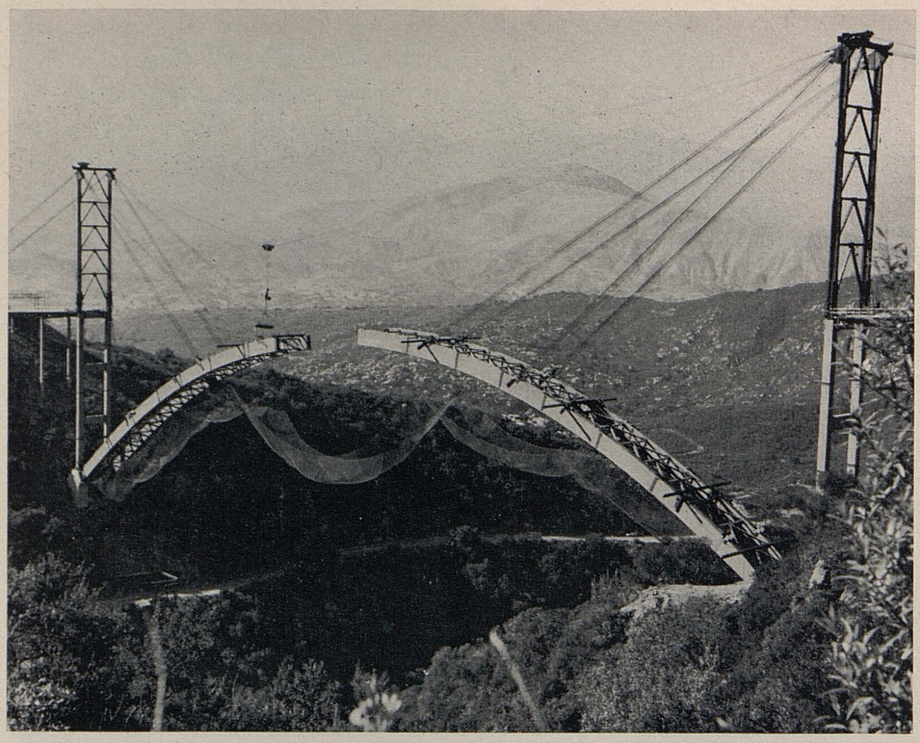
Slotted Floor Beams

Continuity for the girders across the floor beams was obtained by slotting the floor beams to match the girder flanges. This permitted installation of bolted field splice plates for girder flange connections. Girder web connections to the floor beams were made in the usual manner with angle connections to the floor beams.

Girders were made composite with the concrete deck. A steel lateral system was installed near the lower flange of the girders. Both the steel bracing and the deck act to resist horizontal loadings. The girders support a 7¼-inch concrete deck which is 28 feet wide between type II barrier railings. Each railing is three feet seven inches high with a two-foot-wide curb. The total width of deck is 34 feet. The concrete deck is reinforced longitudinally, as well as transversely, to act in conjunction with the girder bracing system to resist lateral loadings. Deck units were required to be placed in a sequence designed to reduce the effects of concrete shrinkage. The longitudinal reinforcing and composite action of the girders resists any tendency toward cracking.



Further segments have been added to the arch. The temporary erection towers and high-line rigging are in position on top of the permanent main tower at each end of the arch.



The arch is nearly completed. Note the safety nets under the arch.

Abutment No. 1 at the end nearest Santa Barbara rests directly on bedrock. Abutment No. 20 is supported on steel pilings which were driven to bedrock. The deck is tied to Abutment No. 20. Expansion takes place at Abutment No. 1.

Abutment 20 supports both the vertical loads from girders and vehicles and the longitudinal loadings due to live load traction and loads from the cross tie cables at the arch crown.

Rugged Terrain

The accompanying photographs show the rugged terrain at the bridge site. Surveying to the high degree of accuracy necessary with this type of construction in this terrain posed problems not commonly encountered in bridge work. To assure the required accuracy, horizontal distances across the canyon were measured by five separate methods. They were: slope chaining, direct chaining, subtense bar, triangulation and by geodimeter measurement. Triangulation results were discarded because the short base lines and large vertical angles required introduced errors which could not be eliminated. Results of the remaining methods agreed to within ½ inch in 740 feet or an accuracy of about 1:18,000.

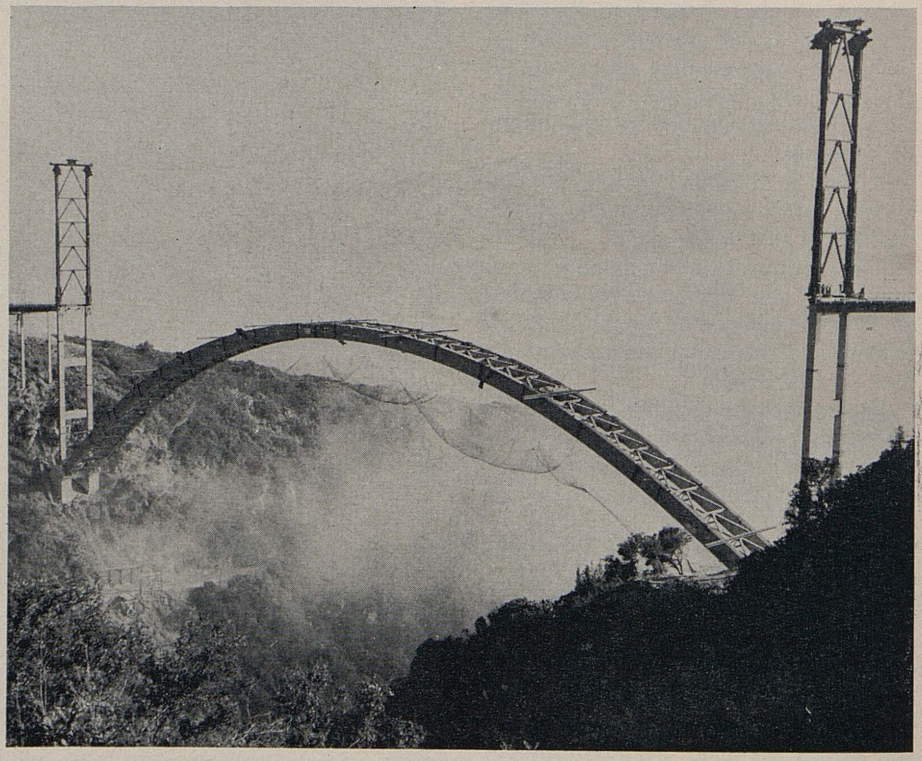
A giant slingshot composed of two very elastic rubber bands, normally used for exercising, was used to put the first line across the canyon. This was done in order to pull a 600-foot chain over the top of the dense growth of trees and brush. Level circuits were run along the existing road and across the canyon.

The contract was awarded to the United States Steel Corporation, whose American Bridge Division did the steel erection. In June 1962, Massman Construction Company of Kansas City, Missouri, moved on the site. They were the subcontractors for the excavation and concrete work. Foundation work began on the south slope, progressed downhill and across to the other side of the canyon.

Hand Tools Used Extensively

Due to inaccessibility of the footing sites very little heavy equipment could be employed for excavation and concrete work. Hand tools and air jackhammers were used extensively for excavation. Concrete was transported from transitmix trucks to footings and skewbacks by a machine which pushes the concrete through a pipe by air pressure.

Concrete was dry batched in Santa Barbara and transported in dump trucks to a transfer plant at the San



The arch completed. All temporary support cables are removed and the arch is self-supporting.

Marcos Pass summit. At the transfer plant transitmix trucks were waiting to be belt loaded with the dry batch and to have water added. This arrangement made it possible for the contractor to have concrete at the worksite in the minimum amount of time, and also to have better control of the rate of delivery.

Grinding was required for the arch and tower bearing surfaces on the skewbacks. This was a major job considering that areas which were as much as 24 feet square had to be ground to within $\frac{1}{32}$ inch of a true plane. Grinding was done with portable electric-driven hand grinders. Results were checked with a scratch template.

The arch segments and arch lateral bracing were fabricated by the American Bridge Company at their plant in Gary, Indiana. All other structural steel was fabricated at the Maywood plant near Los Angeles. Steel was shipped by rail to Santa Barbara and trucked to the site.

Shop inspection of the work done at Gary was performed for the State by the R. W. Hunt Company, under provisions of a service agreement. The Division of Highways Materials and Research Department performed shop inspections for all other work.

Additional tests, sufficient to assure suitability of delivered materials, were performed by the materials laboratory at the request of the resident engineer during progress of the work.

Erection of structural steel began October 30, 1962. The south approach spans and tower were erected first, as shown in the photo on page 16. A traveler crane was assembled on span 1 and moved forward on rails to erect the next four spans and high-line tower. The traveler was then dismantled and reassembled on the other side of the canyon at abutment 20, and the same procedure repeated. Temporary guys and bracing were used at bents and at the top of girder flanges during erection to provide increased stiffness until the deck was in place.

High-line System

A high-line system was used to erect and support the arch during construction and to place superstructure steel on the arch. A high line consists essentially of a suspension bridge having special equipment for transporting loads along the main cables.

The 120-foot high-line towers were placed on top of the 134-foot high skewback towers. The function of the temporary towers was to carry the high line and to support the arch during erection. The high-line towers were free to rotate at the bottom in the direction of the centerline of bridge. A pair of 500-ton hydraulic jacks were put under each leg to provide a high degree of control over the vertical position of the towers. Both the erection towers and traveler crane have been used on similar jobs.

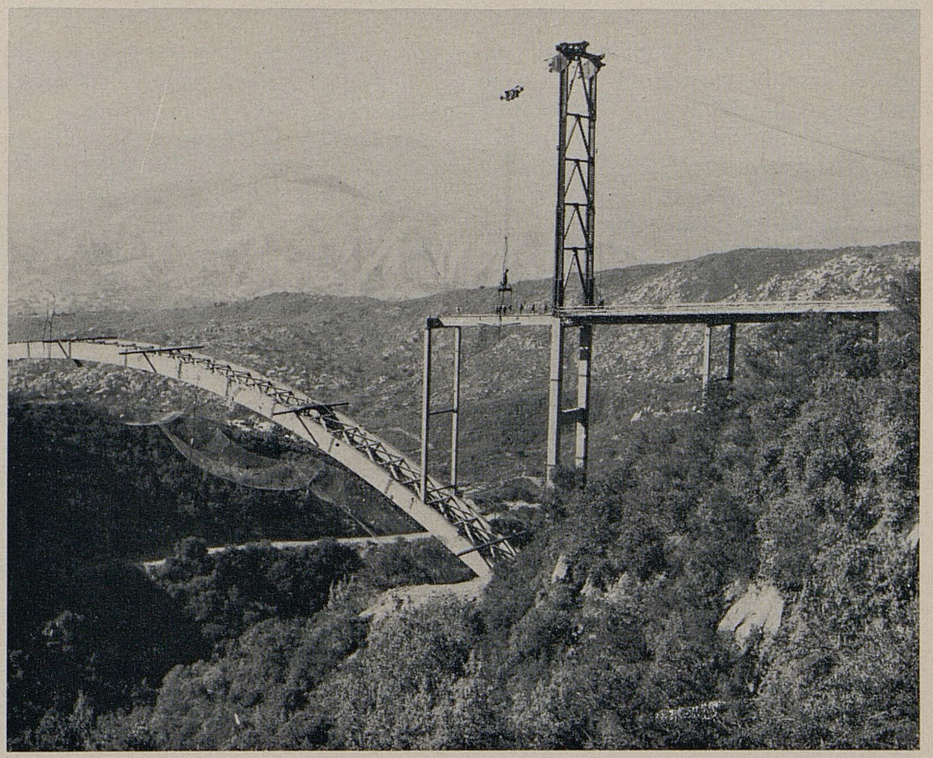
Five miles of cable were used for the high line, arch tiebacks, and backstay lines shown in the photographs. During operation, three hoists were used to control the moving cables. A carriage, riding on rail, atop the erection towers provided for transverse movement of the high line.

Rib sections were transferred directly from trucks parked on the existing road near the north skewback to the high line and then into position in the arch.

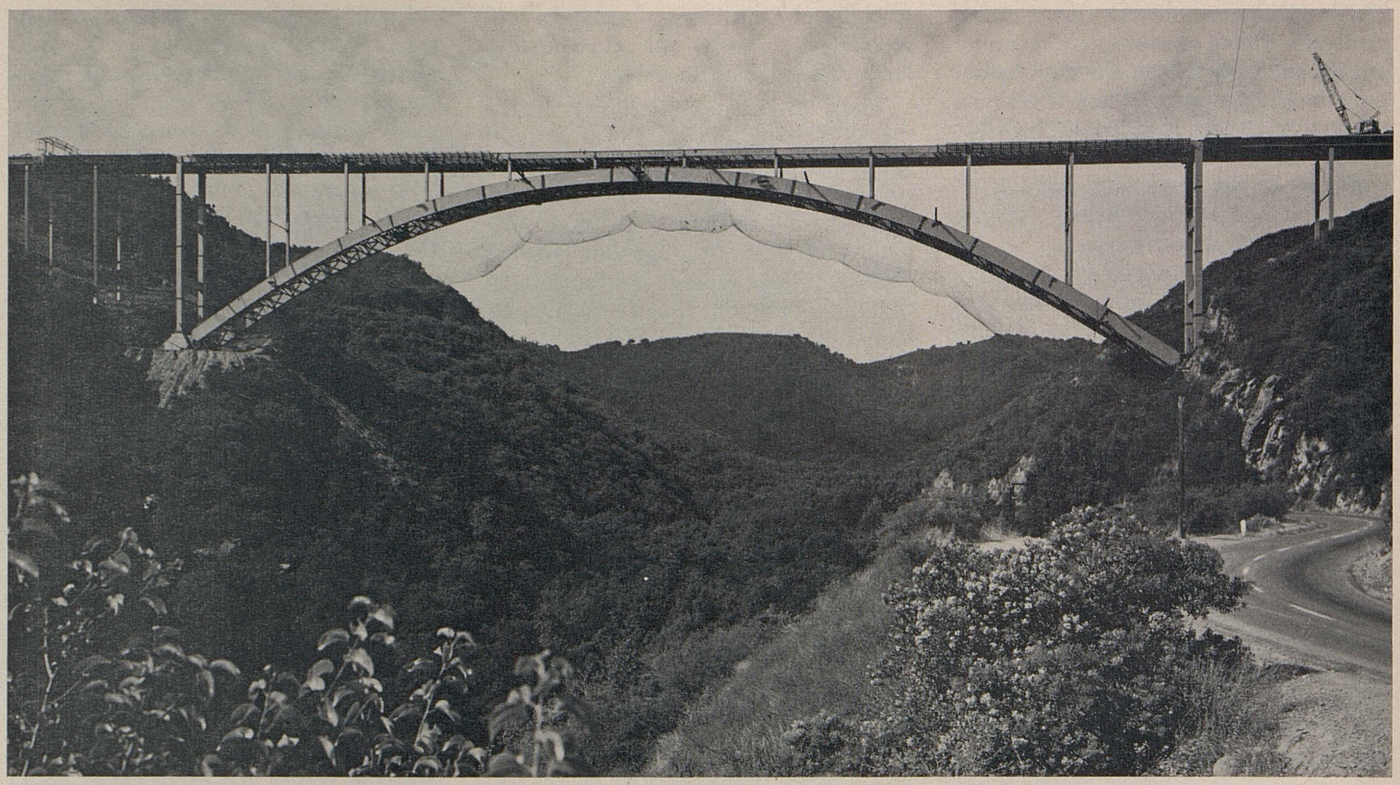
Communications between the contractors' key personnel were maintained by use of citizens band transceiver radios. The advantages of this radio system can be appreciated when it is recognized that each of the two hoist operators (one near each abutment) were hundreds of feet from the point of picking up the rib segments and seldom could see the load being lifted or set.

Tieback Tables

As succeeding sections of arch were placed outward from each skewback, tieback cables from the erection tower to rib were set near the end of the newly placed segment and the preceding tieback cables were released. This procedure was repeated until the last section of rib was in place at the crown. All field connections were made with high-strength bolts. The arch was intentionally erected higher than the intended final elevation so that by releasing pressure from the hydraulic jacks at the base of each erection tower the arch halves could be lowered until bearing was obtained at the crown hinge. This delicate and critical operation was completed on



The final operation of setting girder spans on the arch. Girder span 7 is shown in position. Upon completion of this operation all highline rigging and temporary bracing are removed.



The steel structure as seen from downstream. The deck and railing remain to be completed. The bridge will be painted green as a final operation. The existing road can be seen in right foreground.

June 27, 1963. The "topping out" or in this case the closing operation was celebrated in the traditional manner by raising the "Stars and Stripes" with the final rib segment, signifying the successful completion of a difficult and noteworthy task. Erection of the rib segments was completed in 60 working days.

The arch became self-supporting when the two halves were lowered into bearing at the crown hinge. All tieback cables were then removed and erection of the columns, floorbeams and girders on the arch was begun. Each floor beam and column was raised and set as a unit. The four girders were then placed and bolted in each span. The final piece of structural steel was set on July 25, 1963. A total of 8 months and 25 days elapsed between setting the first and last pieces of structural steel. The crown hinge was then bolted rigid, as planned, thus converting the arch from three-hinged to a two-hinged type.

Accurate Within One Inch

Surveys on the arch after all structural steel was in place show that the arch curve actually obtained was accurate to within one inch in elevation compared to the theoretical elevations planned. This is within anticipated variations for this type of work. Final adjustments will eliminate all variations in the deck profile.

The high-line rigging and towers were removed during August 1963 and placing deck concrete on the arch spans was commenced. Deck concrete for the approach spans was placed while the arch erection was underway. All deck concrete was placed by labor crews using "Georgia Buggies."

Concrete for deck spans on the arch was placed in a special skip pattern specified by the designers. The purpose of this placing pattern was to keep the arch from deflecting excessively under the unbalanced loadings and also to minimize deck cracking resulting from normal shrinkage of the concrete. A specially designed rolling frame was used for stripping deck falsework. This frame rolls on the completed deck and has two platforms which extend under the deck. The platforms are hinged in such a way that they can be raised or lowered by operators on the deck. This machine thus eliminated the need for conventional working platforms under the deck.

The bridge will be painted green as the final operation.

The contract bid cost was $1,948,-638 which includes about one-fourth mile of approach grading necessary to provide a working area for construction of the bridge. Three hundred working days were allotted for completion of the contract.

The Cold Spring Canyon Bridge is one of the first major arch structures to use all welded sections. This feature combined with the unusual arch proportions, the picturesque setting and the generally pleasing appearance make this structure a notable addition to the California highway scene.

Top 10 Percent

Nation's First Right-of-way Academy Prepares Picked Group of Young Men

By RUDOLF HESS, Chief Right-of-way Agent

California's 14,000-mile state highway system has been built, almost entirely on lands which had first to be purchased from private owners. The job of appraising these lands, negotiating their purchase, and managing them until construction is scheduled, falls to a technically trained state employee called a right-of-way agent. The first California right-of-way academy, recently instituted on the campus of the University of California at Davis, represents an innovation in training procedures for new employees in this field.

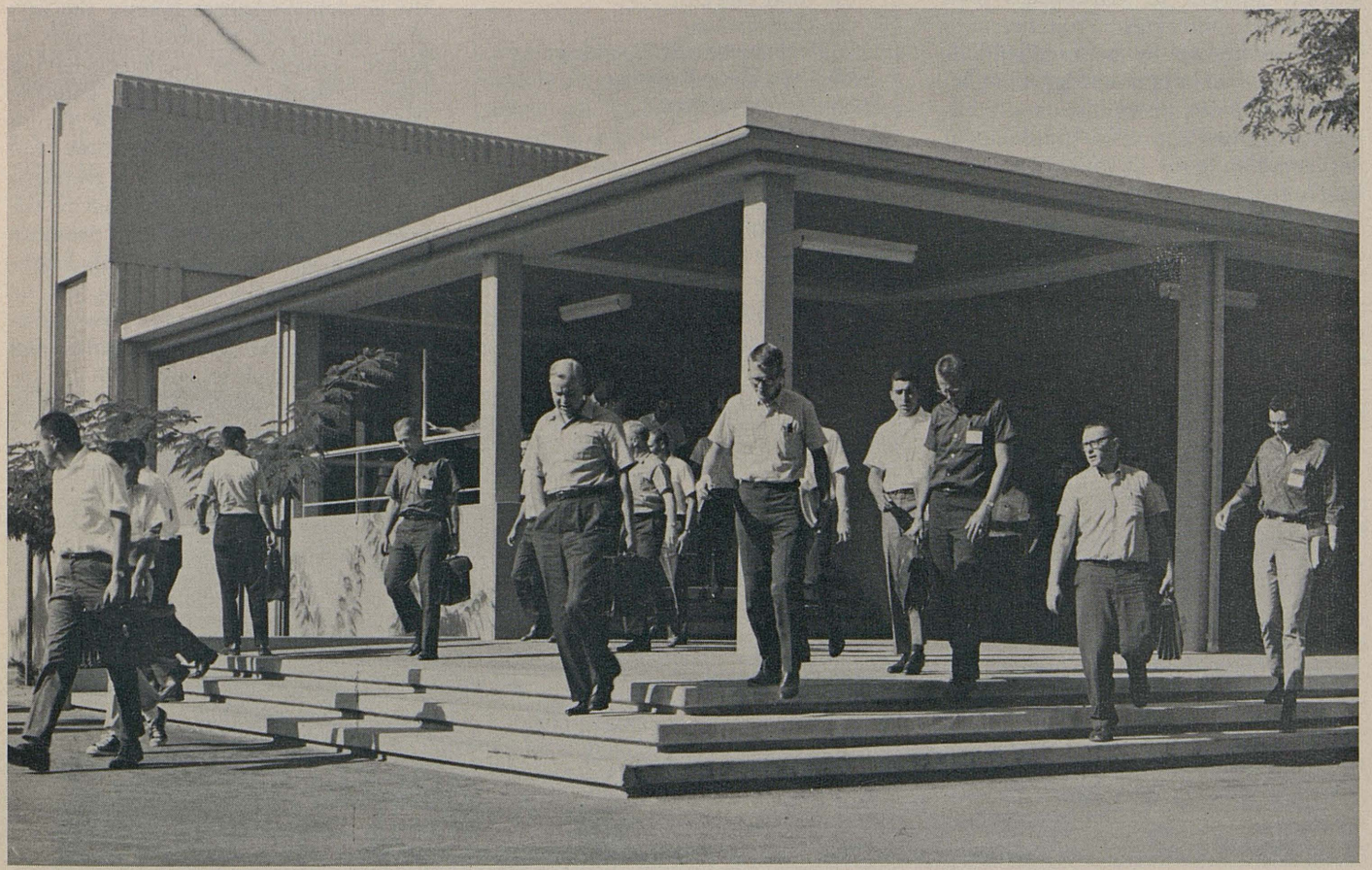
An intensive recruiting campaign during the last college year interested nearly 600 young men in careers as right-of-way agents with the California Division of Highways. Typically few, if any, of the applicants had previously considered a future in right-of-way; none had prepared themselves for such a career in their courses of study.

A composite picture of the typical applicant would show a liberal arts graduate who was attracted by the challenge implicit in the task of appraising, acquiring and managing over 9,000 separate parcels of land required for highway purposes each year. He would be tempted by the promise of a basic education in several professional specialties; by the varied responsibilities a right-of-way man is expected to assume; by the chance to help build something of usefulness and permanence.

600 Applicants

Nearly 600 applicants sought a right-of-way career, but fewer than 10 percent survived a rigorous testing and interview procedure designed to eliminate all but the most promising. The top 10 percent, all hired and sent to one or another of California's 11 highway district offices, began their new career with the knowledge that they would have to begin the learning process all over again.

Among right-of-way professionals throughout the nation, the California Division of Highways has been noted



Right-of-way Academy students leave a class held in the auditorium of the Physical Sciences Building at the University of California at Davis.

for many years for the excellence of its comprehensive educational programs. With the co-operation and assistance of the Extension Division of the University of California and of the American Institute of Real Estate Appraisers numerous on-the-job and after-hours training programs have been offered to right-of-way men in each of Highways' district offices.

California's long experience in right-of-way education was recently tapped by the American Association of State Highway officials and an outline of a course of study along with tried and proven educational materials was prepared for use in other state highway departments. Although the course outline was not formally published by the AASHO Committee until late 1962 several states have already begun programs based on the material furnished.

AASHO Program Used

Work on the AASHO program provided the perfect opportunity for a critical analysis of California's own educational offerings. Program content was found to be excellent. A practical working knowledge of right-of-way policies, procedures and techniques formed the solid backbone of information being passed on to new employees.

The analysis did, however, bring the suggestion that instructional techniques could be improved. Past educational programs have been conducted separately in each district office and instructional personnel were drawn from the ranks of each district staff. Although basic content was the same, instructional quality would naturally vary with the people involved and with the environment in each district.

There was need of a uniform instructional pattern designed to give students a single high quality of instruction and to impart a nonparochial feeling of belonging to an organization having objectives which would be of ultimate benefit to all Californians. It became evident that these goals could best be reached by gathering all new employees at one location so that the finest instructional talent available could be used without the disruption to continuing work programs which would be necessary if the course of instruction were given in each district.

Based on Educational Needs

The first session of the California Right-of-way Academy on the campus of the University of California at Davis during the first two weeks of August was the culmination of a series of major revisions in management's thinking on the educational needs of entering employees. Actually, the academy concept is only the first of a number of proposed changes in future educational policies, having been designed to prepare entering level right-of-way agents for future job assignments. Formalization and changes in techniques and emphasis are planned throughout the entire educational and intraining program structure of the Division of Highways.

Orientation training for new right-of-way agents has been planned and

COURSE OUTLINE

The R/W Function; its Proper Place in Highway Department.
- (a) Introductory
- (b) The Training Program
- (c) State Highway Department
- (d) Right-of-way Structure, Function
- (e) Right-of-way Relationships

Property Acquisition Law
- (a) Basic Laws Covering Acquisition of Property for Public Use
- (b) Case Law Pertaining to Access Control and Severance Damages
- (c) Condemnation Procedures

Basic Engineering
- (a) Mensuration
- (b) Maps and Descriptions
- (c) Construction Plans

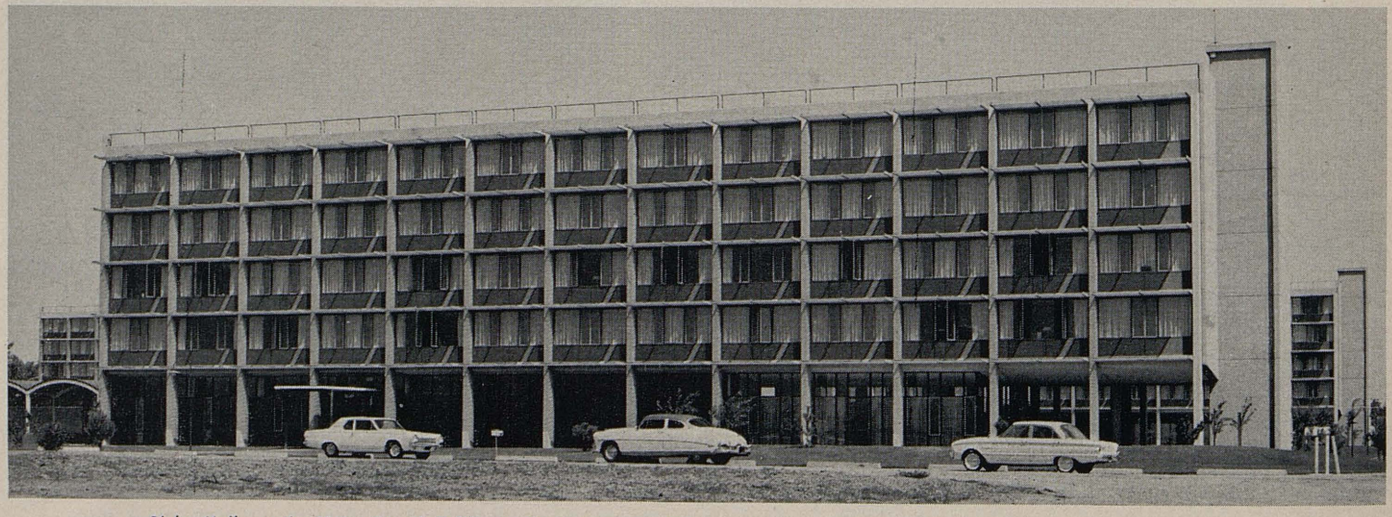
Appraisals
- (a) Basic Principles and Methods
- (b) Case Study Problems
- (c) R/W Appraisals

R/W Research and Development
- (a) Legal Aspects of Damage—Benefit Determinations
- (b) Objective Measurement of Damages
- (c) Land Economic Studies

Negotiations
- (a) Land Title Law
- (b) Contract Law
- (c) Techniques and Psychology
- (d) Case Study Problems

Property Management
- (a) Rentals
- (b) Clearance
- (c) Excess Land Sales
- (d) Relocation Advisory Assistance

Examinations



Bixby Hall, on the University of California Davis campus, where academy students were housed during the two-week session.

organized to provide basic skills and knowledge directly related to the department's policies and procedures and job performance requirements. The district training programs, in operation since 1950, have consisted of 100 hours of concentrated instruction spread in weekly sessions over a one-year period. Course content, of course, has been subject to continual critique and sharpening during the last 13 years which simplified the pre-academy analysis considerably. The basic structure which has been in use was retained but content was considerably strengthened in light of the continuity which would be possible with daily classroom instruction.

The analysis of course content proved to be a relatively simple task compared to the multitude of minor but necessary arrangements which had to be made once detailed planning for the academy began. Transportation, meals, housing, reading assignments, visual aid equipment, instructor assignments, detailed lesson plan construction, and examination content were just a few of the considerations complicating progress toward the first academy session. These, and many other, major and minor details necessitated a host of decisions and extremely close co-ordination during the preparation period.

The quiet Town of Davis and its rapidly growing branch of the University of California was the site of the Division of Highway's Right-of-way Academy.

Overall Responsibility

Overall responsibility for creation of the academy and its course of instruction was assigned to Harry L. Kagan, Supervising Right - of - way Agent in charge of Research and Development. His major tasks were to delegate his authority for detailed preparations to capable people and to act in an advisory and co-ordinating capacity for overall academy continuity.

Lesson plan preparation in each of the major divisions of right-of-way work was made the responsibility of the administrative heads of functions involved. For academy purposes these positions were titled unit co-ordinators. The unit co-ordinators in turn chose instructional personnel from among the senior members of the statewide right-of-way staff. All had an extensive knowledge of the right-of-way function and a specific knowledge in depth of the particular unit which they were to teach. In addition nearly all had had prior experience in instructing various courses of study given in past years at the district level.

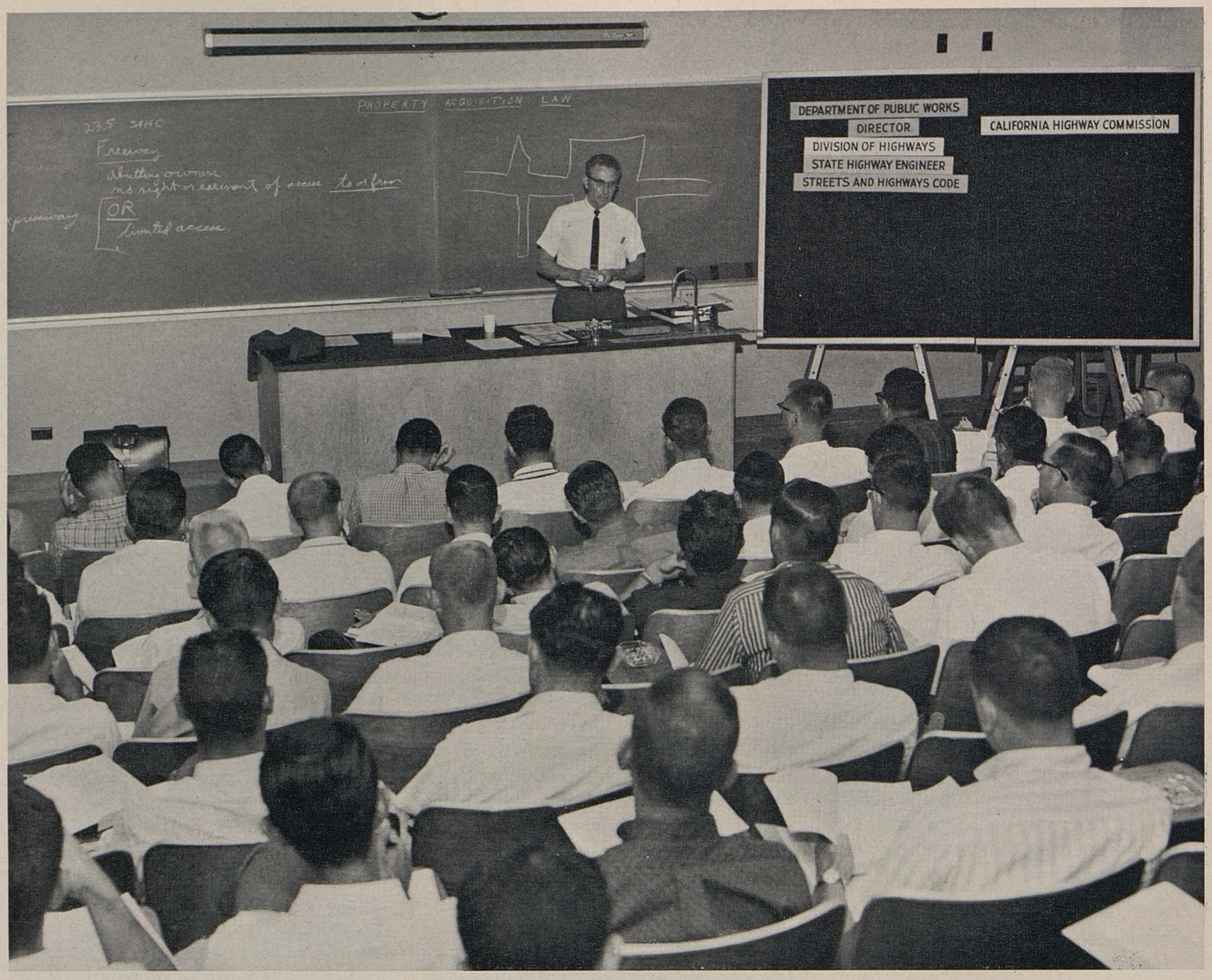
Following the selection of instructors, and as a first step toward the formal preparation of the course of instruction, the Division of Highways training officer conducted a refresher course in instructional techniques. The course, in the form of a guided round table discussion, covered preparation of lesson plans, use of visual aids, theories of learning, methods of self-evaluation and a final comprehensive discussion of total program concepts and objectives. Discussion on this last point provided some of the most interesting moments of the faculty training period.

Unanimous Agreement

A clear and unanimous agreement on the ultimate objective of any proposed course of action is the basic ingredient of success and it is particularly important in a case where many variations of emphasis are possible. But right-of-way work itself is tremendously varied; it requires skill in several technical areas and a long period of testing and training is required before a new employee can competently and satisfactorily represent the Division of Highways, the public, and the individual property owner in equal measures. The work requires that attitudes be as well developed as are skills, and to be successful in his career, the future agent must be prepared for the working conditions which apply in a civil service organization. The nature of the agents' future needs, then, required that several basic objectives be held firmly in mind by the instructional staff.

First, the student had to be equipped with a knowledge of the *ideals and philosophy* of the Division of Highways; he had to know how and why it worked. This called for both a specific presentation of mechanics and a strong idealistic exposition of motives.

Second, the student had to be given a *basic technical kit* which would enable him to understand and apply his future on-the-job training. Here a selection had to be made of a maximum number of key points for inclusion in lesson plans.



Senior Right-of-way Agent T. L. Carlson instructs a class in highway organization and property acquisition law.

Proper Attitude Is Vital

Third, the student had to be imbued with the attitude that the *rights of the public and the property owner had to be equally protected*, and that the policies and procedures of the Division of Highways were adequate to achieve this end. This meant that the instructors had to be highly skilled and thoroughly prepared and that presentations had to be absolutely factual and unbiased.

Finally, the boundaries and restrictions applying to *civil service* had to be completely and honestly explained to give the student a basis for a realistic appraisal of his future.

Within the context of these basic objectives, the methods of instruction were formalized during preparation of lesson plans. Under the direction of the unit co-ordinators, lesson plans were analyzed, and it was decided: where the lecture method would be most appropriate; which sections would be most effective with class participation; which lent themselves to homework assignment and discussion under the case study method; and where each of the various types of visual aids would be most effective.

With these initial decisions preacademy study assignments were selected for the students. Certain of the study materials were completely self-explanatory and would be useful as a preindoctrination. Since almost all of the students had reported for work before the academy was scheduled to begin, this technique had the advantage of easing them into study habits and generally preparing them for what was to come.

Finally the academy co-ordinator, with the help of individual unit co-ordinators, integrated reading assignments, the separate lesson units and the insession homework assignments so that emphasis was placed on the interrelationship of the various operations of right-of-way within the overall right-of-way function. The final result was a demonstration of the practical application of lesson material to realistic situations. Nearly every point was related to a realistic situation within the realm of the students'

understanding and experience and this proved, during the course, to be an extremely effective method of presentation.

Positive Motivation

One extremely important element in any educational program is a positive motivation for the student. Of course, in job-oriented training the student is largely self-motivated or rather, he should be, since the training is essential to his future progress. A unique feature was, however, included in the academy which furnished greater incentives to the students. Junior right-of-way agents who complete the course of instruction and the final examination will qualify as having passed, when they are eligible, the written test requirements for promotion to assistant right-of-way agent. The student's performance at the academy, as evidenced by his relative standing in the class, when combined with his subsequent job performance will determine his advancement to a higher classification and salary.

Provision was made of course to continuously evaluate the instructors and instructional material while the academy was in session. Each individual unit co-ordinator monitored his entire session, checking for adherence to lesson plans, completeness of instruction, and timing while at the same time critically reviewing lesson plan content. Additionally the training officer and his staff observed and commented on instructional techniques, presentation, use of visual aids and class response. The instructors themselves were expected to complete a self-evaluation particularly noting strengths and weaknesses in the lesson plans and in their own technical presentations.

In effect all plans and preparations for the academy were on trial and were subjected to a very critical analysis so that the effectiveness and future of the academy could be realistically appraised.

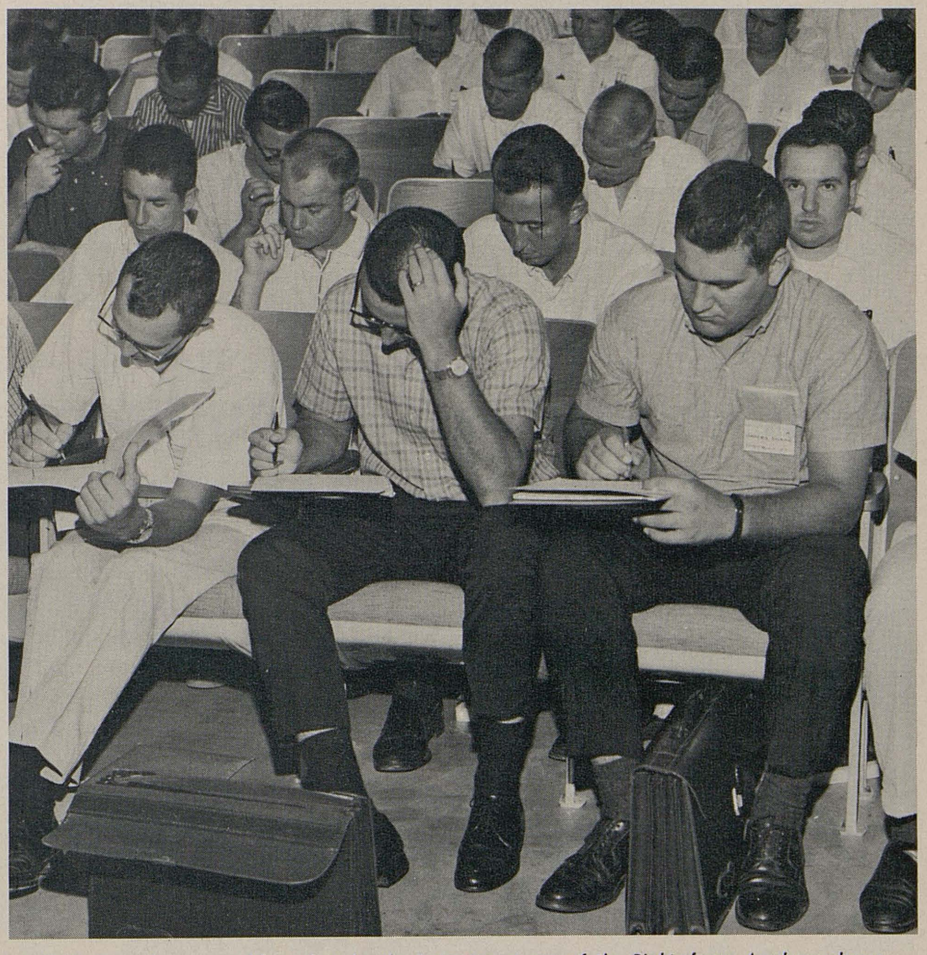
Eleven Days of Classes

Class sessions were scheduled for a total of 11 strenuous days, 6 days the first week followed by 5 full days the second week. The volume of technical material to be transmitted made it necessary to hold classes for a full eight hours each day. In addition, reading assignments, problems and case study materials were given to the students as homework. The students were lodged in Bixby Hall, one of the new, comfortable dormitories on the Davis campus, and all meals were served at the Student Union Cafeteria. These arrangements cut distracting influences to a minimum and provided nearly ideal conditions for study. In fact, it was reported that study sessions continuing until two in the morning were not uncommon.

To ease some of the pressures on the students, the instructors in each unit spent their evenings in the dormitory lounges and made themselves available to assist individual students or to participate in general "bull sessions" covering many phases, techniques or procedures for which time had not been allowed in lesson plans. These evening sessions proved to be excellent yardsticks by which the instructors could measure their own effectiveness as well as the capacities of their students. It is probable that this extra little bit added by the instructors contributed more to the development of an *esprit de corps* among the new agents than any other single factor.

Esprit de Corps

Esprit de corps is an intangible factor, but one which must be developed to have a successful organization. Such a feeling is extremely difficult to induce in a new employee and usually only comes after a long period of training under ideal circumstances. The development of a feeling of belonging in a large organization, especially in a new employee, is really a bonus and was one of the benefits of the academy concept which was not consciously anticipated to any great extent before the course began. Subsequent reactions from the students and from their superiors in the dis-



Students work on a problem given by the instructor at one of the Right-of-way Academy classes.

Charles Newman, junior right-of-way agent assigned to the San Francisco District office, reviews his evening reading assignment in the student dormitory.

tricts were so good, however, that future academy sessions for new employees are assured.

These reactions are in effect a second-level evaluation which began the moment academy students returned to their districts; and this will actually be the most important evaluation of all. The first line supervisors in each district have the responsibility for continuing on-the-job training and for rating their subordinates performance on the job. The academy graduates will be closely watched for visible signs of enthusiasm and improved productivity and in the final analyses an enthusiastic, well-adjusted, productive right-of-way agent staff will be proof of the success of the academy concept and approach.

Division Publishes New Right-of-Way Booklet

A new 24-page booklet on right-of-way acquisition policy entitled *Your Property, Your State, Your Highways* has been issued by the State Division of Highways.

Prepared especially for people whose property may be needed by the State for highway or freeway construction, the booklet explains in easy-to-read terms the State's obligations to the owner in purchasing his land for public use.

In addition to being distributed to affected property owners the booklet is also handed out at public meetings and hearings on proposed freeway routings.

Specific topics explained by the booklet include the method of determining a highway location, how the property owner will be contacted, how a fair price is decided upon for his property, some advantages in selling his property to the State over a private sale, damages paid for remaining property, how he may move his old home to a new location or purchase a new home before he is paid for the old one and transference of GI and Cal-Vet loans.

The new booklet replaces the division's previous brochure *16 Million People Want My Property*.

Nondiscrimination Policy Reiterated

Director of Public Works John Erreca has called on all employees of the Department of Public Works to take positive action to make the department's long-established policy of nondiscrimination fully effective within the organization.

"Simply being against discrimination will not make this policy effective," Erreca said in a general circular issued to the department staff, including the Division of Highways, Division of Architecture, and Division of San Francisco Bay Toll Crossings.

"It is the policy of this department that employees shall be appointed, assigned, trained, evaluated and promoted on the basis of merit and fitness without regard to race, color, religion, national origin, or ancestry," Erreca said.

He cautioned that equal consideration of minority personnel must be accomplished in all phases of the civil service process.

The circular was issued in accord with the Governor's Code of Fair Practices, and Erreca said that positive action on nondiscrimination would enable the department to show substantial progress in its annual report as required by the code.

The circular contained specific instructions under the headings of appointments, recruitment, promotions, qualifications appraisal panels, evaluation and training. Copies of the circular (General No. 73) were placed in the hands of all employees of the Division of Highways by order of State Highway Engineer J. C. Womack.

WRONG RIVER

Inside the front cover of last month's issue the river shown in the photographs was called the "Truckee."

This was one of those mental lapses no one caught in time. It was really the South Fork of the Yuba.

The Truckee runs in the other direction and is on the other side of Donner Summit.

Westside Progress

Construction Starts on New 321-Mile Interstate 5 Route

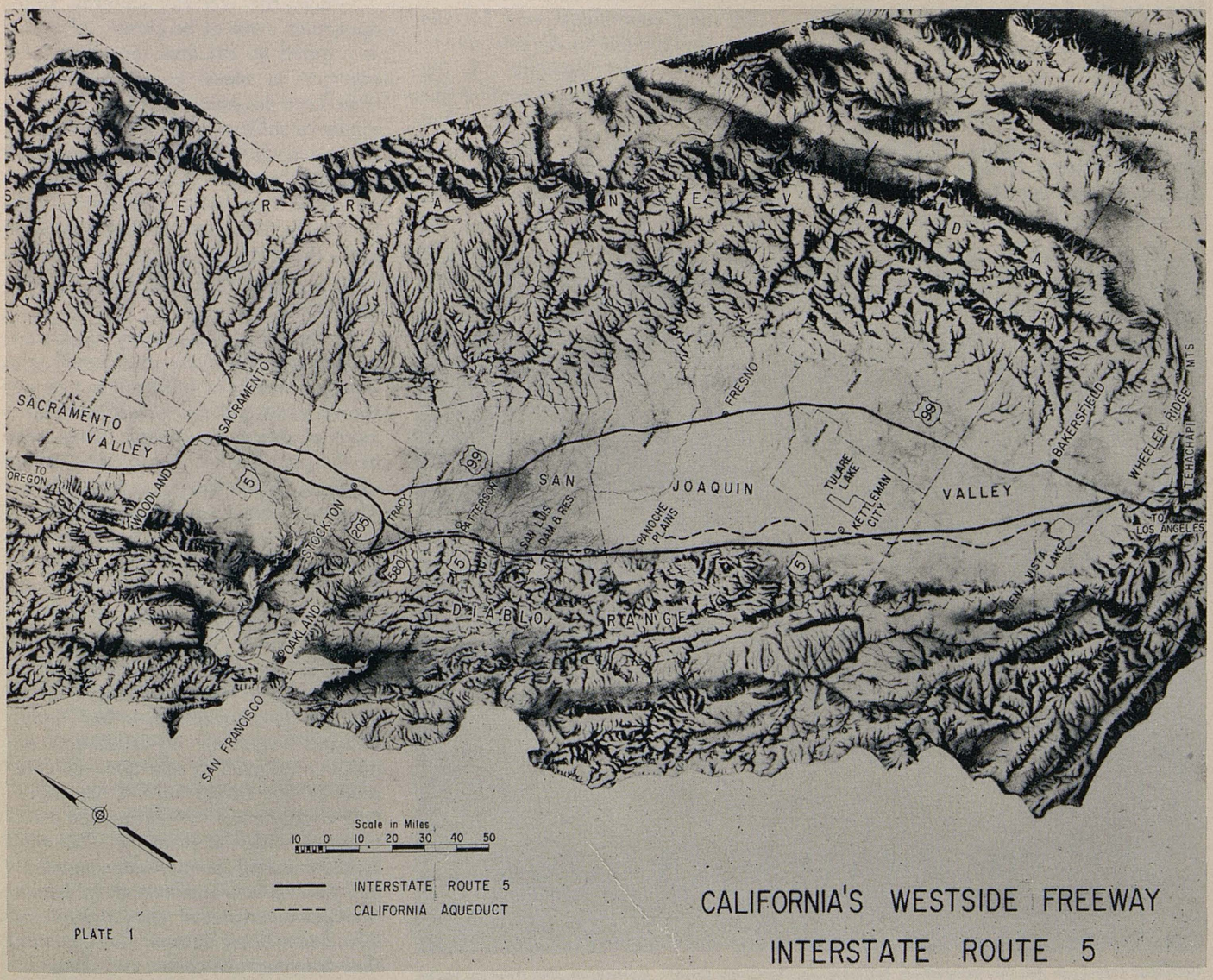
By M. E. CORNELIUS, Assistant Engineer of Design

Construction has started on the longest freeway project on entirely new alignment ever undertaken by the California Division of Highways. Actually the first construction work of consequence on this California freeway is being done by the United States Bureau of Reclamation.

The work being done by the Bureau of Reclamation for the Division of Highways is on Legislative Route 238 which, when completed, will be signed as Interstate Route 5. Legislative Route 238 extends for 321 miles, most of it completely new alignment up the west side of the San Joaquin Valley between U.S. 99 near Wheeler Ridge, some 40 miles south of Bakersfield, and U.S. 99W near Woodland.

The routing for this freeway has been adopted throughout by the California Highway Commission as has the routing for that 16-mile piece of Interstate Route 580 which is needed to connect Interstate Route 5 to existing U.S. 50 west of Tracy. This 16-mile freeway connection is required to serve Bay area-Southern California traffic desiring to use Interstate Route 5 southerly of Tracy.

The location of these routes along the west side of the Central Valley is indicated on Plate 1. Because of the



The Westside Freeway extends from U.S. 99W near Woodland to Wheeler Ridge south of Bakersfield, a distance of 321 miles.

route's location in relation to the Central Valley, it has been known locally as the Westside Freeway from its inception. (See "Westside Freeway," *California Highways & Public Works*, September-October, 1960.)

Also indicated on Plate 1 is the general route which will be followed by the California Aqueduct as it runs from the San Joaquin-Sacramento Delta to the Tehachapi Mountains. This aqueduct is a key feature of the California State Water Project. It will transport surplus water from Northern California to areas of need in California's great Central Valley and south of the Tehachapi Mountains.

State Facility

From the Sacramento-San Joaquin Delta to the San Luis Reservoir west of Los Banos the aqueduct is to be a state facility for which the California Department of Water Resources is responsible. From San Luis south to Kettleman City (including the San Luis Dam and related facilities) the aqueduct is a joint state-federal undertaking for which design and construction responsibility has been assigned to the U.S. Bureau of Reclamation. The State will operate the joint unit. Southerly from Kettleman City the aqueduct again becomes a state facility.

The reason for the joint undertaking by the state-federal water agencies between San Luis and Kettleman City is that the San Luis Creek basin is the only area where economic water storage can be obtained on the west side of the San Joaquin Valley. Federal interest entered into the picture because the increasing demand for irrigation water on the west side of the valley created the need to extend the reclamation features of the federal Central Valley Project southerly from the U.S. Bureau of Reclamation's Delta-Mendota Canal service area.

The most economical way for the federal government to do this was to use the offseason capacity of the Delta-Mendota Canal by pumping this water into a storage reservoir on San Luis Creek from which a canal could be constructed southerly to near Kettleman City. By co-operating in financing the construction of larger facilities both state and federal water requirements through this area could be satisfied at a minimum of overall cost.

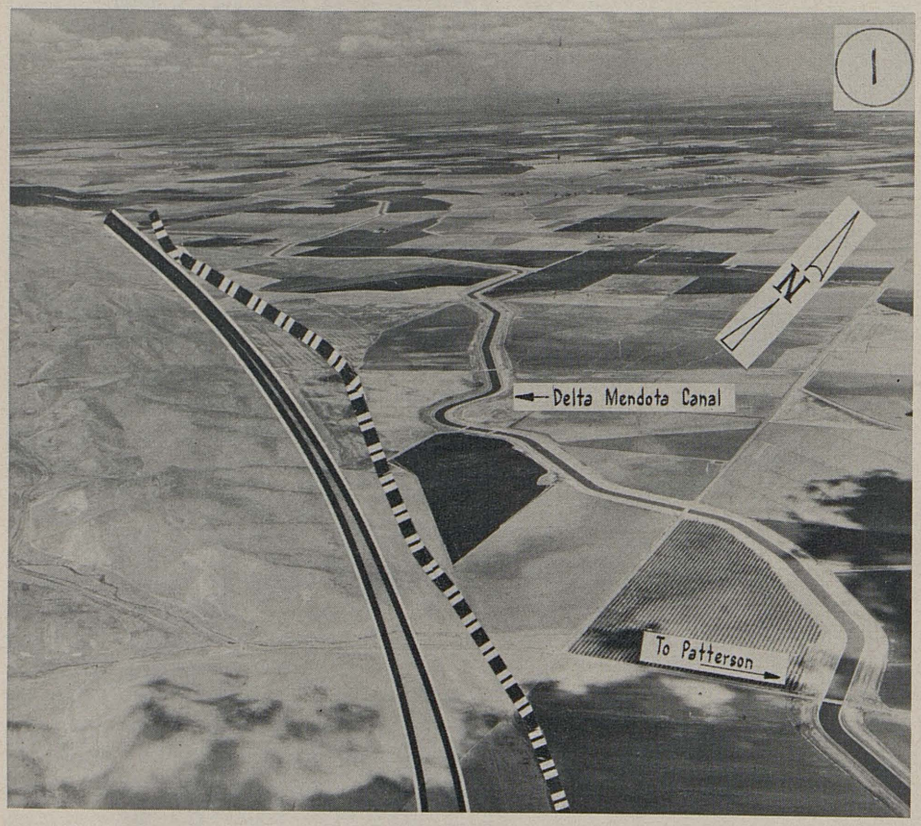
Plans Are Complete

Plans, specifications and estimates for the freeway are complete for that portion of the route northerly of the Fresno-Merced county line to U.S. 50 west of Tracy, and design work is in various stages of completion for all remaining portions of the route. As the freeway is part of the National System of Interstate and Defense Highways, construction of it must be completed by 1972. Construction of the aqueduct between the Delta and the Tehachapi Mountains is scheduled for completion by late 1970.

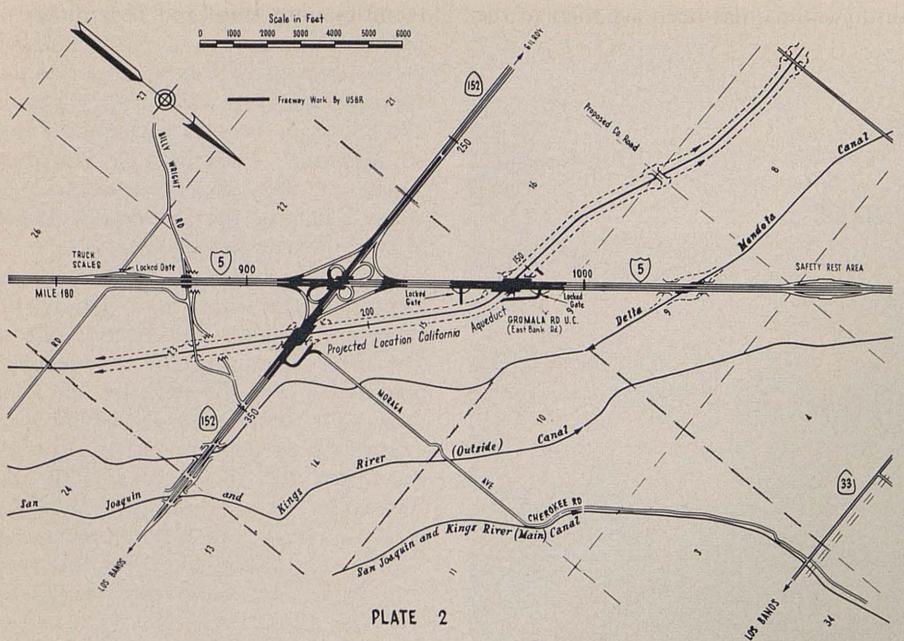
Where the freeway and the aqueduct must cross or be closely adjacent, as typified by the area shown in Photograph 1, close co-ordination between the designing agencies was necessary to achieve mutually satisfactory designs with the maximum savings in time and money. Excellent detail co-operation prevailed throughout between the Division of Highways and both the Department of Water Resources and the U.S. Bureau of Reclamation.

In Photograph 1, as in all photographs accompanying this article, the separate roadbeds of the freeway are shown solid and the aqueuduct alignment is shown as dashed. Some idea of the projected aqueduct size can be obtained by comparing it to the Delta-Mendota Canal in Photograph 1. In this area westerly of Patterson the aqueduct is to carry approximately 2½ times the quantity of water which the Delta-Mendota Canal is capable of carrying.

While the need for co-ordinating cross drainage structure designs is evident in Photograph 1, other design features requiring co-ordination are not so obvious. For example, the cross road in the foreground is an important county road which must be interchanged with the freeway. This road must be raised to cross the aqueduct yet pass under the freeway in a manner permitting the construction of safe interchange ramps. Complicating this design problem are five large intrastate pipelines which parallel the



PHOTOGRAPH 1. In this aerial west of Patterson in Stanislaus County location of the freeway route is shown by the superimposed double solid line and the proposed aqueduct by the single dashed line.



A design map showing location of the Interstate 5-Sign Route 152 interchange in relation to the California Aqueduct.

freeway-aqueduct through this area and the major cross drainage channel of Black Gulch which parallels the county road.

Joint Financing

The joint construction features in this area will be done as part of the freeway's construction as it will precede construction of the aqueduct in this area. Financing of joint work, of course, will be by both agencies under terms of an agreement drawn beforehand.

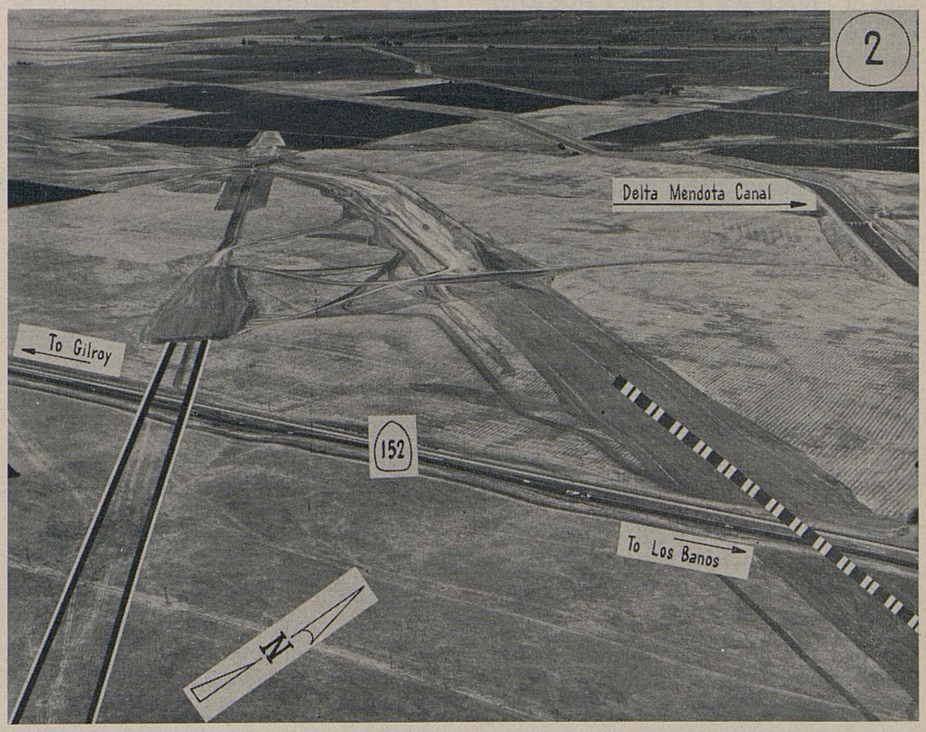
As the Division of Highways was first to perform its detailed survey work through the Westside area, all of its survey control data, section corner ties and related survey and map information were supplied early to the water agencies to assist them in fixing their survey work to the same survey base. Co-ordination at this stage greatly simplified subsequent design co-ordination which included designs of mutually satisfactory alignments, grades, drainage, crossroads, geometrics, earthwork, right-of-way maps and right-of-way deeds.

As many land ownerships are being crossed by both the freeway and the aqueduct, it early became evident that rights-of-way for both facilities should be acquired as one transaction by one state agency where both facilities were under state jurisdiction. From this beginning came an agreement whereby the Division of Highways has been made responsible for the acquisition of all rights-of-way required by the Department of Water Resources.

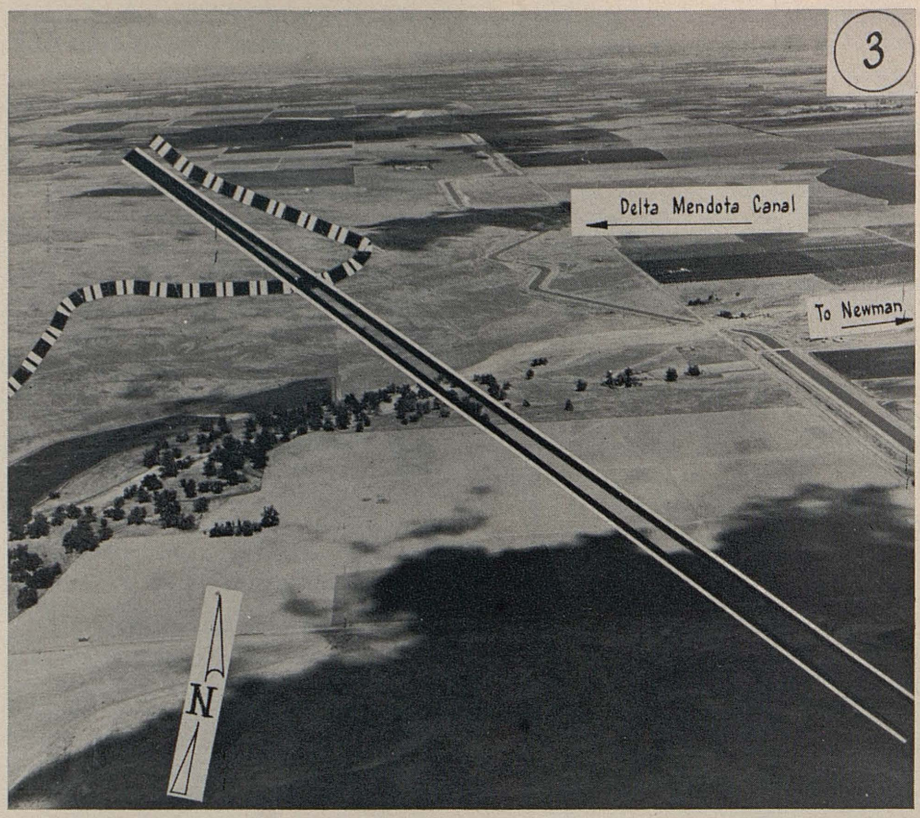
An example of how close interagency co-operation has borne fruit in construction is where the freeway must interchange with the Pacheco Pass Highway, State Sign Route 152, westerly of the City of Los Banos in the San Luis area. Here two freeways must interchange in an area where the U.S. Bureau of Reclamation desired to locate a portion of the aqueduct. The excellent co-operation between representatives of the Division of Highways and the Bureau of Reclamation not only resolved the problem of locating the respective facilities so as to eliminate location conflicts, but also provided the groundwork by which it became possible to incorporate considerable state highway work into the aqueduct construction contract covering this area.

Aqueduct Construction

The construction contract for that portion of the aqueduct between San Luis and 18 miles southerly thereof was awarded by the U.S. Bureau of Reclamation to Guy F. Atkinson Company on April 29, 1963. Included in this aqueduct construction contract is approximately $1,500,000 worth of freeway work on Interstate 5 and Sign Route 152, approximately two-



PHOTOGRAPH 2. An aerial of part of the area shown in the above map with the aqueduct indicated by the dashed line and the freeway by the double solid line.



PHOTOGRAPH 3. At this location just north of Orestimba Creek in Stanislaus County the aqueduct (dashed line) must pass under the freeway (solid double line). Aqueduct excavation will furnish borrow material for construction of the freeway.

thirds of which is to be done at Division of Highways' expense. This work on the two state highways is indicated on Plate 2 and consists essentially of:

(1) Constructing some 570,000 cubic yards of roadway embankments using all economically available excess excavation material from canal construction.

(2) Constructing all work necessary on State Sign Route 152 through the future interchange so that only one construction interference with traffic will be necessary.

(3) Constructing bridges over the aqueduct for both the Westside Freeway and Sign Route 152.

It is estimated that this construction co-ordination will result in a savings of approximately $500,000 to the public agencies involved.

The Atkinson Company started work on this construction on June 27, 1963. Photograph 2 shows the construction activity under way in this area on September 3, 1963. In this area the California Aqueduct will carry approximately four times the quantity of water that the Delta-Mendota Canal is capable of carrying.

Aqueduct Furnishes Borrow

Similar construction co-operation is to be undertaken at other locations. Where freeway construction requiring borrow material will precede aqueduct construction and the aqueduct is close enough, the required borrow material will be obtained by excavating the aqueduct as part of the Division of Highways' construction contract. Construction co-operation also will be undertaken at the other places where the aqueduct and the freeway must cross.

One such instance is shown on Photograph 3 where the aqueduct must pass under the freeway just northerly of Orestimba Creek in Stanislaus County. In this case, present construction scheduling has aqueduct construction underway first with freeway construction to follow within a year or two but before the aqueduct must carry water.

At this crossing the Department of Water Resources will delay lining a short segment of the aqueduct so the Division of Highways can construct the necessary bridges with a minimum of difficulty. Placement of aqueduct lining in the crossing area will be made a part of the Division of Highways construction contract.

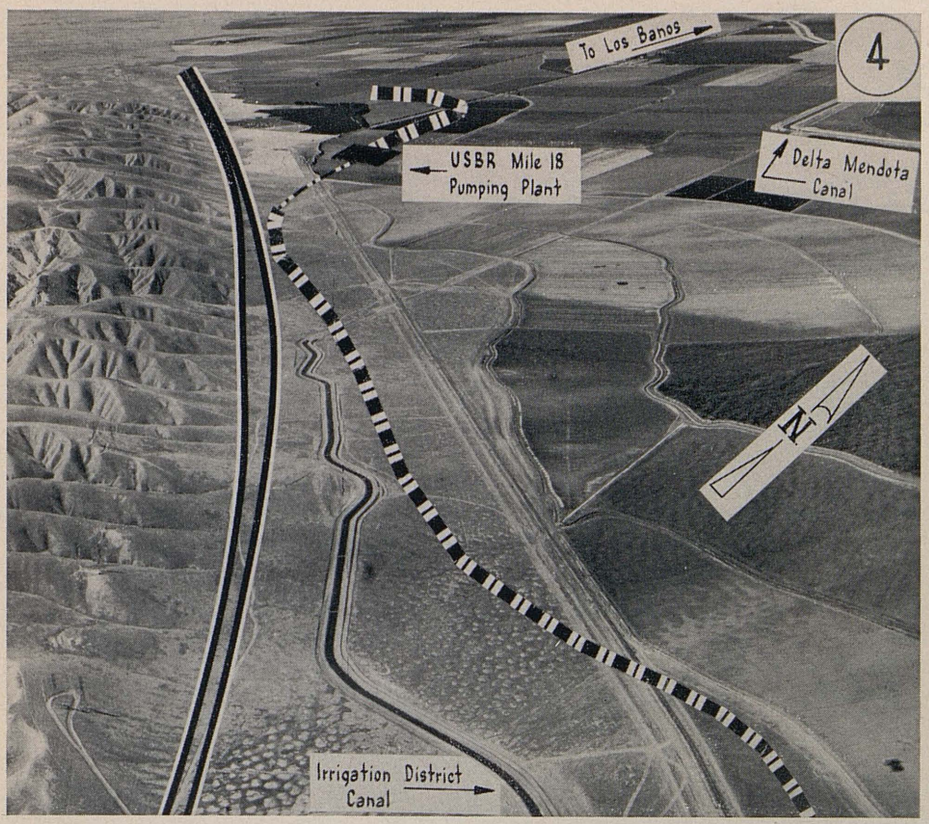
Orestimba Creek flows through the center of Photograph 3 where the trees are evident. This area is one of the most promising for the development of a wayside park by the California Department of Parks and Recreation. That department was granted authority for such parks along the Westside Freeway by the Westside Freeway Park and Development Act which was passed by the Legislature and signed by Governor Brown on July 17, 1963.

Wayside Parks

Wayside parks are located off the freeway and will have access to the freeway via interchanges. Wayside parks, where overnight and picnicking facilities will be available, should not be confused with safety rest areas which are parking and rest areas which will be located within the freeway's right-of-way but clear of the traveled ways.

Between Wheeler Ridge and Tracy six pairs of safety rest areas will be constructed. Each pair will be located at about one-half hour driving intervals at locations which have been approved by the U.S. Bureau of Public Roads. Under authority of the above-mentioned Westside Freeway Park and Recreational Act, the Division of Highways will install restroom facilities, tables, refuse containers, shade trees or shade structures and other related noncommercial facilities for the traveling public at these six locations. These service facilities will be in addition to the on and off access roads and parking areas usually constructed by the Division of Highways under authority granted to it by the federal government for the construction of safety rest areas on the Interstate Highway System.

In addition to the above six pairs of safety rest areas, two vista points will be constructed in Stanislaus County, one northbound and one southbound.



PHOTOGRAPH 4. North of the Fresno-Merced county line the freeway (solid double line) will be located along the edge of the Coast Range foothills.

These vista points will be located atop knolls adjacent to the freeway where the interested public can obtain outstanding views of the Central Valley, the foothills, the California Aqueduct and the Delta-Mendota Canal. At these locations, parking areas connecting to the freeway via offramps and onramps will be provided.

Scenic Values

Northerly from the Fresno-Merced county line, the freeway is located generally along the toe of the Coast Range foothills within a narrow belt which is above the westerly extent of irrigable lands. As a consequence of its elevation and location, the drive along the Westside Freeway through Merced, Stanislaus and San Joaquin Counties where the California Aqueduct is adjacent should prove enjoyable from a scenic standpoint as changing vistas of the vast farmlands to the east and the Coast Range to the west will be obtained.

Photograph 4 is illustrative of the location above described and also shows a section of freeway where independent roadway alignments and grades have been combined to achieve a pleasing effect. In this instance, the freeway steps up the foothills to clear the outlet channel of the U.S. Bureau of Reclamation's Mile 18 pumping plant southerly of Los Banos. The difference in elevation between the northbound and southbound roadways in this area reaches approximately 70 feet.

Between Kettleman City and Tracy five sections of independent alignments have been designed to obtain an aesthetic and pleasing appearance. Independent gradelines of the two roadbeds are to be used throughout, being more exaggerated in the areas of independent alignment.

Three Contracts to Be Awarded

Three contracts are to be awarded this coming year for approximately 20 miles of construction along the freeway. Construction on an additional 72 miles is scheduled for the year which follows. A high rate of contract construction will continue through the 1970-71 fiscal year so as to complete the entire freeway by 1972.

Although some local traffic service will be rendered by those portions of the route completed prior to 1972, the freeway's full benefit to California's motoring public will not be realized until it can be opened to through traffic. An example of these benefits is the 22-mile distance savings the freeway will provide Bay area-Southern California traffic over the shortest existing route now serving this traffic.

New freeway construction of the length and magnitude of California's Westside Freeway is indeed unique. As this freeway generally parallels major aqueduct construction for much of its length, an unusual amount of close detail co-ordination was required between the Division of Highways and those agencies responsible for aqueduct construction—the California Department of Water Resources and the U.S. Bureau of Reclamation. This freeway-aqueduct co-ordination is now beginning to bear fruit in construction and was, of course, in addition to much necessary co-ordination with many other federal, state and local agencies.

District IV Loses Materials Expert

Edgar R. Hoffman, Associate Highway Engineer for the Division of Highways Materials and Research Department in the Berkeley Branch Office, has retired after a career of 35 years with the State.

EDGAR R. HOFFMAN

Hoffman was born near Keystone, South Dakota. A graduate of the University of California at Berkeley, he joined the division in 1928 as an assistant resident engineer.

At the time of his retirement he headed a staff engaged in the inspection and testing of highway construction materials prior to their shipment to state highway jobsites.

Hoffman is married and has a daughter.

Employee Safety

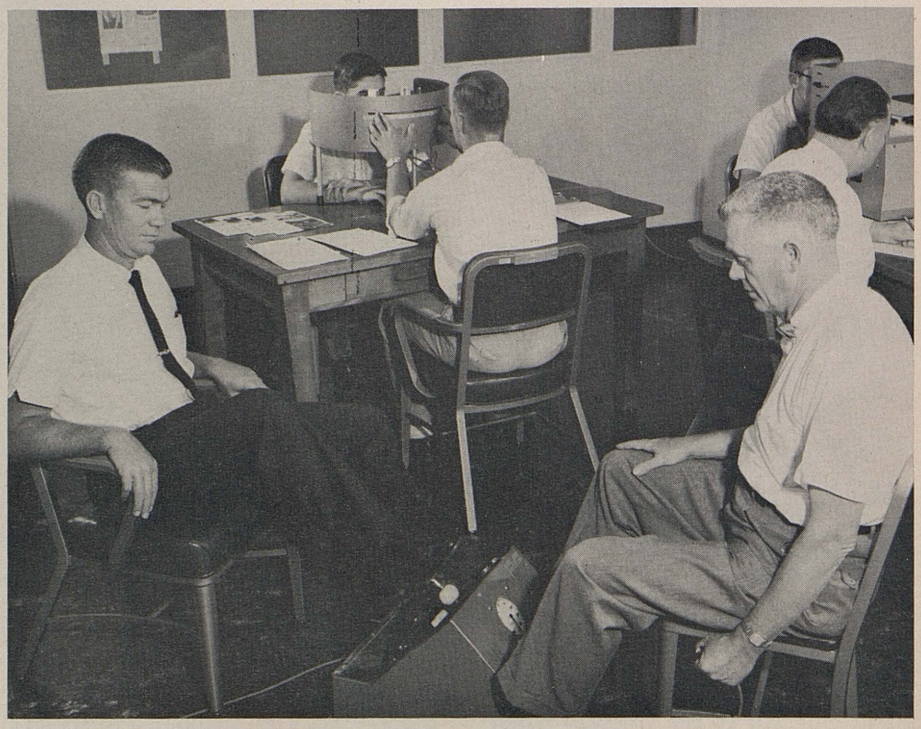
Twenty-five-year Effort Brings Outstanding Results

By B. A. SWITZER, Division Safety Engineer

Safety as an independent function in the Division of Highways was recognized when an administrative order creating a Traffic Safety Department was issued March 1, 1938.

The new department was instructed to make traffic studies, review traffic accident reports, make recommendations for traffic control devices, promote traffic safety and review compensation accident reports, inspect buildings and plants and take action or make recommendations to improve our employee accident record. Traffic engineers were appointed in all the districts with these responsibilities.

In June of 1940 the State Highway Engineer, in a circular letter to the district engineers, emphasized the importance of an active program to prevent employee accidents. He called attention to the high cost of compensation and advised them that our accident frequency rate was three times higher than the general industrial rate. He added that not only had there been no improvement in the past eight years, but it had actually become worse.



Psychophysical tests in connection with the driver training program underway in District VII (Los Angeles). In the foreground is an electrical device for clocking braking reaction time; top center, testing for angle or side vision; right, testing for depth perception. The latter instrument is also used to determine visual acuity.

Information Inadequate

It was soon evident that the factual information on the compensation forms was not adequate for a satisfactory safety program. On January 1, 1941, a new form was added to those to be submitted on injury cases. The front of this form was identical to the compensation form and on the back was a number of analytical questions to be answered by the supervisor. These questions were calculated to encourage the supervisor to analyze and determine the cause of the accident and put into effect or recommend to higher authority appropriate action to prevent a recurrence.

In March of 1943, diminishing manpower resulting from our war effort impelled the State Highway Engineer to again circularize the district engineers and department heads to conserve manpower through accident prevention. Our accident frequency rate for 1942 was 50.89 and was especially a reason for concern when manpower was so scarce.

Governor Warren, in December of 1949, called on state department heads to establish safety committees and take all reasonable steps for prevention of state-owned vehicle accidents. The following .May the Director of Public Works instructed his division heads to activate an all-inclusive safety program.

The Division of Highways the following July (1950) named full-time safety supervisors to each of its 11 districts and part-time safety supervisors to each of five major headquarters departments. The safety section was established in headquarters and administrative procedures were developed. The headquarters office of the safety section is composed of the safety engineer and two assistants with a small staff to co-ordinate the program and collect and analyze accident statistics.

District Committees

In each district there is a safety committee to review accidents and recommend accident prevention procedures. The committee is composed of the district maintenance engineer, the superintendent of the equipment department shop and such other district department heads as the district engineer considers appropriate. The district safety supervisor acts as secretary to the committee and in most cases reports to the Assistant District Engineer—Administration.

The members of the district safety committee are expected to be at sufficiently high levels of authority to en-

able them to take immediate and effective action on safety proposals that affect the welfare of the employees of their departments. Since the safety supervisor must work across all channels of line supervision, it has been found most satisfactory for him to report to a high level of administrative authority.

The duties of the safety supervisors have been established as follows:

1. Serve as secretary to the district (or bridge department, laboratory, etc.) safety committee.
2. Maintain records and prepare statistical reports for headquarters safety section and the division safety committee.
3. Do the necessary preliminary work and carry out the details of functions assigned to the district safety committee as outlined below.

The district safety committee:

A. Examines and reviews all accident reports. This includes reports of automobile accidents (Form 270); and reports of industrial injuries (Form 67);

B. Ascertains that all material facts are contained in the reports;

C. Decides the basic cause of each accident and recordability; decisions to be based on whether or not the state operator or employee exercised prudent and careful judgment in his attempt to avoid the accident;

D. Interviews the state operator or employee who has been involved in an accident in all instances where such action is deemed advisable;

E. Advises the state operator or employee of the committee's decision concerning the recordability and the cause for each accident examined and reviewed by the committee (this should be in writing);

F. Makes such recommendations to the district engineer, or through him to the division, as the committee deems appropriate;

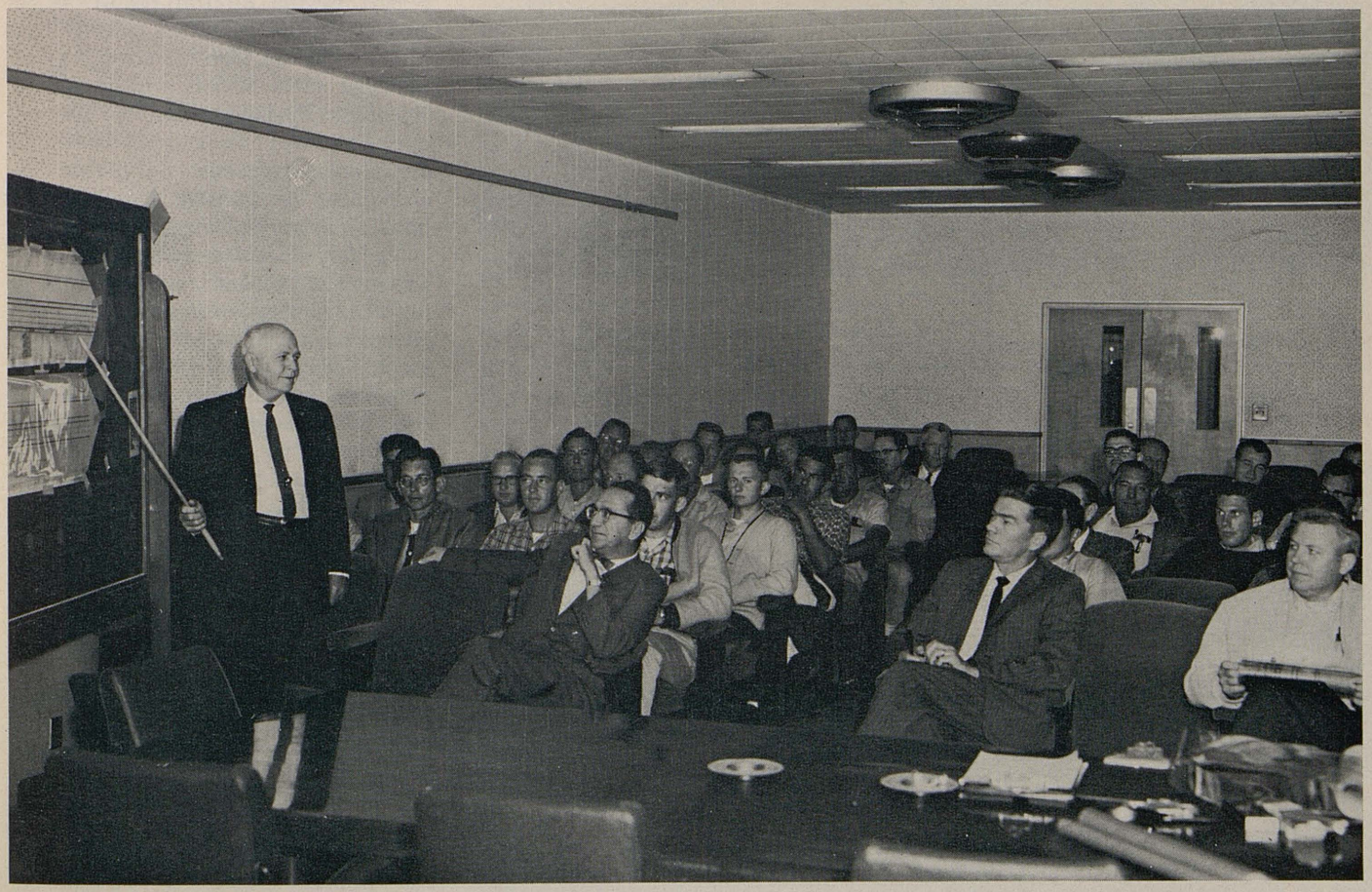
G. Recommends disciplinary action to the district engineer when in the judgment of the committee such action is justified in the light of all the circumstances;

H. Holds regular meetings at least once each month;

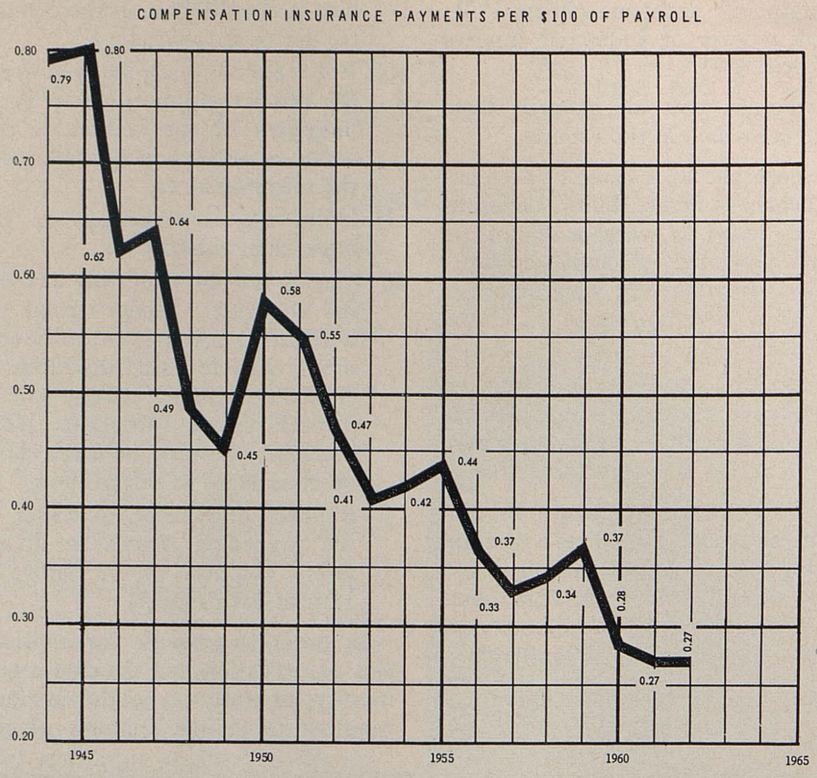
I. Carries out an education program to acquaint district employees with safe practices, the safety code, motor vehicle laws, hazardous operations, accident causes, and the district safety program. Safety literature, posters, bulletins should be considered as safety tools;

J. Reports committee activities for the preceding month to division safety engineer on or before the 15th of each month.

In order to provide for consistencies of operation and develop a community of interest, each district is required to submit minutes of their



Safety Engineer B. A. Switzer discusses a guide system in control of traffic around a typical working area with surveyors, engineers and maintenance supervisors at a class on work area protection.



monthly meetings to headquarters with meetings being held early enough so that the minutes can be prepared and be in Sacramento prior to the 19th of the month.

The minutes from these meetings are condensed into an interim report, which is forwarded to the division safety committee five days in advance of its meeting. The division or headquarters committee meeting is usually held the first or second Friday of the month following the meeting of the district committees.

The division committee is composed of the Deputy State Highway Engineer—Administration as chairman, with the equipment engineer, the maintenance engineer, the engineer in charge of personnel and public information and an attorney as regular members of the committee. The safety engineer acts as secretary.

The division safety committee responsibilities are:

A. To formulate the details of the program within the framework of which the district committees shall operate;

B. To review the monthly reports of the district committees and advise with the district committees on problems presented;

C. To review and make recommendations with respect to the more difficult problems which may be referred to it by the district committees;

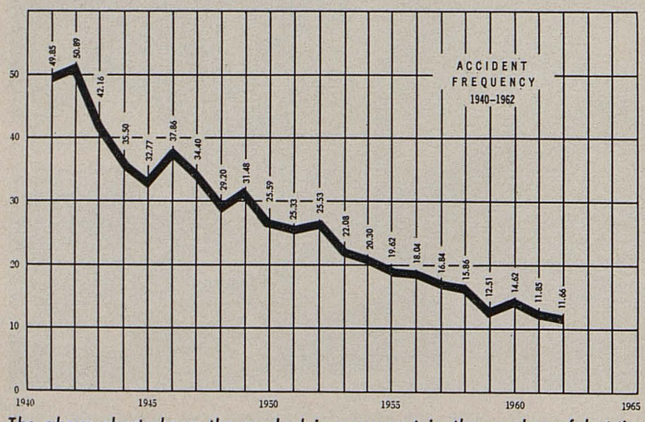
D. Act as a clearinghouse for ideas and suggestions which may be incorporated into the program;

E. Perform the same duties with respect to accidents involving headquarters personnel which are delegated to district committees;

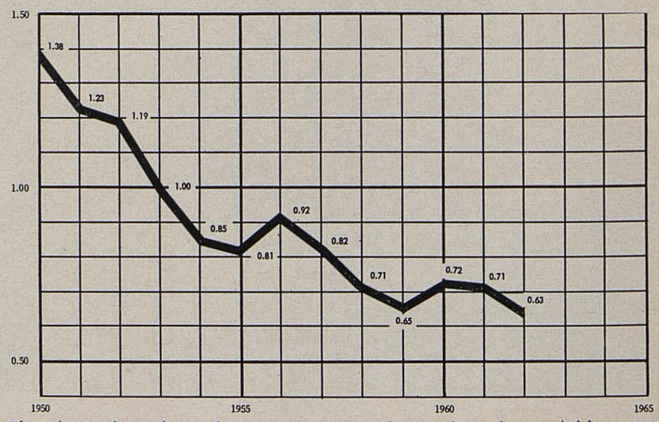
F. Review from time to time the effectiveness of the program as carried out by the various districts and report thereon to the division head. The division head shall in turn report quarterly to the director.

The interim report (in the hands of the committee) is reviewed in detail and the district action may be supplemented by headquarters action to make it more effective. A month-by-month statistical report, which is a part of the interim report, is reviewed to determine the effectiveness of the program. Consideration is given to those areas which require special attention. Detailed reports are requested when more information is considered necessary to enable the committee to prepare recommendations on important measures.

Minutes of the headquarters committees are prepared, and the interim report, together with the minutes, is sent to each district and major department. This provides each district with complete information on the safety program throughout the State and has been found to be a valuable tool in the program.



The above chart shows the marked improvement in the number of lost-time injuries per million man-hours of exposure from 1941 to date.



The above chart shows the improvement in the number of recordable motor vehicle accidents per million miles of travel from 1950 to date.

The safety section develops specialized safety material and promotes meetings and discussions to point out hazards that need to be recognized for developing and using safe procedures.

When Governor Brown, in a directive dated December 16, 1959, required all state agencies to conduct a driver training and vehicle accident prevention program, the responsibilities for developing and conducting the course in the Department of Public Works was assigned to the safety section.

Defensive Driving Course

While a suggested course was made available by the State Safety Co-ordinator, it was determined to develop a defensive driving course appropriate to our particular personnel needs. The course consisted of three hours of classroom work, a psychophysical test and a road observation run.

Approximately two hours of the classroom portion of the course was composed of a lecture and moving pictures on "defensive driving" techniques. The remaining hour was used for classroom discussion with audience participation.

The lecture was pointed toward methods and procedures that have proved effective in defensive driving. The psychophysical tests were designed to indicate to the employee any defective physical condition that might affect his driving and for which he should compensate. It consisted of tests for visual acuity, color blindness, depth perception, width of vision and reaction time. The road observation run was designed to observe the driver's driving habits that could result in his becoming involved in an accident.

By January 31, 1961, the first series of defensive driving courses had been given to 13,580 employees. This is a continuing course with lectures, psychophysical and road evaluation tests given in the districts and headquarters every three months. Since this first series was completed we have given the course to an additional 2,315 employees. Since supervisors are responsible for assignment of driving duties to employees, the responsibility for giving the road observation run to new employees, before assignment of

G. T. McCoy, former State Highway Engineer, presents J. G. Meyer, District Engineer in charge of District X (Stockton), with a certificate of achievement for best accident prevention in 1956. This was the first such certificate awarded for an accident prevention record in the Division of Highways.

PHOTO ABOVE. Deputy State Highway Engineer C. E. Waite (right), who has recently retired, presents to Alan S. Hart, Assistant State Highway Engineer for District III (Marysville), the certificate of achievement for 1962 for best accident prevention record in the division for that year. PHOTO BELOW. C. G. Beer, then Assistant District Engineer for District VIII (San Bernardino) and now urban planner for the division in Sacramento, receives from Safety Engineer B. A. Switzer a plaque commemorating a million accident-free hours in the district. H. N. Lienau, Safety Supervisor in District VIII, is on the right. District III (Marysville) received a similar plaque a few months later.

driving duties, is being delegated to the supervisors.

Inherent Hazards Emphasized

The safety program is based on the principle that safety is an integral part of proper work procedures. Meetings of operational personnel are encouraged monthly or more frequently according to operational conditions. Emphasis is placed on inherent hazards. Safety supervisors frequently address such meetings, but the foremen, superintendents, or resident engineers usually act as the chairmen and promote the discussions.

While no monetary awards are authorized to state employees, safety records and achievements are recognized. Men with no accident records for two years or more are presented wallet cards; superintendents and foremen whose crews work a year or more without lost-time accidents are presented certificates, and each year the district with the best accident frequency record is presented a special certificate of achievement with appropriate ceremonies. For the past two years this has been won by District III. In 1962 Districts III and VIII each achieved a million man-hours without a lost-time accident. Special plaques were designed and presented for this accomplishment.

The safety section does not issue a safety manual. Appropriate safety instructions for various operating conditions are covered in operating manuals. Pamphlets and posters are issued by the safety section when work methods or procedures need added emphasis.

Accident Reports Analyzed

Before being referred to the district safety committee, accident reports are carefully reviewed and analyzed in the districts by the foreman or supervisor of the injured employee. He must answer a series of questions on the back of the accident form designed to help him to analyze the accident, determine its cause, and take appropriate action toward prevention of its recurrence. No accident is studied or reviewed with the intent of placing blame on the employee. An approach of this kind is not appropriate to our safety procedures.

Motor vehicle accidents are reviewed by the district or department safety committee and are divided into three classes:

Class I—An accident in which the state vehicle is not directly involved, but, because of its position, may have contributed toward the accident.

Class II—Accidents resulting from work operations and incidental to operating procedures.

Class III—Those accidents not included in the Class I or Class II. They are further divided into recordable accidents or nonrecordable accidents. A recordable accident is one which could have been prevented by more defensive driving on the part of the state driver. The legal rights and privileges are not determining factors in establishing recordability.

Class III accidents are analyzed by the district safety committee to determine if they are recordable or nonrecordable and to determine appropriate action to prevent their recurrence. Vehicle drivers are frequently requested to appear before the committee to explain the details of the accident and the conditions that prevented the driver's avoiding it. If the committee finds an employee driver does not practice defensive driving and has a record of recordable accidents or citations for moving violations it may recommend counseling by the safety supervisor or disciplinary action by the district engineer.

Problem Areas Determined

The safety engineer and his staff review accident statistics and records to determine trends and problem areas. Such a problem was recently isolated in operation of rotary mowers. In addition to our own records, all of the other states were re-

This high standard with its pattern of three flags can be seen over the top of the average car. Here, it is being used as a support for a 48-inch federal standard sign. The sign is made of nylon material and can be dismantled and transported in rolled condition.

A high-level warning device with flashing lights protects an inspector making compaction tests. Compaction tests are made around the clock, requiring an inspector to make tests at night with contractor's equipment moving around him.

quested to furnish their records and experience. As a result of this investigation special guards were designed and installed on all rotary mowers in the division. Experience with this guarding is being recorded and operating departments are experimenting with other methods and equipment for weed control in an effort to eliminate all possible hazards to passing traffic.

Rear-end accidents to slow-moving equipment such as snowplows, sweepers, etc., are also found to be a special problem. Working with operating departments, alternate flashing amber lights facing the rear have been tried out and appear to be effective.

The inherent hazards of working on the highway under modern traffic conditions have encouraged the safety section to develop a special course of training on this subject.

The course describes how lanes on high-speed multilane facilities can be closed with a minimum of inconvenience to traffic when adequate advanced warning is provided and a well-designed guide system is established. Under such conditions high level warning is essential. Indeed, such warning is desirable in connection with work protection on all types of roads.

The course also shows that when it is necessary to close a traffic lane on a multilane facility, a speed restriction should be avoided, as the slowing of traffic in the restricted area develops congestion and increases the hazards.

Frequency Rate

The effectiveness of a safety program in employee accident prevention is measured by a "frequency rate" which is the ratio of the number of lost-time injuries per million man-hours of exposure and a "severity rate," which is the number of days lost per million man-hours of exposure.

Motor vehicle accident experience is measured by the number of recordable accidents per million miles of travel. To show a cost relationship to accidents we have developed a chart showing the compensation insurance cost per $100 of payroll. Charts showing the division record are included in this article.

The district office buildings, maintenance buildings, and other facilities are protected against fire by standard firefighting equipment, including fire extinguishers. Control of small fires by fire extinguishers is an important part of plant protection.

The most effective use of fire extinguishers can be made by employees who are experienced in the use of the extinguishers. It is, therefore, the practice in the division to have fire control demonstrations at various maintenance stations; particularly those in remote areas which must frequently depend on their own fire protection equipment or facilities. In such demonstrations, each employee is encouraged to actually handle an extinguisher and extinguish a control fire.

Fire Extinguishers Checked

During a fire demonstration a few years ago an extinguisher failed to function and was thrown into a vacant lot where it exploded. This experience prompted the division to make an immediate inspection of all of its extinguishers. Test equipment was purchased and all extinguishers subject to high pressures were hydrostatically tested under control conditions. Inspections and tests of the extinguishers showed that there were a number of antiquated units still assigned to important points of fire protection. As a result of this program, between 15 and 20 percent of the extinguishers were replaced with more modern equipment. A regular program is now underway to test pressurized equipment every five years.

Equipment with separate pressurized units, such as gas cartridges, is referred to the manufacturer when inspection shows dents or other damage.

Berkeley Will Host 1964 Road Conference

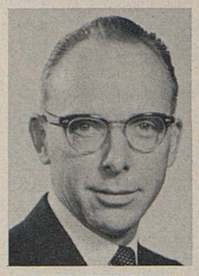
The annual California Street and Highway Conference for 1964 will be held on the Berkeley campus of the University of California. The dates have been announced for January 30 and 31 and February 1.

The conference, which brings together state, city and county engineers and others interested in transportation, is organized by the university's Institute of Transportation and Traffic Engineering.

John Stanford Named To New Department

Governor Edmund G. Brown has appointed John H. Stanford, 44, Assistant Director of the Department of Public Works, to be one of two deputy directors of the new Department of General Services.

"John Stanford is a veteran of 17 years of state service," the Governor said. "His responsibilties will include real property and facilities requirements and the office of the State Architect, responsibilities which he is remarkably well qualified to discharge."



JOHN STANFORD

Stanford, a native of Urbana, Illinois, attended the University of California at Berkeley, where he received a bachelor of arts degree in political science with highest honors. He was a member of Phi Beta Kappa there. He received his master of arts degree in public administration from Syracuse University's Maxwell Graduate School.

He is past president of the Sacramento Chapter of the American Society for Public Administration, a member of the Western Governmental Research Association and the Commonwealth Club.

He began his state service with the Department of Finance and worked for the Department of Insurance before coming to the Department of Public Works in 1955.

He served from 1942 to 1946 in the United States Air Force Air Transport Command, entering as a private and leaving as a captain.

He is a part-time instructor in government at Sacramento State College.

He and his wife, the former Betty Bond, have three children.

An express highway interchange is pictured on a commemorative postage stamp recently issued by Japan. Commemorating the opening of the Nagoya-Kobe Expressway, the stamp is reproduced in three color photogravure

DEPARTMENT MARKS RETIREMENT OF 76 EMPLOYEES

District I

Earl H. Rhoten, Laborer, 17 years; Carl W. Judd, Highway Maintenance Man II, 9 years; Hugh B. Geoghegan, Bridge Maintenance Foreman, 30 years; James Henderson, Associate Right-of-Way Agent, 19 years.

District II

Anthony T. Leal, Highway Maintenance Man II, 31 years; Harry I. Overstreet, Heavy Equipment Mechanic, 37 years; Olen J. Hampton, Highway Maintenance Man II, 18 years.

District III

John R. Christian, Highway Field Office Assistant, 12 years; J. Harold Couk, Office Building Engineer, 13 years; Benjamin F. McDonald, Highway Maintenance Man I, 16 years; William R. Havill, Highway Foreman, 36 years; Eldon C. Patchell, Supervising Cook I, 25 years; Gordon W. Wooden, Assistant Highway Engineer, 17 years; Paul B. Clark, Carpenter I, 11 years; Harry C. Schultz, Highway Foreman, 37 years; William C. Eden, Highway Field Office Assistant, 40 years; Howard T. Bigelow, Highway Superintendent, 43 years.

District IV

Peter J. Meyer, Lead Groundsman, 11 years; Leroy C. Gaberel, Senior Highway Engineer, 33 years; Ruby R. Cook, Senior Stenographer, 21 years; Rolla C. Puzey, Assistant Highway Engineer, 33 years; John R. Hawes, Assistant Highway Engineer, 13 years; Max J. Paul, Assistant Highway Engineer, 34 years; James A. Spence, Supervising Highway Engineer, 34 years; Carl H. Johnson, Electrician I, 26 years.

District V

Dewey L. Barrick, Highway Foreman, 33 years; Percy O. James, Highway Foreman, 37 years; Clarence E. Blinn, Highway Maintenance Man II, 28 years; Henry S. Aldrich, Assistant Highway Engineer, 16 years.

District VI

Lyle Stanley, Highway Superintendent, 30 years; George F. Anderson, Highway Foreman, 33 years.

District VII

Roman H. Brumm, Associate Highway Engineer, 15 years; James B. Griffin, Highway Foreman, 28 years; Edgar Bushman, Drafting Aid II, 7 years; Carl C. Nelson, Highway Foreman, 37 years; Edward Love, Janitor Foreman I, 22 years; Van D. Robinson, Highway Bridge Maintenance Foreman, 31 years; Albert E. Thorman, Highway Foreman, 30 years; Blodwen Holman, Senior Clerk, 10 years; Gilbert K. Clark, Senior Right-of-Way Agent, 19 years; William P. Devine, Assistant Highway Engineer, 42 years; Lee R. Potter, Highway Foreman, 31 years; Wayne M. Blotter, Highway Engineer Associate, 45 years; Esther M. Armstrong, Senior Account Clerk, 14 years.

District VIII

William L. Comerford, Janitor, 34 years.

District IX

Henry R. Scott, Highway Foreman, 28 years; Frank B. Thrailkill, Highway Maintenance Man I, 27 years.

District X

Earl L. Highley, Drawbridge Operator, 26 years; Anthony Angerina, Highway Foreman, 42 years; Lester W. Young, Highway Maintenance Man III, 33 years; Paul V. Craig, Drawbridge Operator, 20 years.

District XI

Leo G. Cline, Assistant Highway Engineer, 37 years; Alameda K. Wheeler, Account Technician III, 36 years.

Headquarters Office

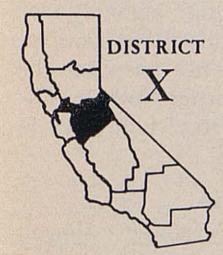
Luther L. Funk, Principal Highway Engineer, 33 years; Matthew Freder-

. . . Continued on page 63

Modesto Project

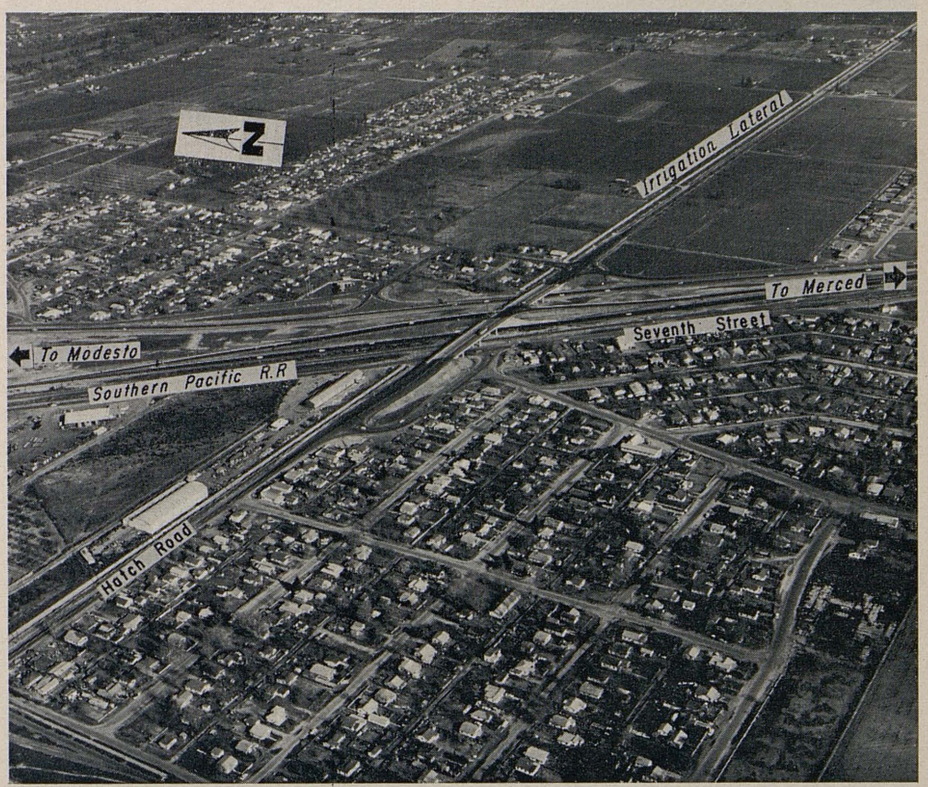
6-Lane Freeway Will Form Nucleus of Future System

By J. G. MEYER, District Engineer



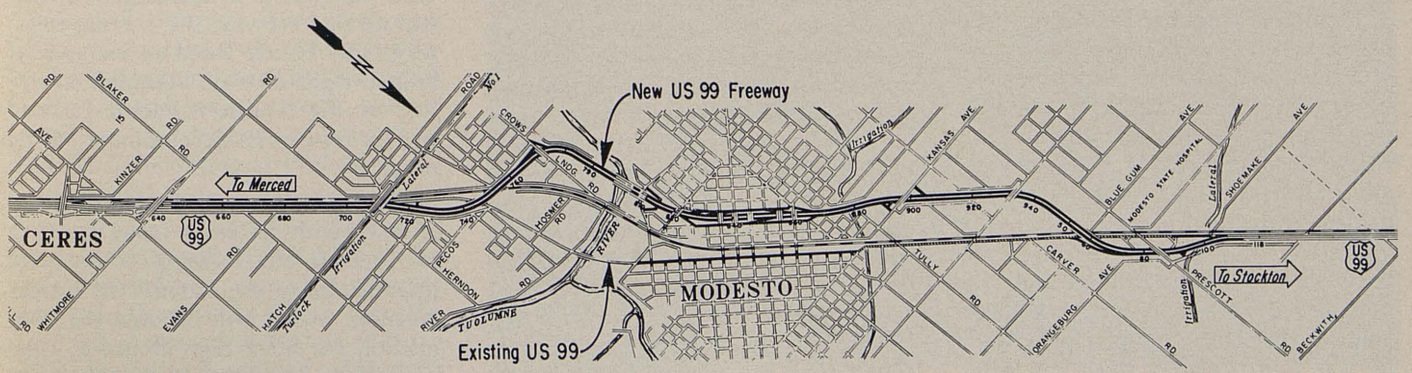
The message on the illuminated metal arch, "Modesto—Water, Wealth, Contentment, Health," tells the story of this progressive community to the present generation of Highway 99 motorists just as it did to travelers of 50 years ago. Traditionally the focal point of agricultural operations in Stanislaus County, one of the more productive agricultural counties in the nation, Modesto is also an important industrial and transportation center and is growing in population at twice the rate of the State as a whole.

To keep pace with the rapid traffic expansion generated by this growth, the Division of Highways has freeway construction on U.S. 99 in progress through the greater Modesto area. This six-lane freeway will be the nucleus of a network of state highways still in the planning stage, which will comprise the California freeway and expressway system in the area. The other routes of this network are Sign Route 132 extending from Interstate Route 5 south of Tracy to the Mother Lode, and Sign Route 108 extending from Interstate Route 5 near Crows Landing to Sonora Pass and the easterly side of the Sierra.



Hatch Road overcrossing looking east. The interchange is not complete at this stage.

Construction work on U.S. 99 freeway is now more than half completed. The full significance of the seven-mile-long project may not be apparent to the casual glance of the motorist, because four miles are on new alignment to the west of the existing highway. The through driver does, however, get some encouragement from the noticeable construction activity visible at the ends of the project, as he is delayed by the heavy traffic



A map of the Modesto area showing the limits of the new freeway project.

An aerial of the existing bridges across the Tuolumne River with the twin freeway spans under construction in the foreground.

passing through the series of intersections, traffic signals, and railroad crossings on the present highway. Occasional train movements along the Tidewater Southern railroad tracks running down the center of the highway add to the difficulties and hazards of driving through Modesto. The motorist, however, can look forward to traveling through this city in 1965 at freeway speeds with a feeling of safety now enjoyed by other motorists traveling on portions of California freeway system already completed.

Planning

The initial planning for this project began in 1952, with route studies for a freeway alignment which would supersede the existing U.S. 99 that passes along the business district. At that time, the highway was carrying an average of approximately 20,000 vehicles a day and had a four-lane divided section north of the city, four lanes plus a left-turn lane through the most heavily developed area, and three lanes to the south. Summer peak traffic was approximately twice the average traffic and additional lane capacity had to be provided on the three-lane section. Freeway construction was too far in the future to give necessary relief; therefore, in 1955, U.S. 99 between Hatch Road and the Tuolumne River was widened to a four-lane divided highway, and a fourth lane was added to the Tuolumne River bridge.

The freeway route was the subject of exhaustive studies by the Division of Highways, local governmental organizations, and civic groups. All the pertinent information gathered in these studies was presented to the California Highway Commission at a formal hearing in Modesto, and the commission in 1954 adopted a freeway route which crossed to the westerly side of the Southern Pacific railroad and passed through the developed area of the city between Fifth and Sixth Streets. The city agreed to the use of these as one-way streets, and the freeway was designed so that Fifth and Sixth Streets will collect and distribute traffic in conjunction with the freeway ramps.

The new freeway alignment is separated from the existing highway and the principal business district of Modesto by several city streets and two railroads. The Division of Highways and city are working toward developing a couplet of major streets, which would operate initially as part of the city's system of one-way surface streets, but would ultimately cross the railroads and existing highway by means of underpasses. This couplet will strengthen the ties between the freeway and the central business district and the other state highways in the Modesto area.

Design

Design of the freeway began shortly after the adoption of the route and extended over a nine-year period. For purposes of design and construction, the overall project is divided into three separate phases, each corresponding to a construction contract. The first contract for construction of a frontage road between the city limits of Ceres and Hatch Road and a portion of the Hatch Road interchange was completed in 1962. The second contract for grading and structures throughout the Modesto area is now nearing completion, and a third contract for paving and completing the freeway will be advertised in the fall of this year.

The freeway design includes seven traffic interchanges and six additional street separations. The partly completed interchange at Hatch Road is already open to traffic and allows an average of 22,000 vehicles a day on Highway 99 to cross under this major east-west county road without interruption. This interchange replaces a former signalized intersection, which was one of the most serious points of accident concentration in District X. The completed interchange will integrate the freeway, the existing highway, and Hatch Road in an area of limited right-of-way, bounded on one side by the Southern Pacific railroad and by residential development on the other.

The freeway will be constructed initially with six lanes from the City of Ceres to the location of a future interchange in the vicinity of Kansas Avenue, which will become the connection for State Sign Route 132 approaching Modesto from the west. North of that point, four lanes will

be constructed. The project was designed so that two additional lanes may later be added for the entire length of the project.

Much engineering study went into the determining a grade line which would cause the minimum amount of disruption to the local area and still provide sufficient fill material for constructing the various street and railroad separations. The result was the depressing of the freeway below ground level at three locations: one adjacent to the Tuolumne River in the vicinity of Crows Landing Road; another between Fifth and Sixth Streets; and the remaining one in the vicinity of Kansas Avenue. These depressed portions provided sufficient material to balance the embankment requirement and, in addition, yielded the subbase material used on a major part of the project.

The depressed sections are lower than the high-water elevations in the Tuolumne River, therefore, storm runoff from these depressed areas must be pumped. Four pumping plants and an extensive system of concrete pipe storm drains were designed to convey this drainage into the river.

Right-of-way

All of the 475 parcels of land required for this freeway were acquired without a single parcel going to a jury trial. This remarkable record can be attributed largely to the length of lead time between determination of right-of-way requirements and construction. In this instance, the six-year interval allowed normal right-of-way negotiations with the property owners to be concluded successfully.

The project required the co-ordination of details for the relocation of facilities of 10 utility companies, and, although the relocation operations required concurrent work by the utility companies and the contractor at some locations, no serious complications have been encountered to date.

Negotiations were carried on with the Southern Pacific and Tidewater Southern railroads during most of the design period and extended into the construction period. These negotiations led to the construction of three railroad grade separation structures and adjustment or elimination of railroad grade crossings with local streets throughout the project.

Construction

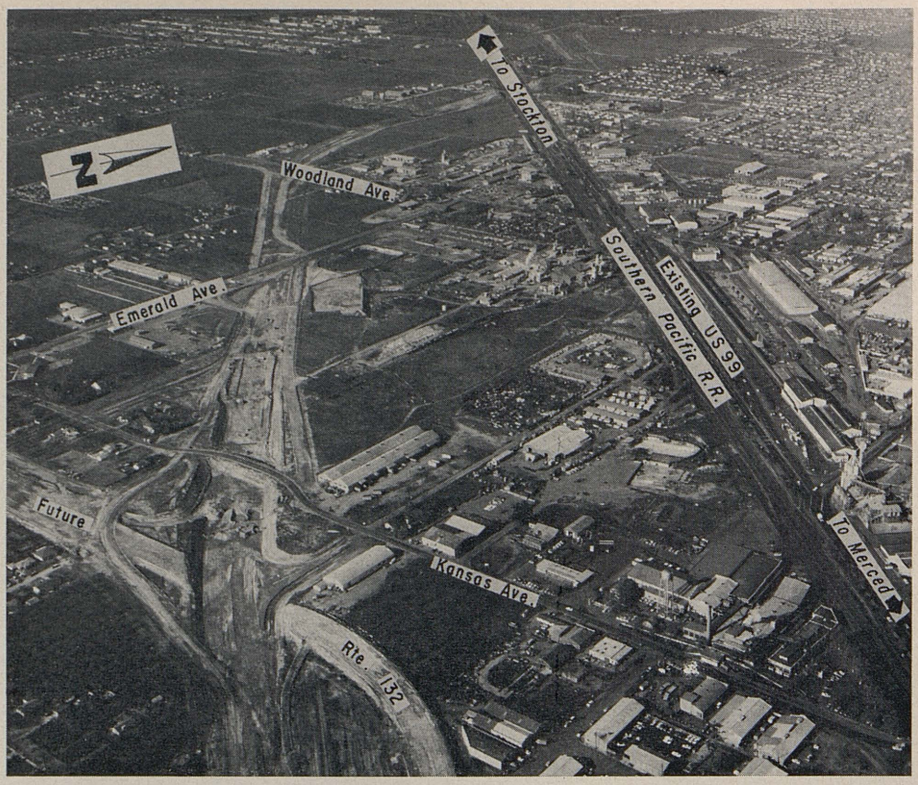
The first contract on the overall project, a joint venture of Fredericksen and Watson and Lew Jones Construction Company, was completed in November 1962 at a cost of approximately $1,200,000. This project eliminated all intersections south of Hatch Road and provided traffic with interim use of the Hatch Road interchange.

A second contract, now in progress, was awarded to Matich Constructors and W. F. Maxwell Company with a bid of approximately $5,300,000. This contract covers grading, drainage structures, bridges, and the paving of local roads and street connections. The depressed sections provide 5,100,000 cubic yards of excavation used primarily for construction of fills at the overhead structures north and south of Modesto where the freeway crosses the Southern Pacific railroad and the bridge approach fills at the Tuolumne River. Some surplus excavation material is also being placed in the embankments required for the future interchange with State Sign Route 132.

One of the most unusual construction problems encountered on the grading contract involved the placing of about 55,000 cubic yards of barium waste tailings. The freeway alignment crossed a barium waste stockpile in an industrial area of Modesto, and extensive studies by the Materials and Research Department were made to determine the suitability of this material for embankment construction. Laboratory tests indicated the material to be satisfactory for deposit in thin layers in the larger fills, even though it contained 60 percent to 90 percent fines and had moisture contents up to 150 percent. In working with the material, the contractor found that in thick layers it would not support the weight of construction equipment, but after much difficulty, he was able to get enough earth cover over the spread out tailings to stabilize the fills.

On a project of this size and complexity, communications were a major problem until radio units were provided for the construction forces. The addition of three mobile units greatly

An aerial of grading operations on the new freeway through Modesto. The bridges are under construction.



Freeway grading and construction on the Kansas Avenue overcrossing.

increased the effectiveness of available engineering personnel.

As the grading and structures contract nears completion this fall, a third contract is being prepared for paving the freeway and opening it to traffic. This last contract will include about $4,000,000 worth of construction work and is expected to be completed early in 1965.

Bridges

The most prominent single feature in all this freeway construction is the impressive pair of freeway bridges across the Tuolumne River, each of which is three lanes wide and 700 feet long. These bridges are of reinforced concrete box girder construction and will cost about $730,000.

Eighteen other structures will separate the freeway traffic from rail and local street traffic.

Magnitude of Project

By the time of completion, the three contracts contributing to this freeway will have totaled approximately $12,000,000 in construction cost. Actual construction operations will have taken over four years. A project of this magnitude can only be designed and constructed by close coordination of effort between the state highway organization and the many individuals and organizations, both public and private, that are affected by the freeway. In the progress of the project from the early planning stages to the opening ceremony, myriad engineering and economic problems had to be resolved, if not to the satisfaction of all concerned in each case, at least to an acceptable compromise. In this regard, it is a pleasure to acknowledge that the Division of Highways received a high degree of co-operation from both the City of Modesto and Stanislaus County, and all can take pride in the accomplishment of the completed freeway.

The individuals in the Division of Highways organization most closely associated with the projects comprising this freeway were District Design Engineers Charles Moffatt, Ken Hatch, and Irwin Rosa; Project Design Engineers George Demetras, Tom Wong, Ed Fujitani, and Walt Curtis; and Resident Engineers Ed Robinson and G. P. O'Dougherty.

Fenton Is Legal Head, Rhyner Named Deputy

Appointment of Harry S. Fenton as Chief of the Division of Contracts and Rights of Way and Emerson W. Rhyner as Deputy Chief has been announced by State Director of Public Works John Erreca.

HARRY FENTON

Fenton had been acting chief since the death of Robert E. Reed in April. Rhyner had been attorney in charge of representing the department on legislation.

A native of Sacramento, Fenton is a graduate of the University of Santa Clara and the San Francisco Law School.

After World War II service in the Air Force, he joined the Department of Public Works legal staff in 1946 as junior counsel. He was appointed assistant chief of the division in 1955.

Fenton is a member of the Elks Lodge and the Native Sons of the Golden West. He also holds membership in the Sierra Club, California Historical Society, Crocker Art Gallery Association and Mount Ralston Fish Planting Club. He is past director of the Sacramento County Historical Society and past president of the Sacramento Book Collectors Club.

Fenton is married and has one son.

EMERSON RHYNER

Rhyner, who was born in Glendora, attended Southwestern University in Los Angeles and received his bachelor of laws degree in 1939.

He served in the U.S. Navy during World War II, entered private law practice in Puente in 1946 and was appointed Deputy City Attorney of Glendale in 1947.

He joined the Division of Contracts and Rights of Way in 1953.

Rhyner is married and has a son and a daughter.

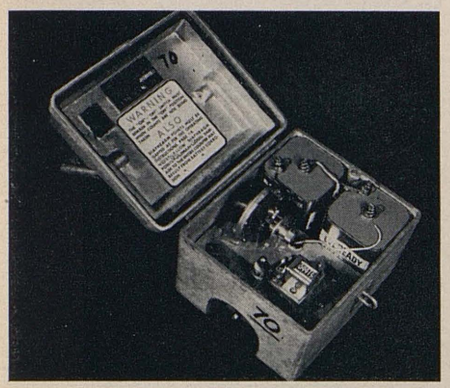
Modernized Counters

Junior Units Take 20,000 One-day Counts Each Year

By C. F. WASSER, JR., Assistant District Traffic Engineer, and
CARROLL E. DUNHAM, Associate Highway Engineer

Three years ago, California's manual traffic counting system was replaced by a mechanical counting program. The planning and organization of the new census program were discussed in "Traffic Census" in the July-August 1962 issue of *California Highways and Public Works.*

As expected, first-year operational difficulties limited program accomplishments. Troubleshooting became the main occupation of traffic census personnel.



One of the unmodified portable ever-accumulating traffic counters. It is powered by two six-volt batteries. The circular piece next to the rear battery is the air diaphragm.

The largest problem was the erratic performance of the small junior traffic counters. These counters were difficult to adjust for both fast- and slow-moving traffic, for heavy and light vehicles, and for various roadway widths. The contact points on these counters tended to burn and/or stick, causing lost counts.

These difficulties did not last long. Experiments conducted in at least three Districts resulted in two successful employee suggestions. Both suggested inexpensive alterations to the electrical circuitry of the counter, improving its operation.

The junior counter improvements have already enjoyed a far-reaching effect by attracting attention of out-of-state and foreign traffic engineers.

Frequent Redesigning Impractical

With the limited market for counters of this type, frequent redesigning and modernization of the equipment is not practical from a manufacturer's viewpoint. The junior counters are produced by a reliable company. Their performance had been satisfactory for our purposes before adoption of the mechanical traffic census program. The mechanized system expanded their use and demanded counting accuracy equal to the punched tape hourly recording counters. (Both the recorders and nonrecorders are used simultaneously when taking route traffic volume profiles.) The junior counters are performing one-half of the field work in California's census program. They produce about 20,000 one-day counts annually.

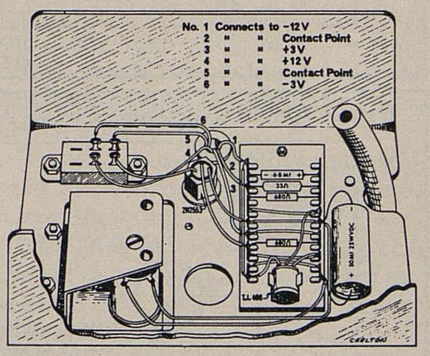
The road-tube-actuated junior counter was designed over 20 years ago. The original models were powered by two 6-volt dry cell batteries connected in parallel as shown on Diagram I. They operate something like this:

An automobile tire passing over a closed end road tube compresses the trapped air, causing defiection of a thin plastic diaphragm at the counter end of the tube. The diaphragm movement forces closure of silver contact points. About 1.2 amperes flow through the contact points and 7.2 watts is delivered to a coil wound about an iron core, producing a magnetic field. The field attracts a steel lever arm that is held away by a steel spring. When the contact points break, opening the circuit, the magnetic field collapses allowing the spring to return the lever arm to its original position. On the way to the reset position, the lever arm kicks a ratchet wheel, causing $\frac{1}{20}$ rotation of the shaft of a simple dial counter. This counts $\frac{1}{2}$ of an automobile.

Inductive Kick Absorbed

The resistor and capacitor network across the coil in Diagram I was designed to absorb the high-voltage inductive kick and minimize contact point arcing upon collapse of the magnetic field.

The circuit and mechanical linkage were simple and worked well on low

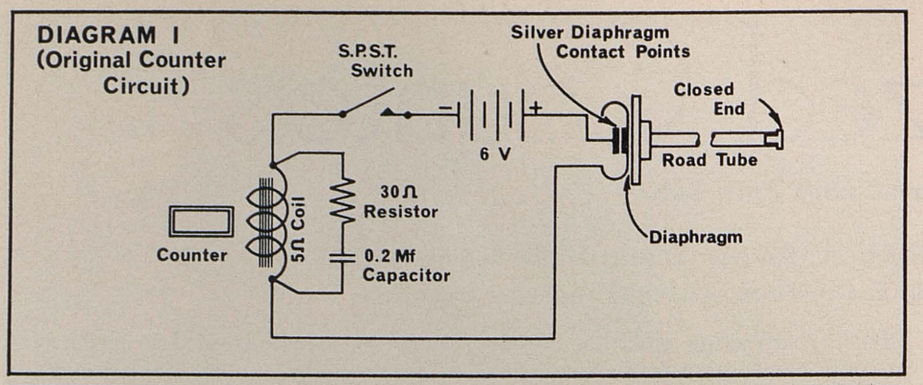


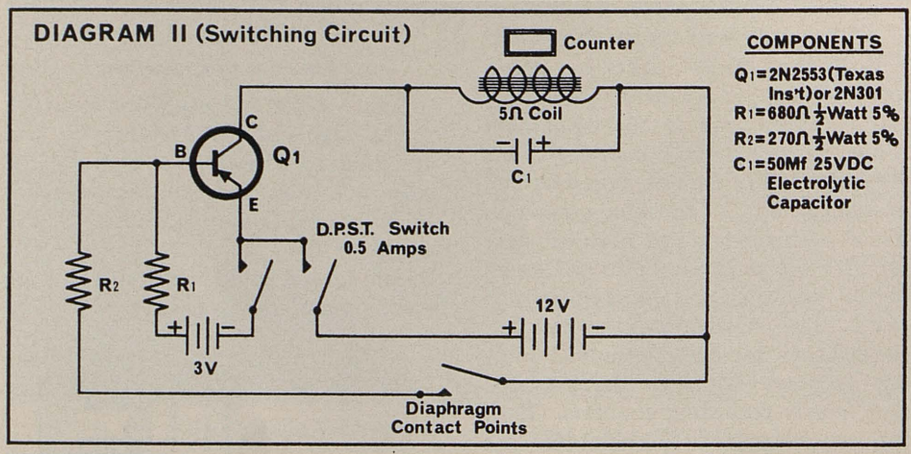
Cutaway section of the junior counter chassis assembly removed from its outer box.

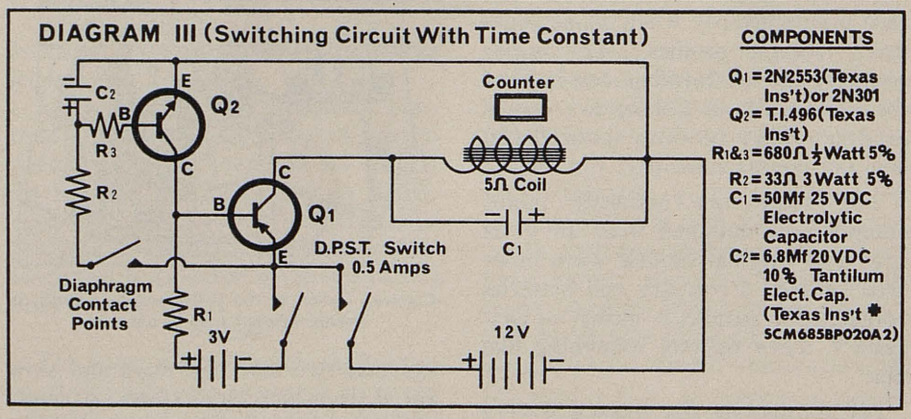
volume, two-lane highways and slow speed, two-lane city streets. A single count cycle required about 40 milliseconds, after which the counter was prepared to receive another call.

When counting high-speed traffic, the electromagnet did not have the power to fully actuate the lever arm during very short periods of contact closure. When a road tube was stretched across multilane highways, the lever arm spring did not complete the cycle and reset the counter quickly enough to record a close-following air pulse.

Some time later, the manufacturer recommended increasing the strength of the electromagnet and stiffening the return spring. They simply connected







the two 6-volt batteries in series instead of parallel, took advantage of the available 12-volt power supply, and delivered 28.8 watts to the electromagnet. The stronger magnetic field attracted the lever arm faster and the stronger spring hastened the reset action.

It was at this stage the State increased its number of junior counters from 150 to about 500.

Personnel using junior counters soon discovered a major flaw in the electrical circuit. Passing 2.4 amperes through the 2.0 amp silver contact points was not successful. After a few days of field operation, the contact points were badly burned and pitted.

Maintenance costs for cleaning and replacing contact points were prohibitive. Contact gap and air pulse strength adjustments were critical and time-consuming for field personnel. Field data from the counters ranged from marginal to unsatisfactory.

Transistor Switching Circuit

In 1960, an employee suggestion from Cecil Baisley of District X had recommended a transistor switching circuit in the junior counter to reduce the current through the contact points. Little interest had been shown in developing such a circuit until large scale production was required from the counters.

The transistor is a miracle of modern electronics and physics. It not only replaces the vacuum tube in small radios, but can also be used as an ultra-high-speed DC switch or relay. Normally, the device offers extremely high resistance to voltage applied across the emitter-collector electrodes. When a small current passes through the base-emitter junction, the emitter-collector resistance practically disappears, allowing large currents to flow through the emitter-collector circuit like a closed switch. The switching time of transistors is a few microseconds.

A joint effort of Headquarters Materials and Research Department and District XI developed the high-speed switching circuit shown on Diagram II. Less than 50 milliamps through the contact points is required to switch on power transistor Q-1. Approximately 1.7 amperes flow through the collector and coil. Electrolytic capacitor C-1 across the coil with reverse polarity causes rapid collapse of the magnetic field when the transistor is switched off. C-1 also minimizes the inductive kick upon collapse of the coil, protecting the emitter-collector circuit of Q-1 from high voltages exceeding breakdown conditions.

Resistance Drops Rapidly

The emitter-collector resistance of germanium power transistors drops rapidly as the case temperature approaches 100° F. The device then leaks more current than can be tolerated. A small reverse voltage supplied by the three-volt battery compensates for the resistance drop and extends the high ambient temperature capability of the circuit to 170° F. The circuit is designed for cold weather operation to −30° F.

This modification was publicized and made available to the districts in kit form in 1961. About ¾ of all junior counters were converted by district personnel.

The Diagram II switching circuit worked fine under low- and medium-speed traffic conditions. However, when highway speeds exceeded 55

miles per hour, the contact points were not closed long enough for the mechanical counting operation to function. Laboratory tests proved that eight milliseconds closed circuit is required for reliability. Field adjustment of contact point gap was often critical to .001 of an inch. Too wide a gap did not give enough contact closure time. Less gap caused contact bounce, giving two signals to the circuit. Contact bounce caused extra recordings, commonly called "doubling." Sometimes, overnight temperature and pressure changes affected the diaphragm deflection enough to cause counter failure.

Further experimentation in District XI produced the circuit shown on Diagram III in the form of an employee suggestion from C. F. Wasser, Jr. This circuit added a time constant which holds the power transistor turned on for about 12 milliseconds after the contact points break. The results were amazing. The counting mechanism was given time to function with near instantaneous contact closures. The circuit sees a contact bounce, or "doubling," as a single signal since the second contact usually comes within the added 12 milliseconds.

The operation of the more sophisticated circuit on Diagram III is as follows:

Contact point closure applies voltage across the base-emitter of transistor Q-2 and almost instantaneously charges capacitor C-2. Q-2 switches on, allowing current to flow through the base-emitter of Q-1. Q-1 switches on and current flows through the counter coil.

Upon break of the contact points, the energy stored in C-2 maintains current flow through the base-emitter of Q-2 for about 12 milliseconds, holding Q-2 and Q-1 switched on.

During the past year, approximately 75 junior counters have been used with the more sophisticated circuit of Diagram III. The modified counters count accurately on high speed multilane highways or low-speed city streets. Field adjustments of contact point gap and air pulse strength are no longer critical and time consuming. An .008 inch range of gap adjustment frequently causes no measurable change in counting accuracy. Counter failures are rare.

A typical junior counter installation, this one on the Roseville Freeway north of Sacramento. Note the counter chained to the base of the sign post and counter hose stretched across the pavement.

Following District XI's conversion to this circuitry, District VIII and several northern districts experimented successfully with it. Soon it was adopted for statewide use.

The Service and Supply Department has prepared a contract to manufacture easily installed modules for converting the remainder of California's junior counters.

The cost of components for our test assemblies was about $10 per counter. Assembly time is about 1½ hours each.

Power transistors must be mounted on a large aluminum surface that will act as a heat sink. On our test assemblies, the power transistors were mounted on the aluminum chassis.

2N2553 is a new number designation for 2N1039-1. The device is stud mounted. Only one hole is drilled in the chassis or heat sink for mounting. The 2N301 works equally well, but must be mounted on a transistor socket. Six carefull placed holes must be drilled for mounting the 2N301.

The collector electrode is common to the case of the power transistor. Therefore, the case must be electrically insulated from the chassis. Mica insulators are included with each transistor for this purpose.

There is danger of damage to all transistors if overheated while soldering. Long nose pliers or some other device should be used as a heat sink between the case and the point where heat is applied.

Transistors can be permanently damaged by incorrectly placing an ohmmeter across the electrodes.

The assemblies use two AA cells for the three-volt power supply. They are held in a Keystone Battery Holder No. 140.

Most of the circuit is assembled on a three-inch-long portion of an Erie Terminal Strip No. 3976-205-6. The terminal strip must be insulated from the counter chassis.

The TI 496 is mounted in a Texas Instrument Clip No. 10-31-052-007.

The original S.P.S.T. slide switch must be replaced with a D.P.S.T. switch to disconnect the two DC power supplies when the counter is not in use.

It is suggested that the fixed contact point in the diaphragm assembly be rounded to reduce the area of contact. Small particles of grit or dirt do not easily remove themselves once lodged between flat contact surfaces.

Oxidation of the silver contact points eventually causes enough contact resistance to disturb the circuit. Points should be polished occasionally.

Personnel

C. E. Waite Retires; Langsner, Hill and Wilson Are Promoted

Deputy State Highway Engineer Charles E. Waite, who spent the past 8 years of his 34-year career with the Division of Highways as the man responsible for its wide range of administrative activities, retired from state service on August 31. George Langsner has been appointed to succeed Waite as Deputy State Highway Engineer.

Langsner was promoted from the position of Assistant State Highway Engineer—Administration. He has been succeeded by George Hill, who has

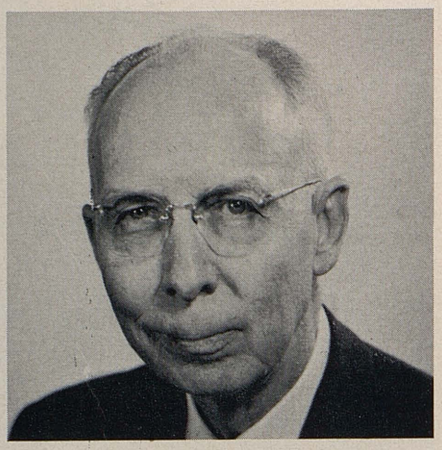
J. E. Wilson, formerly Assistant District Engineer in the District X been Traffic Engineer for the division. office of the Division of Highways in Stockton, has become Traffic Engineer.

Waite's areas of responsibility have included overall supervision of such administrative functions as office engineering, city and county projects, service and supply, management analysis and systems research; personnel and public information, including employee safety and training; and fiscal

GEORGE LANGSNER

management. The division's budget exceeds $600,000,000 a year and its staff totals more than 16,000 employees.

Waite was born in Hutchinson, Kansas, and educated in Oklahoma. He served in the U.S. Army in 1918.



C. E. WAITE

Following his graduation from the University of Oklahoma in 1922 with a B.S. in civil engineering, he was employed by private engineering and construction firms in Oklahoma until 1927, when he moved to Yreka, California, to work for a mining concern.

He joined the California Division of Highways in 1929 and worked in design and construction in the Redding district until 1933, when he was assigned to the Fresno district as assistant district maintenance engineer. In 1935 he was transferred to division headquarters in Sacramento as assistant office engineer.

Waite moved to San Luis Obispo in 1942 as construction and location engineer for the division's central coast district. In 1947 he was promoted to District Engineer at Stockton, with responsibility for all state highway planning and operation in nine Central California counties.

Two years later he returned to division headquarters as Engineer of Design, and in 1950 was promoted to Assistant State Highway Engineer in charge of personnel, public information and related functions. He was advanced to Deputy State Highway Engineer, with additional responsibilities, in 1955, and has served in this capacity under State Highway Engineers G. T. McCoy, J. W. Vickrey and J. C. Womack.

Waite is a member of the American Society of Civil Engineers and of the Committee on Administrative Practices of the American Association of State Highway Officials. Other affiliations include the Masonic Lodge and Shrine, and the Sierra View Country Club near Sacramento.

Waite and his wife Amanda live at 505 Blackwood Street, North Sacramento. They have four daughters: Mrs. George Dewey of Bakersfield, Mrs. Clem Lambert of Arroyo Grande, Mrs. Harold Gill of Lafayette and Mrs. Phil Wenzel of Rockford, Illinois.

Langsner joined the Division of Highways in 1931 upon graduation from the California Institute of Technology. He served in the Los Angeles district (District VII) in positions of increasing responsibility, including design and other work in planning the Los Angeles metropolitan area freeway systems, and became District Engineer there in 1955. He was transferred to Sacramento headquarters office in 1957 as Engineer of Design

GEORGE A. HILL

and was appointed Assistant State Highway Engineer in 1960.

He is a native of Brooklyn, New York, coming to California in 1922.

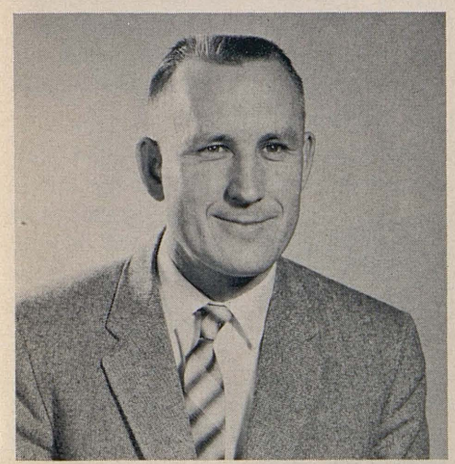
Hill, being promoted to Assistant State Highway Engineer, is a native of Oakland, and received his engi-

neering degree from the University of California at Berkeley in 1937. He joined the Division of Highways the same year and served most of the next nine years in District VI (Fresno), except for World War II military duty with the Army Engineers in Alaska and the Pacific.

In 1946 Hill went to Yale University for a year's graduate study in traffic engineering. On his return he was assigned to District IV (San Francisco), and served there until 1953 in construction, traffic analysis and planning functions.

In 1953 he was promoted and transferred to the design department in division headquarters in Sacramento. In 1955 he became District Engineer in Los Angeles and returned to Sacramento as Traffic Engineer in 1962.

J. E. Wilson, being promoted from Assistant District Engineer—Operations, Stockton, to Traffic Engineer of



J. E. WILSON

the Division of Highways, is a native of Berkeley and received his engineering degree from the University of California in 1947 after having served with the Navy in the Pacific from 1944 to 1946.

Although he had worked earlier as a summer employee of the Division of Highways, he became a permanent employe in Stockton in 1949. Wilson advanced to become District Traffic Engineer, Assistant District Engineer —Administration and Assistant District Engineer—Operations. As Division Traffic Engineer he will have the civil service rank of Principal Highway Engineer.

INTERNATIONALLY KNOWN LABORATORY CHIEF RETIRES

Francis N. Hveem, Materials and Research Engineer for the State Division of Highways, retired on September 30, culminating a 45-year engineering career which has brought him an international reputation in the field of highway research and testing.

Testing equipment, procedures and design theories developed by him and under his supervision have been accepted and used throughout the United States and many foreign countries and, in turn, engineers from abroad have come to the United States to study his methods.

Some of the better known devices and test methods he developed are the

FRANCIS N. HVEEM

stabilometer, the cohesiometer, the kneading compactor, sand equivalent apparatus and profilograph. The series of barrier crash tests using remote controlled vehicles and anthropometric dummies which he promoted and directed has furnished valuable highway design and safety information now being used by other highway departments throughout the United States. His formulas for the design of asphalt pavement are also recognized as one of his outstanding contributions to the highway science field.

He is the author of more than 40 technical papers, most of which have been presented before meetings of the Highway Research Board, the American Society for Testing Materials, the American Concrete Institute and the Association of Asphalt Paving Technologists.

Among Hveem's honors are the Highway Research Board's award for the paper of outstanding merit in 1949 and the Roy W. Crum Award for distinguished service in 1956. The University of California has awarded him an honorary membership in the university's chapter of Chi Epsilon, civil engineering honor society.

Hveem was born at La Moine, Shasta County, and received his early schooling at the nearby community of Delta.

He started his career with the State in 1917 as a draftsman for the Division of Highways in Dunsmuir.

He became an assistant resident engineer in 1918 and a resident engineer in 1924. He was promoted to maintenance superintendent in 1925.

In 1929 he joined the Materials and Research Department, having attracted the attention of its then chief, the late Thomas E. Stanton, by his independent field research in design and control of bituminous mixtures for highway surfacing. It was during the ensuing years that Hveem began to build a national and later international reputation, first as a specialist in bituminous mixes and later extending into the broader field of highway research and testing.

Hveem was named Construction Engineer for the division in 1950; and in 1951, on the retirement of Stanton, returned to the laboratory as its chief. He played a leading role in the planning and operation of the test track in Idaho, a co-operative project of the 11 western states with federal agencies and private industry. He also helped plan the national test road in Illinois. The purpose of these test roads was to analyze the effect of loads of varying weight on different types of highways.

. . . Continued on page 48

LABORATORY CHIEF RETIRES . . .

. . . Continued from page 47

The Materials and Research Department now has more than 300 employees, not including 350 people operating 11 district laboratories throughout the State. The work assigned to the department is carried on in five sections: Administration, Foundation, Pavement, Structural Materials and Technical (the latter primarily concerned with cement, concrete and chemicals).

To give some idea of the volume of the department's activities, a perusal of the last fiscal year's report shows that it tested nearly 11,000 samples of asphalt, some 14,500 concrete cylinder specimens and 9,000 control checks on samples representing 2,500,000 barrels of cement. Numerous other tests were made on prestressing and structural steel, barrier cables, electrical equipment, sheeting and paints. The division's 11 district laboratories performed more than 166,000 tests on soils and aggregates. The Materials and Research Headquarters Laboratory at 5900 Folsom Boulevard, Sacramento, conducts all basic research involving materials while the district laboratories handle most of the materials testing.

Much in demand as a consultant, Hveem has traveled through much of the United States and abroad, has accepted invitations from national highway departments in Argentina, Brazil, Mexico and Egypt, the last named through the Technical Assistance Program of the United Nations.

He holds membership in the American Concrete Institute, the Highway Research Board, the American Society for Testing Materials, the Association of Asphalt Paving Technologists and is past president of the Sacramento chapter of the American Society of Civil Engineers. He at present holds appointments to 12 national committees of technical societies including the Flexible Pavement and Rigid Pavement Design Committees of the Highway Research Board and the Road and Paving Materials Committee of the American Society for Testing Materials.

Hveem and his wife, Evelyn, have four children and seven grandchildren.

BEATON IS NEW LAB HEAD; ANDERSEN PROMOTED

Appointment of John L. Beaton as Materials and Research Engineer for the California Division of Highways and of Neal E. Andersen to succeed Beaton as the division's Equipment Engineer has been announced by the Division of Highways.

JOHN L. BEATON

Beaton succeeds Francis N. Hveem who retired as head of the division's Materials and Research Department on September 30.

Andersen is being promoted from the position of Assistant District Engineer for the division's District I at Eureka.

Beaton, prior to his appointment as Equipment Engineer late in 1962, had been an assistant to Hveem since 1951, with responsibility for the structural materials section of the department. One of his recent assignments was planning and supervision of tests using radio-controlled cars to determine the most effective types of median barrier for use on freeways.

A native of San Francisco, Beaton attended high school in Sacramento and first joined the Division of Highways as a rodman and axeman on the Kings River Canyon project. He worked on highway projects during summer vacations while attending the University of California and was assigned to the Bridge Department upon his graduation with a B.S. degree in civil engineering in 1937.

In 1945 Beaton transferred from the Division of Highways to the State Personnel Board, where he served as senior engineer examiner for four years. On his return to the division, he worked in the Design and later the Personnel Departments before joining the Materials and Research Department in September, 1951. He was promoted to Equipment Engineer in December, 1962, upon the retirement of Earl E. Sorenson.

Beaton is the author of professional papers which have appeared in the proceedings of the Highway Research Board and covered such subjects as the testing of concrete bridge rails and median barriers, causes and repair of bridge deterioration due to corrosion, radiographic inspection of welded bridges, and corrosion of metal culverts.

Beaton served as president of the Sacramento section, American Society of Civil Engineers, in 1962. He and his wife Rosina have two children, Richard, a student at Sacramento State College, and Judy, a student at El Camino High School.

The new Equipment Engineer, Andersen, has been Assistant District Engineer in charge of planning for District I, in northwestern California, since May, 1961.

A native of Brooklyn, New York, Andersen holds both bachelor and master of science degrees in civil engineering from Columbia University. He served in the U.S. Air Force as a transport pilot in both World War II and the Korean conflict.

His engineering career began in the eastern states and included structural design of industrial plants and bridge design for the New Jersey Turnpike.

NEAL E. ANDERSEN

He moved to California in 1953 as a junior civil engineer in District X, with headquarters at Stockton, and held various positions of increasing responsibility during the ensuing eight years in the fields of traffic engineering, construction, and advance planning. He was Advance Planning Engineer for the district when he was promoted to Assistant District Engineer of District I two years ago.

In his new assignment, Andersen will have responsibility for the extensive automotive equipment and specialized maintenance and construction equipment used by the Division of Highways.

He and his wife Marion have a son Donald, 15.

Route Adoptions

C.H.C. Actions Include Six Freeway Sections

The California Highway Commission adopted routes for six sections of freeway at its July and August meetings. Four of the route adoptions were for highways in San Diego County. The others were in Lake County and in Yolo County. One route for a conventional highway in Yolo and Colusa Counties was adopted.

San Diego County

The San Diego County freeway route adoptions are:

For 2.3 miles of State Highway Route 282 between the adopted route for Route 280 and Blossom Lane. The adopted route is three miles south of La Mesa. For the most part it runs just west of Sweetwater Road and coincides with Sweetwater Road at Blossom Lane.

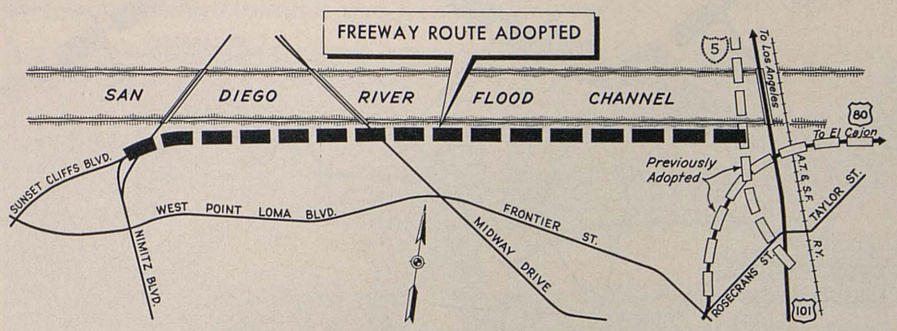
Route 282, when completed, will link together eight present and future state freeways in the San Diego area.

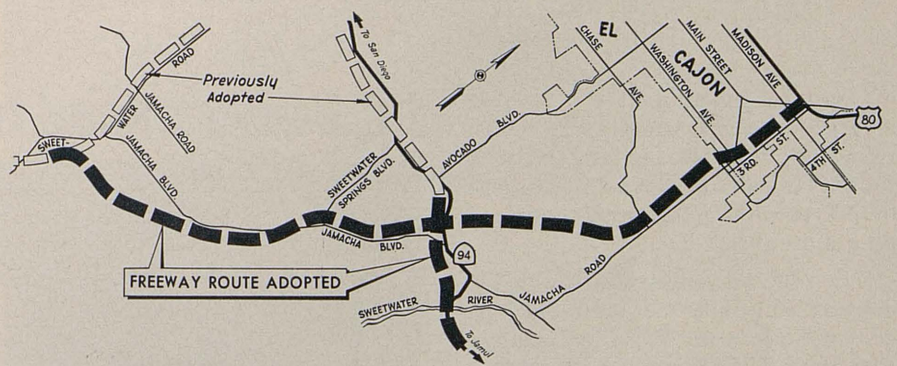
For State Highway Route 286 between Sunset Cliffs Boulevard and the adopted route for Interstate 5. The adopted route runs just south of and parallel to the San Diego River Flood Channel.

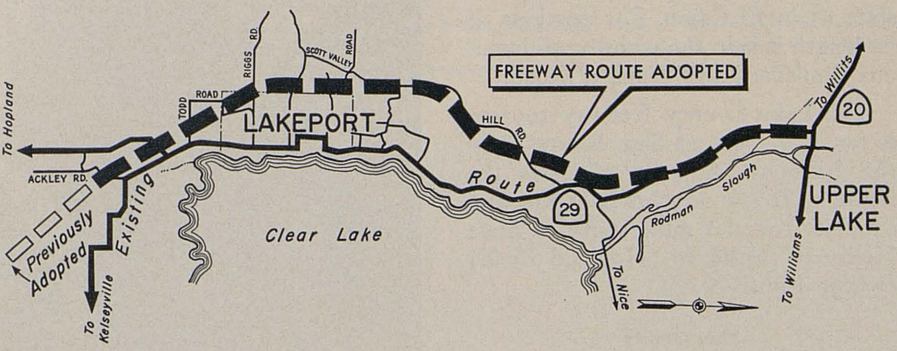
For portions of State Sign Route 94 and State Highway Route 280.

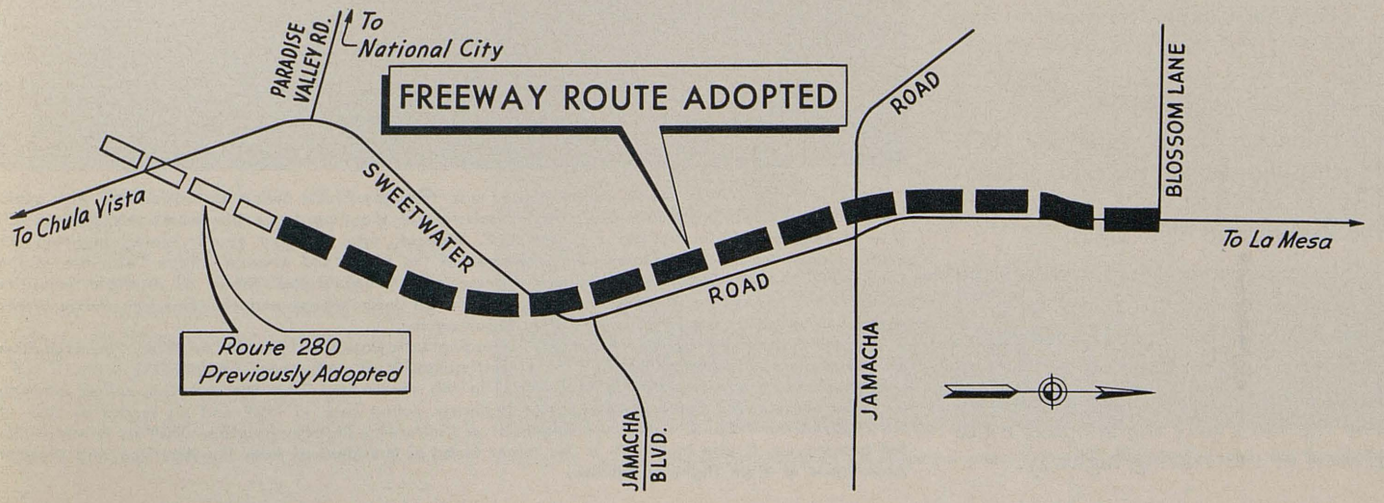
Sign Route 94

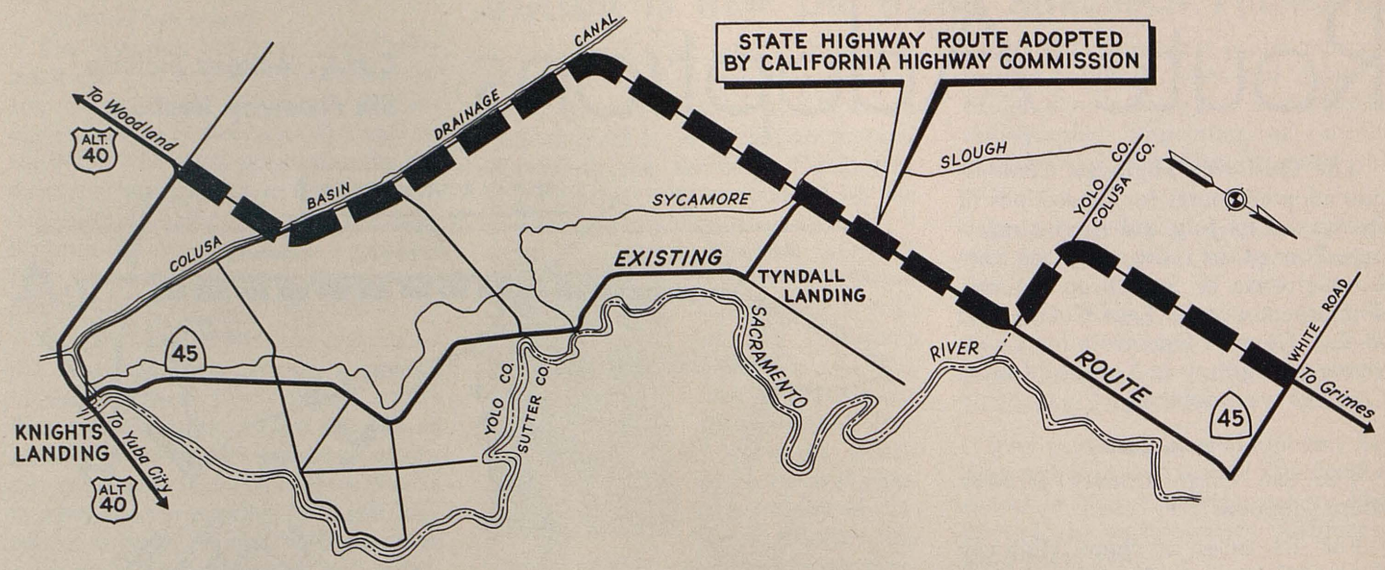
The adopted routing for Sign Route 94 is 1.6 miles in length in the vicinity











of Jamacha Junction. It is a revision of a previously adopted route which follows Campo Road. The adopted route is a short distance to the south of the previously adopted route and on a more direct line.

The adopted routing for Route 280 extends 10.1 miles between 0.4 mile east of Sweetwater Road and a junction with U.S. Highway 80 (Interstate 8) in El Cajon. For portions of its length it is in the vicinity of Jamacha Boulevard and Jamacha Road.

The Lake County freeway routing is for 12.1 miles of Sign Route 29 in the Lakeport area. It relocates the highway to the west of Lakeport and extends from 1.1 miles south of State Highway Route 16 (Hopland Road) to Sign Route 20.

Yolo County

The Yolo County freeway routing is for 12.1 miles of U.S. 99W (Interstate 5) between County Road 18, south of the community of Yolo, and the Dunnigan Cutoff (Interstate 5W). It generally parallels the existing highway on the west, with variations in the Zamora and Yolo areas.

The conventional highway routing is for the relocation of 15.5 miles of Sign Route 45 between U.S. 40 Alternate near Knights Landing and White Road about 8 miles south of Grimes. For the most part the adopted route is west of the existing highway.

J. C. Womack Is Named Among Public Works 'Top Ten'

National Public Works Week, observed annually throughout the nation in September, was again highlighted in 1963 (September 8-14) by the selection of the "top ten public works men-of-the-year." One of them was State Highway Engineer J. C. Womack, who is shown above (center) receiving the official plaque from Carl L. Richey (left), chairman of the Public and Business Affairs Committee of the Sacramento Kiwanis Club, while Highway Transportation Administrator Robert B. Bradford looks on at right. The observance is sponsored jointly by Kiwanis International and the American Public Works Association, in co-operation with several other organizations.

"The selections of the top 10 were made," according to a statement from the A.P.W.A., "in recognition of noteworthy public service reflecting the highest standards of professional conduct."

Womack was the only state highway official in this year's "top 10." The A.P.W.A. called attention to his career with the California Division of Highways dating back to 1929 and his service as chief of the division since 1959, as well as the magnitude of California's highway program which he is responsible for carrying on. It also took note of his recent terms as president of both the American and Western Associations of State Highway Officials.

"Living Pavements"

Division Experiments To Reduce Cracking

By D. L. SPELLMAN, Supervising Materials and Research Engineer

Living pavement?

Not quite true, but if you water it down, it grows. That's what happens when a new type cement is used in portland cement concrete pavements. Recent developments in expanding cements, which appear to make their expansion predictable and controllable in laboratory experiments, prompted the Division of Highways to experiment with actual pavements in an attempt to reduce cracking, and perhaps, to eliminate bothersome and expensive joints.

Ordinary concrete shrinks when it is allowed to dry out. This reduction in volume makes it necessary to construct what is known as "contraction joints" in concrete structures and pavements.

We are all familiar with the grooves or joints in concrete pavements and sidewalks.

If joints were not constructed, many cracks would form anyway, but not along neat, straight lines, nor at controlled spacing. About the only advantages of straight "cracks," aside from esthetic considerations, are that they are easier to maintain (seal), if they should require sealing, and may tend to spall less.

Sealing and controlling spacing helps prevent intrusion of foreign material which sometimes causes spalling. But, all the reasons for spalling of joints are not clearly understood. Some joints spall while others nearby do not spall, yet there is no clear-cut explanation as to why this should occur.

340 Joints per Mile

If it were possible to make a concrete that would not shrink, or otherwise change volume, no joints would be necessary. If volume change is reduced, joints can be spaced further apart. At the present spacing used in California pavements, there are about 340 contraction joints per mile.

For a 24-foot wide pavement (2 lanes), the cost of sawed joints

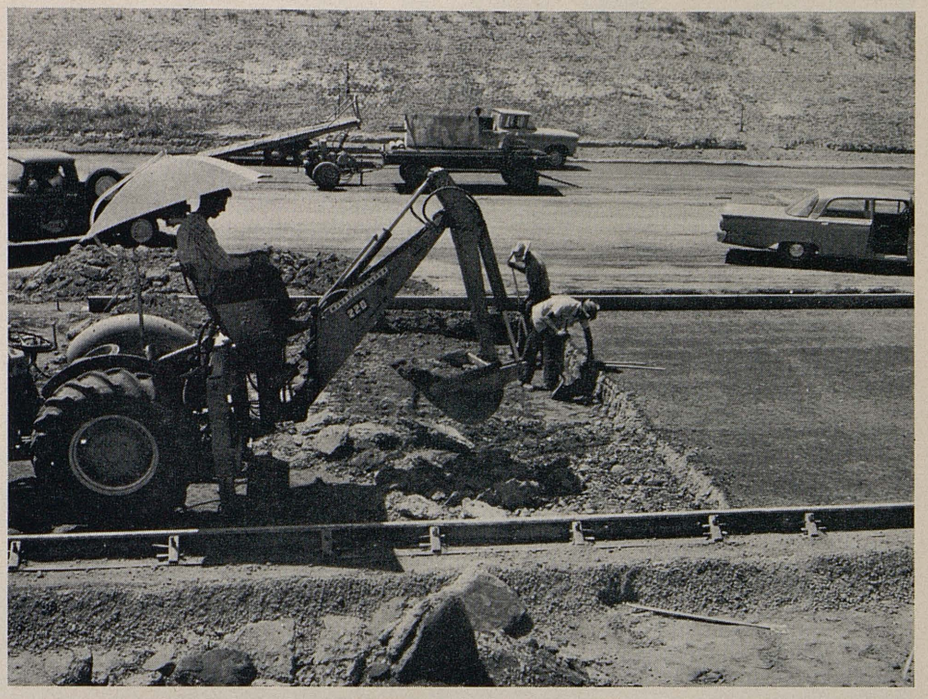


PHOTO 1. End anchors, which were thick concrete blocks, were constructed on the ends of the expending cement units. The anchors prevented movement of the ends of the pavement, causing a buildup of compressive stress in the pavement during the curing period.

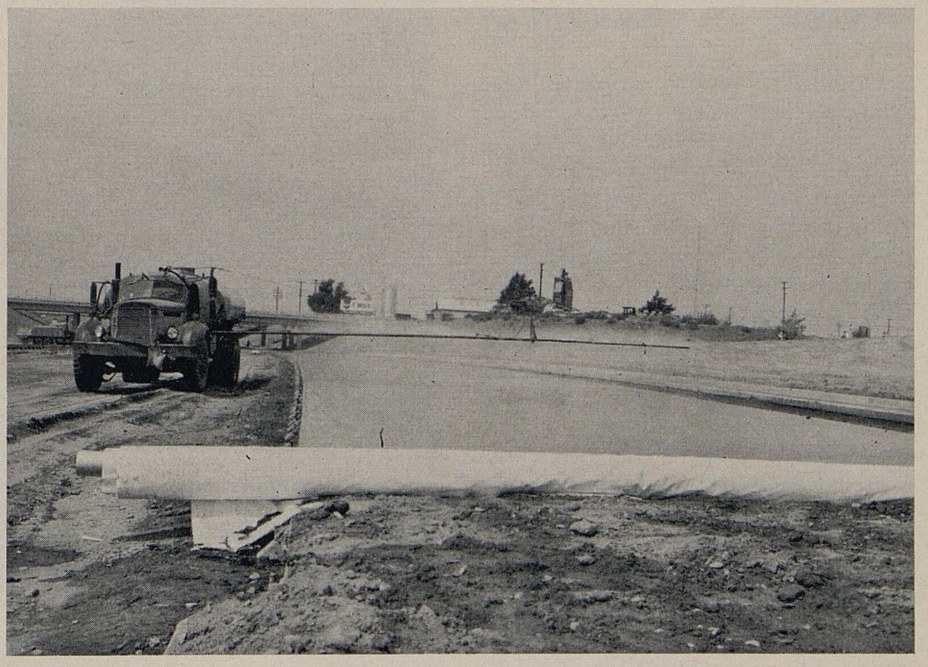


PHOTO 2. Special contractor-built spray rig keeps pavement wet until plastic membrane can be applied.

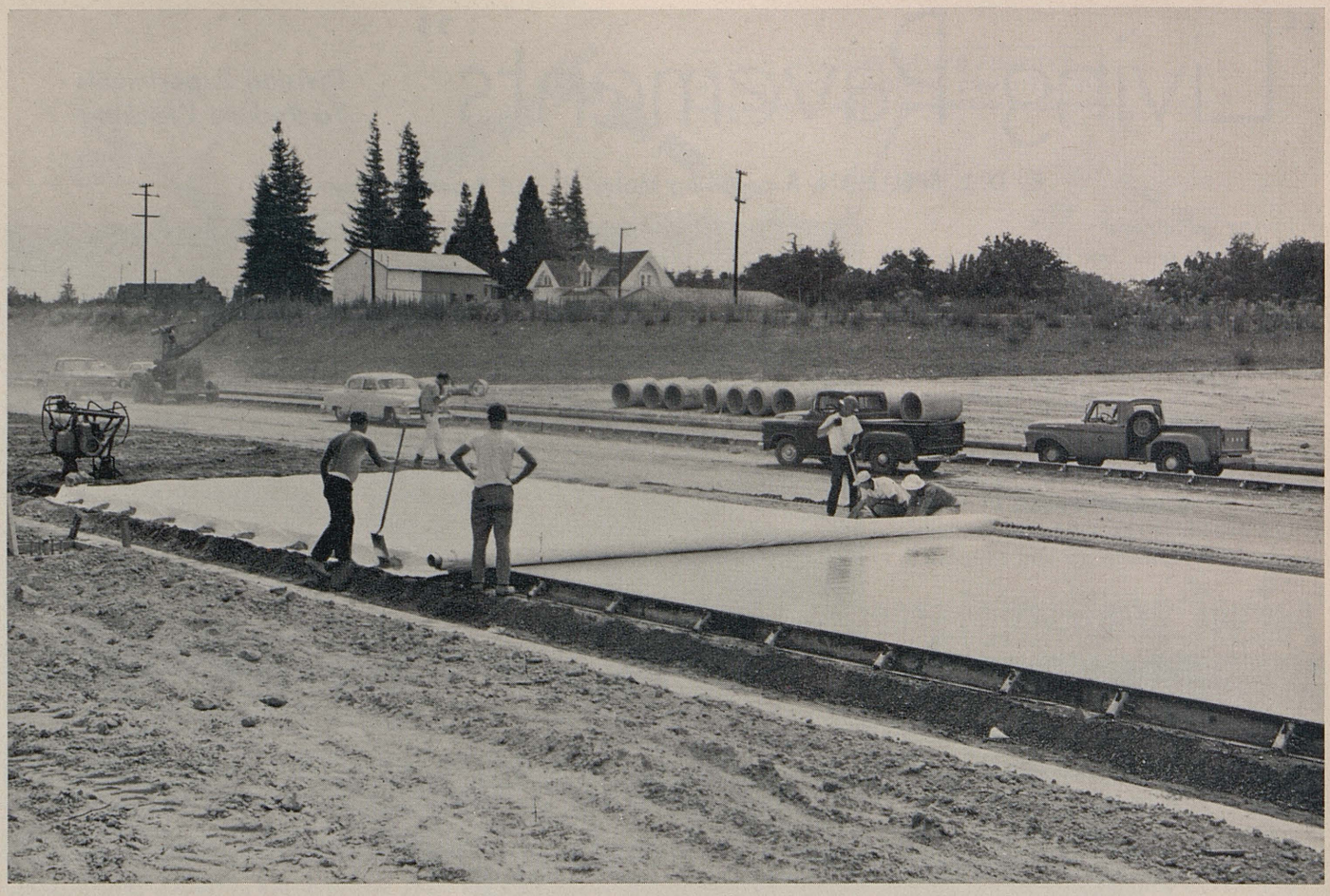


PHOTO 3. White polyethylene plastic sheeting shown being rolled into place over previously wet pavement for purposes of curing the expanding cement section.

amounts to about $1,200 per mile. Expanding cements offer one possibility of eliminating most of this cost. Here's how!

Originally, various materials that would expand when wet were added to portland cement in varying amounts. The idea was to make concrete expand while curing and in so doing, stress imbedded steel and thus produce a "self-stressed" reinforced concrete similar to present day prestressed concrete. Of course, this expansion shouldn't happen too soon, nor expand too much because if the concrete "stressed" itself before it gained sufficient strength, it would destroy itself. This happened in early experiments with expanding cements in the laboratory. The French apparently experimented with expanding cements about 70 years ago, and more recently, the Russians. Their problem was that expansions were not always predictable nor controllable. The result was only limited success with a novel idea.

Possibility of Less Shrinkage

When information was presented to F. N. Hveem of the Division of Highways Materials and Research Department that an expansive component had been developed which could be controlled, the thought occurred to him that it might be useful in offsetting the shrinkage of nonreinforced pavements if used in smaller amounts than were used for self-stressing purposes.

After conferences with the developer, Professor Alex Klein of the University of California, a plan evolved for an experimental application of the idea in actual pavement construction. The amount of "component" was to be relatively small, about 15 percent, blended with 85 percent of a regular Type II cement. Preliminary data on cements containing various amounts of the expansive component, reported in technical publications, were used in selecting the 15 percent value.

Several laboratory tests were made on small quantities of concrete to develop as much knowledge as possible about the characteristics of such cement before its use in an actual pavement. This cement has become known as "shrinkage compensated cement."

Theory Explained

The theory was that if the ends of the pavement could be restrained while the concrete was curing and trying to expand, a compressive stress would be built up within the concrete itself. Despite its apparent hardness, concrete is elastic and can be compressed. Compression was to be obtained, not by squeezing the ends of the pavement, but rather by simply restraining the ends as the concrete tried to "grow." At the end of the curing period, while still wet, the concrete would be in a state of compres-

sion depending upon how much component was used, the effectiveness of the curing, and the degree of success in keeping the free ends of the pavement from moving. When allowed to dry, the concrete, which would shrink absent the prior restraint, would be relieved of most of the compressive stress developed during the curing period. If successful, a small amount of compressive stress would remain. The concrete would not go into tension, and therefore, would not crack.

Laboratory tests indicated that pigmented curing compounds would not retain sufficient moisture in the pavement long enough to complete expansion. The tests indicated that curing with white plastic membrane, after thoroughly prewetting the concrete, would be adequate to obtain most of the potential expansion after six days of curing.

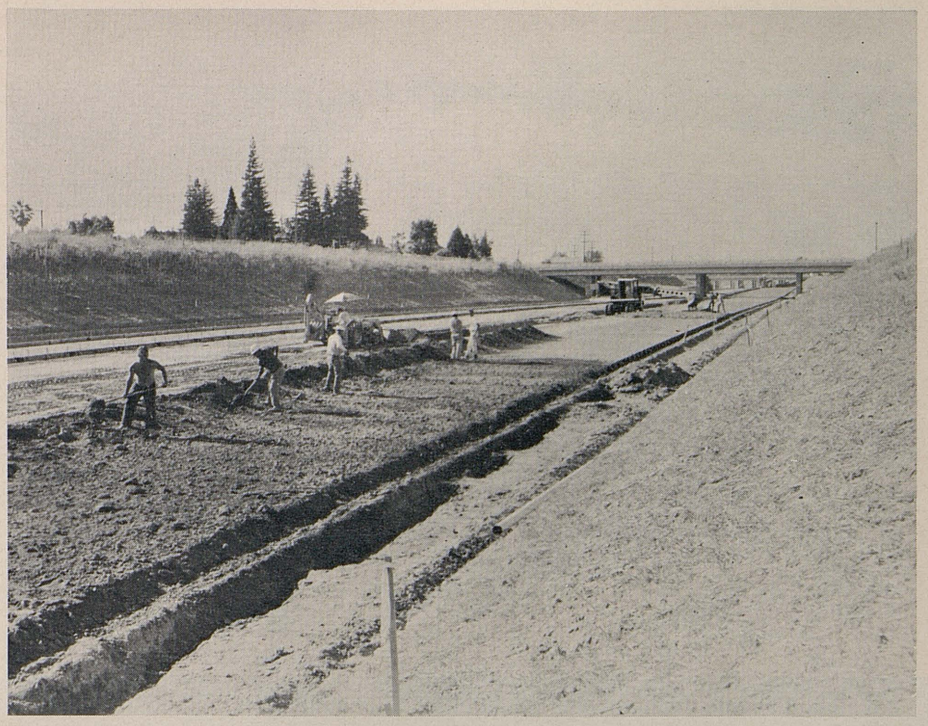


PHOTO 4. Wet earth cure was used on a portion of the experimental pavement at Lodi. The earth was kept wet round-the-clock for seven days by frequent sprinkling.

Specifications Written

Specifications were written for a test section 1½ miles long containing six ¼-mile units. Four units were to contain shrinkage compensated cement; two units were to contain regular job cement, as a control; and, all units were to be cured seven days with white plastic membrane.

No joints were to be used in any of the six experimental units, although construction joints could be formed at the end of any unit. Where a joint did occur at the end of any shrinkage compensated cement unit, an end anchor was to be constructed. End anchors are thickened end blocks of concrete about 15 feet long, tapering from a thickness of 8 inches to about 2 feet. Photo No. 1 shows one of these anchors being constructed.

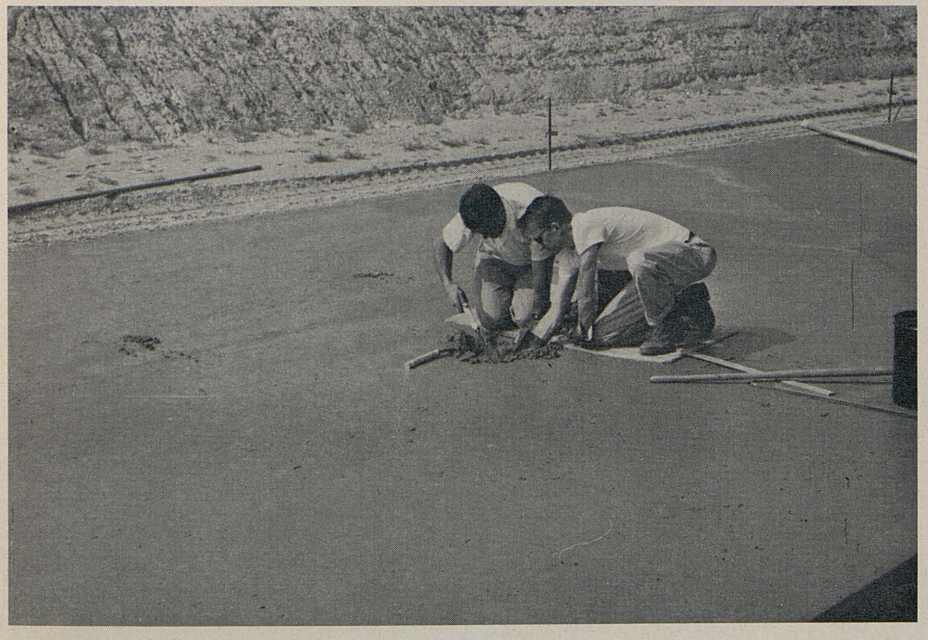


PHOTO 5. This photo shows Carlson type strain gages being installed in the plastic concrete to measure internal movement or "growth" that occurred.

Projects Selected

Two current projects were selected for installation of experimental sections. One was for the construction of a portion of the Antelope Valley Freeway in District VII, and the other was for converting U.S. 99, near Lodi in District X, to freeway status.

On the first test section constructed, part of the Antelope Valley Freeway, lugs were cut into the subgrade in addition to end anchors to increase resistance to sliding, but measurements and analysis of strain data indicated that they were not needed. The end anchors alone, apparently, were sufficient and were the only means of restraint used for the second and later test section near Lodi.

Half of the units in each test section had air-entrained concrete, and half were non-air-entrained. For the Antelope Valley Freeway section two cement factors were used, 6 and 6½ sacks per cubic yard, while a single cement factor was used in all units of the Lodi section.

PHOTO 6. Changes in length of the concrete were measured by means of a comparator. Holes were cut in the plastic sheeting to reach gage plugs cast in the concrete.

Curing Changed Somewhat

The curing for the Lodi job was also changed somewhat. Early data, obtained from the Antelope Valley Freeway section indicated that expansion had stopped after about three or four days. It was believed that the reason might have been lack of moisture. For this reason, half the units in the Lodi section were cured with wet earth instead of plastic membrane as originally planned. The pavement was kept wet by a special spray bar constructed by the contractor (see Photo No. 2), until it had hardened sufficiently to support the wet earth. See Photos Nos. 3 and 4 showing the two types of curing membrane in place.

Surface gauge plugs and internal strain gauges were used to measure length changes in the concrete. See Photos Nos. 5 and 6. Gauge readings established the fact that vertical expansion was greatest, transverse movement was intermediate, and longitudinal movement was almost nil, indicating that the concrete had gone into compression in a longitudinal direction. Of course, measurements are useful, but the real proof of success is measured by the crack interval or slab lengths that result.

Results Not Encouraging

Results so far are not too encouraging. After 58 days, following removal of curing membrane on the Antelope Valley Freeway section, the average distance between cracks in the special cement units was 60 feet, while the average in the control units was 56 feet. This indicates that little, if any, benefit was gained by using the special cement. It now appears that a larger percentage of component could have been used as not all the desired expansion took place. It was not expected that the expansion under field conditions would be as great as that measured in laboratory tests, but it was anticipated that enough would take place to secure the desired result.

One interesting development was the difference in crack spacing as between the air-entrained and non-air-entrained units on the Antelope Valley Freeway section. The average distance between cracks for the air-entrained units was 48 feet at 58 days, while the average for the non-air-entrained units was 70 feet. This indicates that under the conditions existing for this pavement, the air-entrained concrete may have had substantially greater drying shrinkage.

Cracking Patterns Similar

The Lodi section has yielded little data to date, but preliminary measurements and observations show that cracking patterns will be similar to those obtained on the Antelope Valley Freeway section. Cracks have appeared in all units despite the additional precautions taken to secure thoroughly wet conditions during the curing period.

After about three weeks of natural drying following the end of the curing period, the average distance between cracks in the special cement units was 68 feet, while the average in the control units was 65 feet. Again it appears that the use of expanding cement has not resulted in appreciably fewer cracks than the use of job cement. There was also little difference between the plastic cured units and the wet earth cured units.

Further analysis of the data may show why greater differences did not occur. It might be that the concrete underwent plastic flow, or creep, as the expansion took place, thereby preventing development of much compression. The use of a larger percentage of expansive component may be necessary to develop the desired effect.

Others, also, are investigating the use of this interesting material. A self-stressed, reinforced concrete pavement is being planned by the State of Connecticut. More research work is being carried on in laboratories. As with most "new" materials, it will take some time to "discover" all the uses that may be made of it. This, of course, is part of the function of the Materials and Research Department of the California Division of Highways.

FOG WARNING CONFERENCE

Officials of the Division of Highways, the Department of Motor Vehicles and the Highway Patrol met met with an advisory group of representatives of the automobile clubs, insurance companies, law enforcement agencies and bus and truck operators on August 12 in Sacramento to begin a study of ways to provide advance warning to motorists of fog conditions.

Japan's Highways

Economic Growth, Olympics Spur Road Development

Imagine trying to design and build an expressway without the ability to acquire right-of-way through eminent domain or tax the people for funds. Where does one go with his road and where does he get the money once he's found the route?

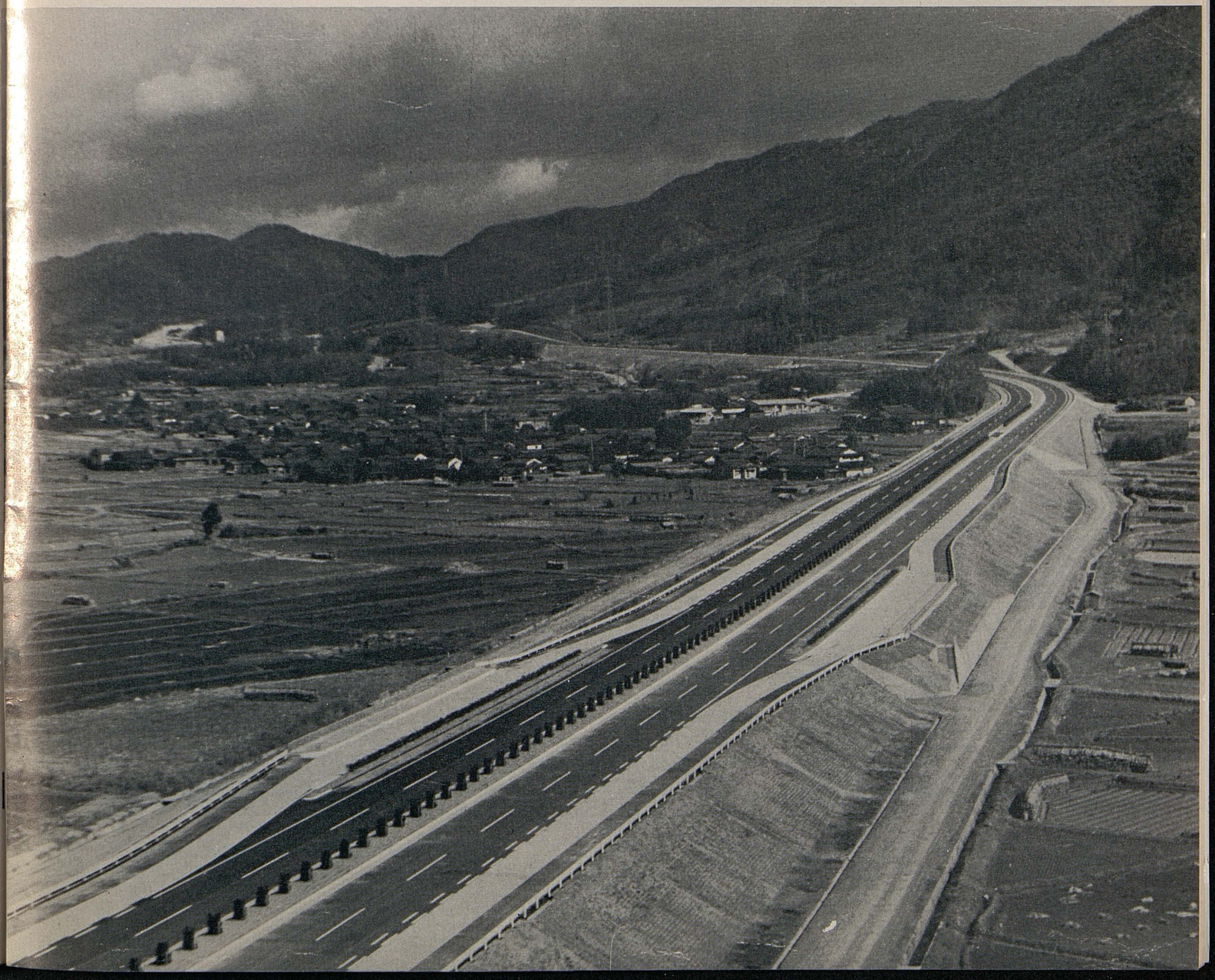
The Japanese make their concrete strips go through mountains, over or under swamps and rivers and around the borders of preferred property like ribbons—and they do most of it on borrowed money.

Burton Sherman, Senior Delineator at District VII, traveled to Japan last year on the invitation of the Japan Highway Public Corporation, Nihon Doro Kodan, returning a visit made by Ken-ichi Fujimoro, present chief of the Highway Planning Department, to District VII in 1958. Because of his interest in highways, Sherman was given a complete tour of Japan's Nagoya-Kobe Expressway, their first modern divided highway, where he made color slides of construction and acquired plans and maps for lectures. A major stimulus for Japan's highway growth, in addition to its anticipated increase in economic growth rate, is preparation for the upcoming 1964 Olympic games. They have been proceeding under the prevailing five-year program, planned for 1961-65, including 305 billion yen ($847 million) for toll roads built by Nihon Doro Kodan.

A completed section of the Nagoya-Kobe Expressway near Kyoto City shows emergency pulloff areas. The median barrier is planted with bushes, as are the dividing strips for rest areas.

Tax, Right-of-way Limitations

Tax and right-of-way limitations have necessarily altered Japanese road-building so as to make some of their



Spiral approaches to the Ondo Ohashi Bridge are shown at night.

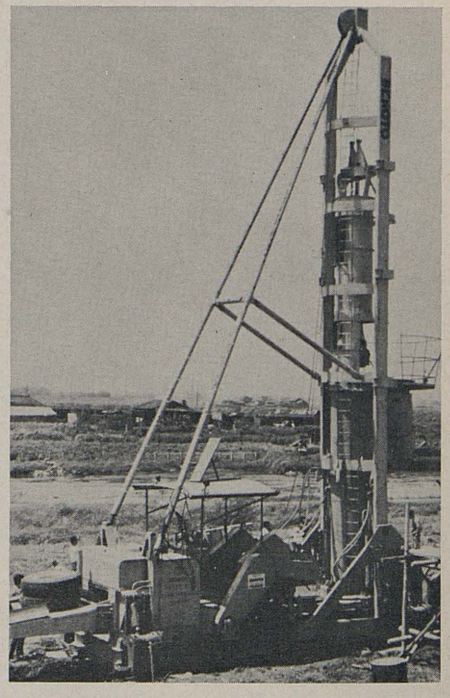
Mr. Nakamura, guide and interpreter supplied by Nihon Doro Kodan; Burt Sherman; and Mr. Tanaka, paving specialist for NDK, study plans at a construction site.

methods quite different from ours. One of the most striking examples is the spiral bridge approach across the Ondo Strait of the Inland Sea, connecting Kure City and Ondomachi. In order to reach a high elevation in a minimum space, the bridge approach ramp rises in a relatively steep manner, spans the river and descends in the same fashion. It looks much like our pedestrian overpass.

All of the roads built by Nihon Doro Kodan are toll facilities and have rest and amusement areas, also run by this group, along the traveled way. Bus stops are provided along the routes—30 on the Nagoya-Kobe Expressway alone.

Nihon Doro Kodan is a private corporation, under the supervision of the Minister of Transportation, created in 1956 to build roads. They are a private concern but are financed from several different sources, including the government. They were set up as a private concern so that they could sell

The French Benoto machine, which has been the subject of much inquiry by District VII bridge engineers, is used widely in Japan to bore for and insert bridge pillars.



Two-level Shimamoto and Kajiwara Tunnels, also part of the Nagoya-Kobe Expressway, are seen under construction. When completed, the higher level tube will carry motorists to Kyoto and the lower one to Kobe.

bonds as well as borrow government money.

Road Bonds Sold

Road bonds sold to Japanese investors bring 46 percent of the necessary funds; capital funds from the Japanese government, 15 percent; loans from the Trust Fund Bureau of the Ministry of Finance, 15 percent; loans from the International Bank for Reconstruction and Development, 11 percent; toll revenues, 10 percent; subsidies from the government, 3 percent. Gas tax money is also used now to help meet financial needs.

The NDK is licensed to build and operate, as toll facilities, expressways, highways, tunnels, bridges, ferry services, parking places, rest houses and gas stations on expressways, and office rooms, shops and warehouses located under viaducts or other of their structures.

They have completed 49 toll roads (237 miles) and are constructing 24 more (114 miles). The Kanmon Undersea Highway Tunnel, a 2.08-mile tube connecting Kyushu Island with the mainland (Honshu), is the only one of its kind in the world.

Nagoya-Kobe Expressway

The Nagoya-Kobe Expressway is the corporation's biggest project. It was begun in 1957 and its completion is planned for 1964. The road will be 112.8 miles long and is estimated to cost $320 million, $100 million of which is expected to be loaned from the World Bank. Three foreign engi neers assisted in the planning, design ing and construction of the expressway, two Americans—from Texas and Nebraska—and one German. Estimated daily traffic will be about 11,000 vehicles, 77 percent of which should be trucks. The area served by the expressway includes four of Japan's six major cities.

—Karen L. Bailey

(Editor's Note: A consultant to the Japanese Ministry of Construction on the original feasibility studies for the Nagoya-Kobe Expressway in 1954 was J. C. Womack, at that time Advance Planning Engineer for the California Division of Highways and now State Highway Engineer.)

West Placerville Freeway

By FRANK V. RAKELA, Associate Highway Engineer

The first section of four-lane freeway on U.S. 50 in El Dorado County between Sacramento and Placerville was opened to traffic August 15, 1963, with a colorful ribbon-cutting ceremony marking the initial day of the county fair, located adjacent to an interchange.

This 2.8-mile stretch of modern highway runs from Perks Corner (Missouri Flat Road) to the Placerville west city limit and replaces 3½ miles of narrow, heavily commercialized two-lane conventional roadway. The new alignment bypasses the loop in the old route as shown on the accompanying map.

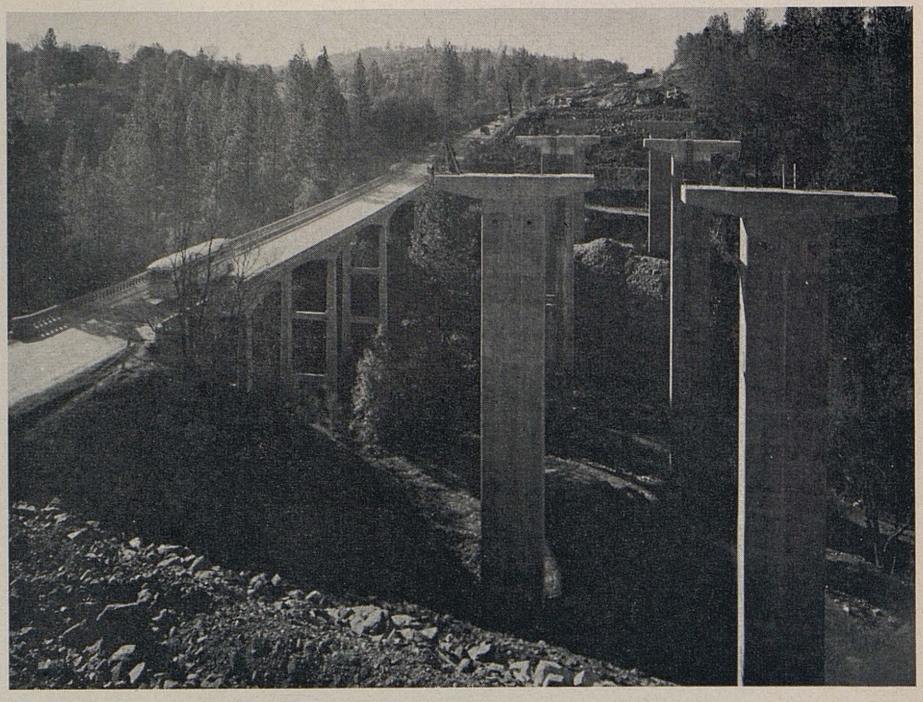
U.S. 50 was one of the first routes to be included in the original California state highway system. Heavy traffic has been commonplace over it for the past century.

Hundreds of Freight Wagons

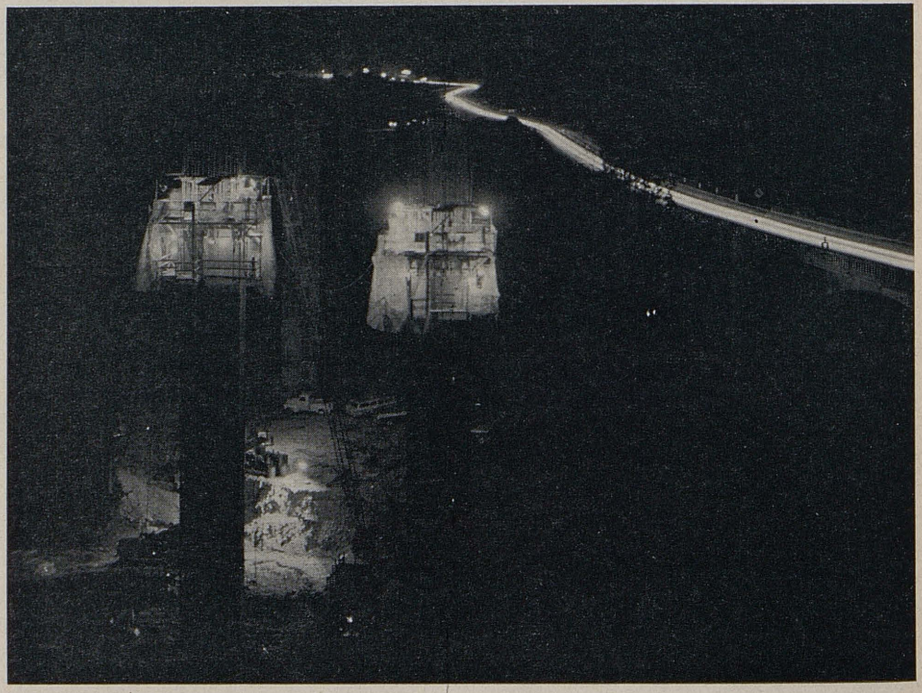
Early records and photographs show that during the 1860's hundreds of freight wagons passed through Placerville (then called Hangtown) destined for the Comstock mines in Nevada. With payloads ranging from drygoods to blasting powder, these creaking earlyday vehicles were drawn by oxen or horses. Mule trains were not uncommon.

Traffic in those days was said to be so heavy that "if a wagon dropped out of the nose-to-tailboard stream of traffic, it waited until nightfall to get back in line."

Closing the Comstock mines had only temporary effects on the traffic. And recent counts show an average daily traffic of 12,000 vehicles of all types in the Placerville area with peak-hour traffic as high as 1,900 vehicles.

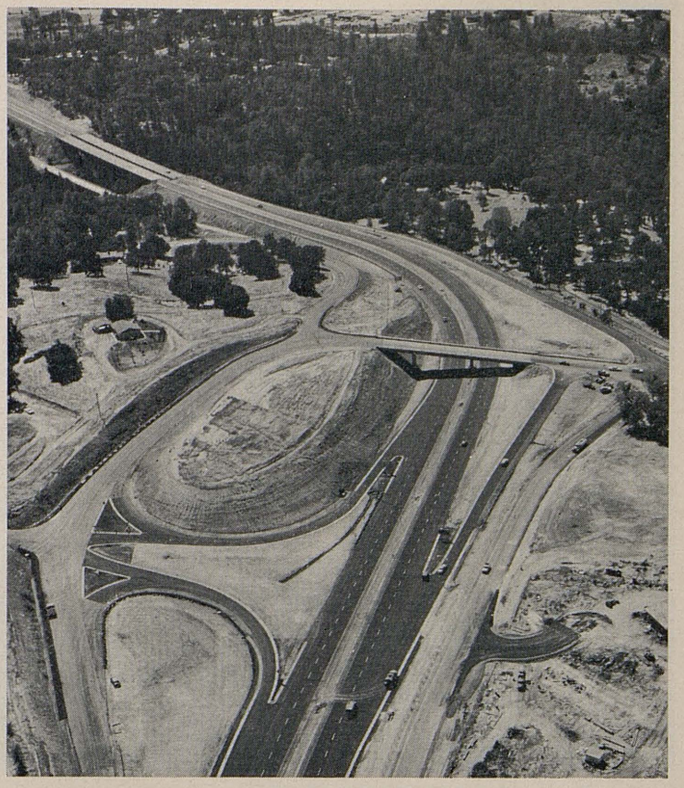


The completed Webber Creek piers prior to construction of the superstructure of the bridge.

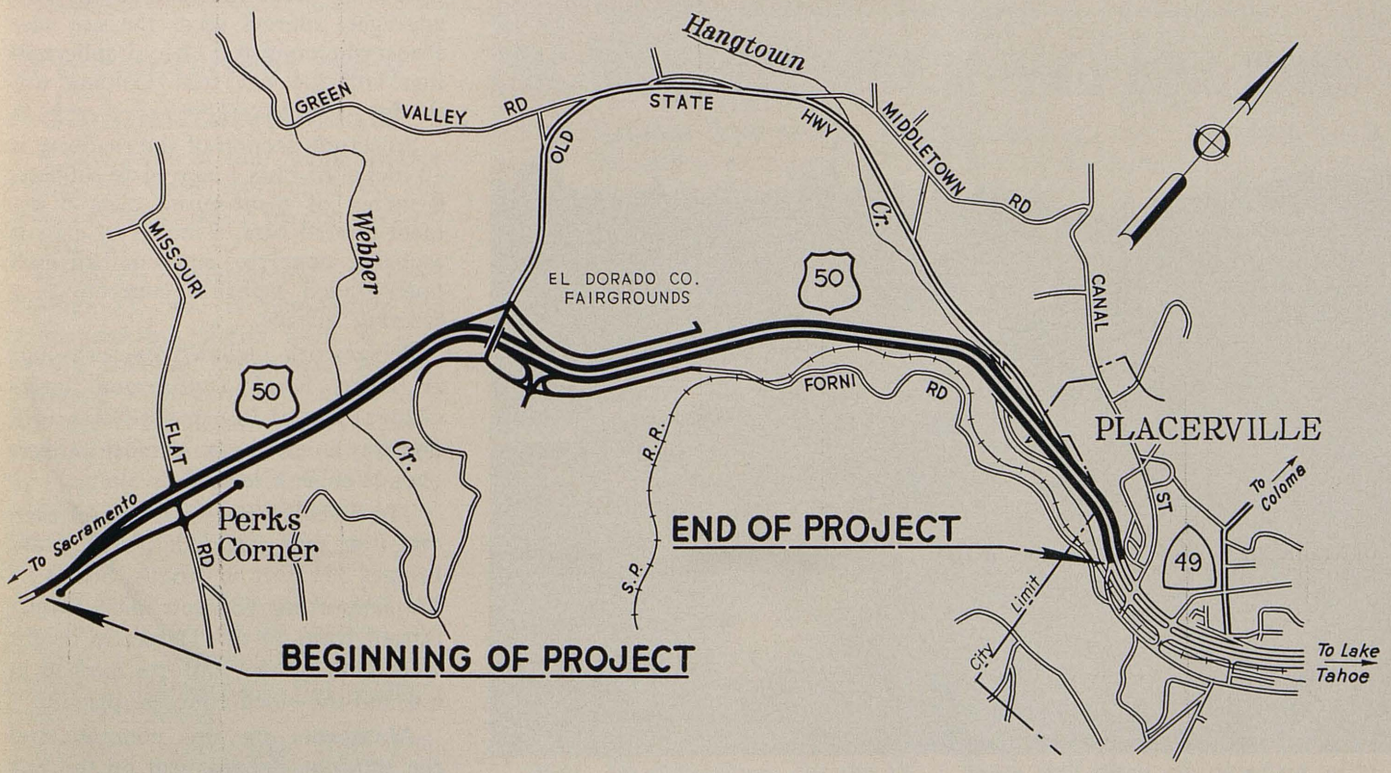


A night shot of the round-the-clock slipform pouring of the pier shafts on the Webber Creek twin bridges. The lines of light on the old highway to the right were caused by the headlights of oncoming cars.

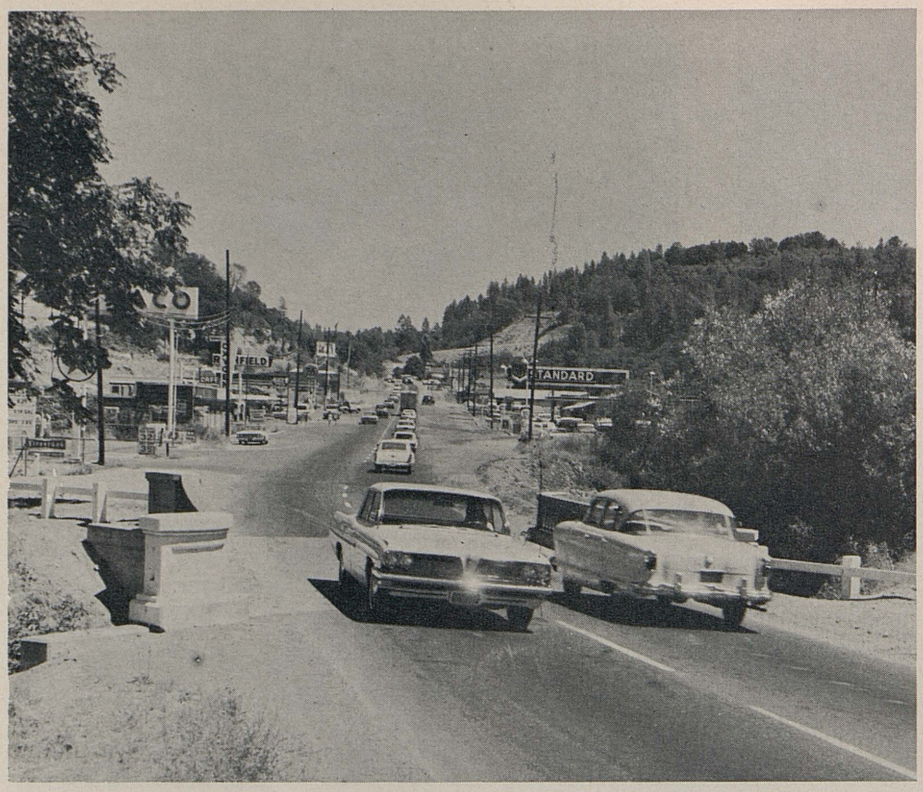
A southwest view of the new freeway showing the fairground interchange and Webber Creek bridge in the distance. The county fairground can be seen upper center.



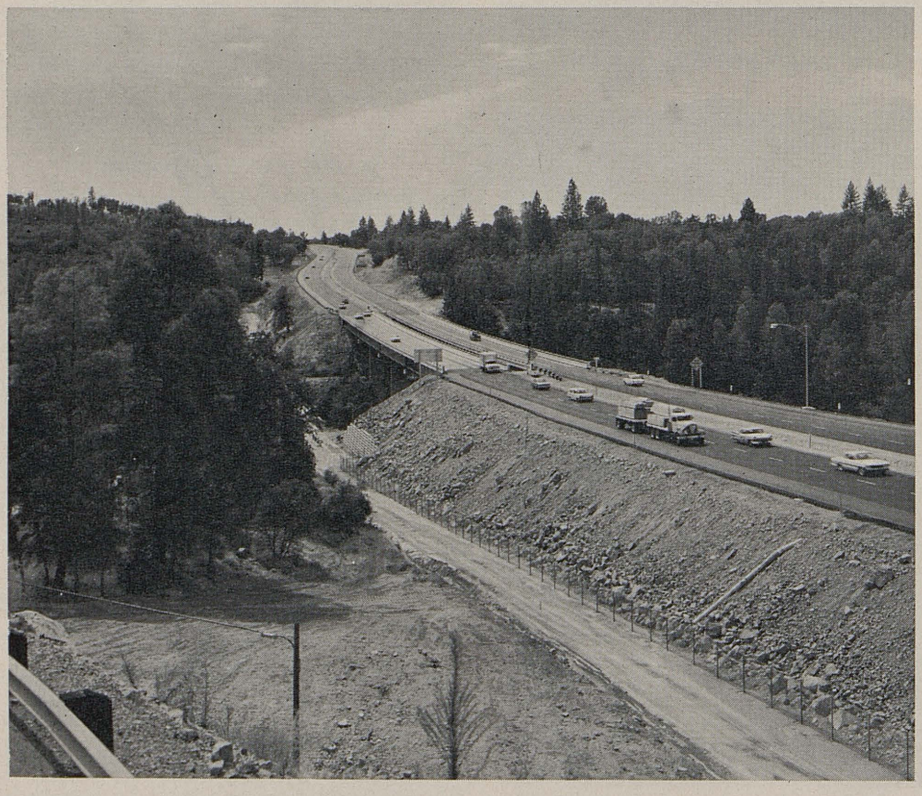
A closeup of the fairground interchange and Webber Creek bridge.



A map showing the location of the new freeway section in relation to the City of Placerville and neighboring points.



Traffic on the old highway near the east end of the project passes through a commercialized area which fronts close upon the roadways on both sides.



Typical traffic flow on the new freeway in the vicinity of the new Webber Creek bridge.

Completion of this latest project now provides a total of seven miles of uninterrupted four-lane freeway and expressway through the Old Hangtown area. At the present time two other jobs are under way east of Placerville. When these are opened to traffic—probably by the end of next year—along with previously completed sections, motorists traveling U.S. 50 will enjoy 25 miles of four-lane highway running from three miles west of Placerville to Riverton.

Construction on the west of Placerville job—with maximum grades of 6 percent and 1,200-foot-minimum radius of curves—required some 950,000 cubic yards of excavation. A rocky sidehill cut near the east end of the project yielded 300,000 yards of it. Here the existing road had a 30-foot cut slope on one side and Hangtown Creek on the other. Extensive drilling and shooting was necessary in this area, and, because of the proximity of the old highway and heavy traffic involved, blasts were kept small to minimize traffic delays.

Widespread Mining Operations

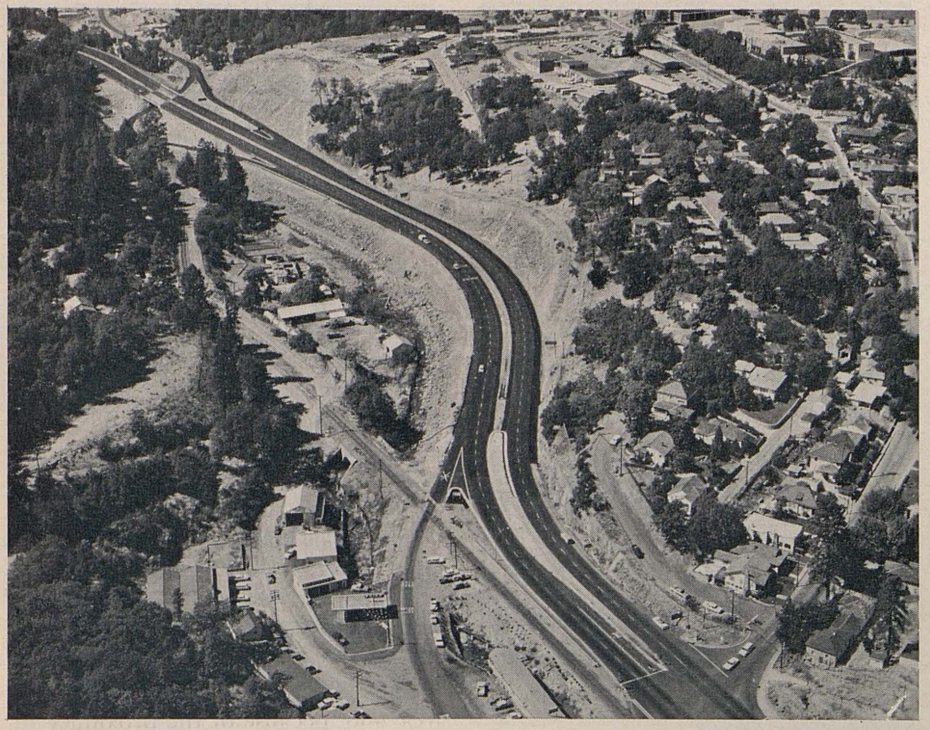
The widespread Gold Rush mining operations were reflected in the two aggregate sources used: the site near Placerville consisted of hydraulic tailings and the one near Coloma was dredger tailings.

Structural section of the roadway is 12 inches of class 1 aggregate subbase, 8 inches of plant-mixed class B cement-treated base, 4 inches of class B asphaltic concrete, and one-half-inch open-graded asphaltic concrete as a wearing surface.

Bridgework included overcrossings at Forni Road (fairground interchange) and at Placerville Drive (old highway), and twin, parallel bridges over Webber Creek.

The Webber Creek structures each are four-span welded plate girder bridges 551 feet in length. Shafts of the supporting concrete piers which ranged from 70 to 135 feet in height were built by the slipform method in a round-the-clock concrete placing.

Abutments are also concrete and the 100-foot embankment on the east was constructed of rocky material in



Looking west from the end of the project at West Placerville city limit where the new freeway connects with the existing expressway through the city.

8-inch lifts. Settlement of the fill was negligible.

Both structures feature an experimental concrete roadway deck. Type I cement was used on two spans of each structure and type II low alkali cement was used on the other two spans. In addition two of the spans in each structure used Bear River aggregate from near Colfax, about 50 miles northerly of the project. Aggregate for the other two spans in each structure was imported from the Pleasanton area in Alameda County, a haul of approximately 145 miles.

Differing amounts and distribution of reinforcing steel were used in the eastbound structure. Electrical thermocouples and strain gauges were cast into the deck and several series of load tests were made. The primary purpose of the experimental work was to determine the effect of various combinations of aggregate, cement, and reinforcement on concrete shrinkage and on the development of cracks in the deck slab. Further tests are planned.

Fredrickson & Watson Construction Co. of Oakland was contractor, and construction cost was approximately $3,240,000. R. G. Elliott was resident engineer during staking, and the author during construction. R. N. Brink was Bridge Department representative. Superintendent for the contractor was Paul Fields.

SPB Establishes New Administrative Class

A new series of four administrative classes has been established by the State Personnel Board for the Division of Highways.

Highways administrative officers I through IV will be responsible for nonengineering duties such as personnel, training, office management, building management, automotive management, and supply and property management. Administrative officers may handle additional staff work, depending upon the needs and size of the district in which they are employed.

This series is intended to simplify the job structure of the division and to provide personnel specifically trained in management and administrative techniques.

The pay scales range from $590 starting salary for a HAO I to a maximum of $1,166 for a HAO IV. Promotional examinations for positions at the I, II, and III level are tentatively scheduled for December 14, 1963, with a final filing date of November 22, 1963. An examination for the IV level will be scheduled later.

TOLL BRIDGE AUTHORITY RE-FUNDS BOND ISSUES

The California Toll Bridge Authority took action on September 25 to re-fund the bond issues of 1955 and 1959 which financed the Carquinez and Benicia-Martinez toll bridge projects and at the same time authorized use of toll bridge bond funds to finance construction of an improved 12-mile bridge approach between Benicia and Interstate 80 near Cordelia.

The authority acted on the recommendation of the Department of Public Works in both instances.

Department officials, with the support of legal and financial experts, pointed out that the current condition of the bond market indicated a saving of more than $3,000,000 in interest costs over the life of the bond issues, in comparison with the interest rates prevailing at the time of the previous issues.

In addition to authorizing call of the previous bonds and issuance of refunding bonds, the authority adopted a resolution making funds from the new issue available in the amount of $10,000,000 to realign and reconstruct the present two-lane State Highway 21 as a four-lane divided highway. This action was made possible by recent legislation defining this highway as a part of the approaches to the bridge.

Since regular state highway funds were not available for this construction, the use of toll bridge bond issue funds will mean advancement of the project by several years.

Earl Hampton Retires, Meret Is Appointed

Earl W. Hampton, deputy chief in charge of architectural and engineering services of the Division of Architecture, retired October 4. Tom Meret, Assistant State Architect in charge of the Los Angeles office, has been appointed to succeed him as deputy.

Hampton has been with the architecture division 38 years. He was Acting State Architect for more than a year following the retirement of State Architect Anson Boyd in 1962.

EARL W. HAMPTON

He is a native of Sacramento County.

Hampton attended the University of California in Berkeley. He received his Master of Arts degree in 1924.

In 1925 he joined the Division of Architecture staff as an assistant architectural draftsman.

Long Career

During his long career, Hampton progressed through each of the drafting and design classifications. In 1949 he was selected to administer the portion of the division's postwar design program turned over to private architects.

From 1953 to 1955 he supervised the preparation of preliminary design studies and budgetary analyses of major capital outlay construction projects proposed for the Governor's annual budget.

TOM MERET

He headed the division's budgetary and fiscal function for four years before his appointment to the deputy chief position in 1959.

In recent years he has been responsible for the planning and design functions performed by the architecture division, the division's construction supervisory forces throughout the State, and the staff operations of the schoolhouse section who checks and passes on the safety aspects of private architects' plans for public school buildings erected in California.

He is a California registered architect, and a member of the American Institute of Architects.

Hampton and his wife, Margaret, have two daughters.

Meret Joins Division

Meret joined the Division of Architecture in 1948 as an associate designer and was appointed senior designer a year later. In 1952 he was promoted to Supervising Architect.

Meret took over supervision of the construction budgets section in 1955 and later headed the division's project management section which developed improved methods for the control and management of the budgetary and working drawings processes engaged in by the division.

Meret is married and has two daughters.

IN MEMORIAM

Headquarters

Mervyn R. Blacow, Senior Landscape Architect.

Materials and Research

Nathaniel C. Martin, Engineering Aid II.

District IV

Harold Skootsky, Senior Highway Electrical Engineer.

District VI

Bentley Barnes, Highway Superintendent.

District VIII

Ralph C. Wright, Assistant Highway Engineer.

District X

Frank E. Randolph, Highway Maintenance Man I.

State-owned Toll Bridges

Thomas Hugill, Service and Maintenance Man II.

Mervyn R. Blacow

Mervyn R. Blacow, Senior Landscape Architect for the Division of Highways, died on August 18 from injuries suffered in a fall from a scaffold while painting his home.

He designed the layout of much of the roadside planting and landscaping of California's freeways throughout the State.

A native of Oakland, Blacow attended grade and high school at Irvington and Centerville and is a graduate of the University of California at Berkeley.

He joined the Division of Highways as a junior architectural draftsman in 1935. He advanced through assistant and associate grades, becoming a senior and assistant chief of the division's landscape design section in 1953.

Blacow was a Mason and active in the Boy Scouts. He was a veteran of World War II.

He is survived by his wife, Lois, and two sons and a daughter.

R. C. Richardson

Rodney C. Richardson, former assistant to the California Director of Public Works, died in St. Paul, Minnesota, on August 15, following surgery. He was 46 years old.

Richardson was born in Superior, Wisconsin, and was educated in Los Angeles. After military service in World War II, he was appointed secretary in 1944 to the Governor's Veterans Commission, predecessor of the Department of Veterans Affairs. He later held other administrative posts in state government and from 1950 to 1955 was an assistant to the Director of Public Works, serving under the late C. H. Purcell and Frank B. Durkee.

Eight years ago Richardson moved to St. Paul as an official of a large manufacturing concern.

He is survived by his wife, Antona, and a son and daughter, living in Roseville, Minnesota.

RETIREMENT

. . . Continued from page 38

icksen, Supervising Highway Engineer, 34 years; Jerome N. Stanley, Senior Highway Engineer, 34 years; Nathan C. McCorkle, Supervising Highway Engineer, 34 years; Charles E. Waite, Deputy State Highway Engineer, 34 years.

Bridge Department

Lloyd B. Dale, Assistant Bridge Engineer, 27 years; Ernest H. Sagehorn, Assistant Bridge Engineer, 33 years; Mildred I. Grant, Intermediate Stenographer, 10 years; Leonard C. Hollister, Principal Bridge Engineer, 36 years; Irene R. Schmidt, Intermediate Account Clerk, 23 years; Cecile Davies, Bookkeeping Machine Operator II, 40 years.

Materials and Research

Howard M. Aaron, Assistant Chemical Testing Engineer, 34 years.

State-owned Toll Bridges

August Sanguinetti, Janitor, 24 years; Edith T. Harrell, Intermediate Account Clerk, 25 years; Joseph E. Miguel, Service and Maintenance Man II, 17 years; Edith E. Schwalen, Senior Stenographer, 9 years.

Shops

Charles Bovey, Supervising Machine Parts Storekeeper, 42 years; William L. McFadden, Supervising Equipment Engineer, 36 years; Edwin H. Hanks, Fusion Welder, 26 years; Melvin Saunders, Fusion Welder, 19 years; Edward G. Schutt, Highway Mechanical Foreman, 28 years; Dennis L. Hicks, Heavy Equipment Mechanic, 37 years; John W. Harris, Automobile Mechanic, 30 years.

ARAMAYO VISITS CHILE

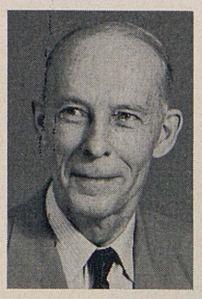
Luis Aramayo, Assistant District Engineer in District II (Redding) was chosen by Governor Brown as a member of an "Alliance for Progress" task force which made a five-week study in Chile.

Aramayo, a native of La Paz, Bolivia, was selected to cover the transportation phase of the study.

Right-of-way Expert J. T. Zeeman Retires

J. T. Zeeman, Assistant Chief Right-of-way Agent for the State Division of Highways, retired on October 1, 1963.

Born and educated in Holland, Zeeman entered the real estate and mortgage loan business in the 1920's in Los Angeles following U.S. Army service during World War I. In 1939, he became deputy land assessor in Los Angeles County.



J. T. ZEEMAN

He began work with the Division of Highways in 1944, serving as right-of-way agent in District X (Stockton). Zeeman left this position to serve first as staff appraiser for the State Board of Equalization, and later as supervising appraiser for the State Savings and Loan Commissioner in San Francisco.

Returning to the Division of Highways in 1948, Zeeman has since served as real estate appraiser and supervising right-of-way agent, appraising property needed for right-of-way purposes. He was also active in the purchase of land parcels for other state agencies, including acquisition of the new State Fair site in Sacramento, Sacramento State College, and others.

He was promoted to the post of Assistant Chief in 1961 to supervise all right-of-way activities in the southern half of the State, and later became administrator of the appraisal department for all valuation activity concerning right-of-way throughout California.

Zeeman is a member of the American Right-of-way Association, Sacramento Chapter; the American Institute of Real Estate Appraisers, Northern California Chapter; the Sacramento Real Estate Board, and the Commonwealth Club of San Francisco.

He and his wife, Marie, have a daughter and three grandchildren.

Tom Bigelow Retires, With State 44 Years

Howard Thayer "Tom" Bigelow of Yuba City, highway superintendent in charge of special maintenance crews of the Marysville district office, retired September 1 following nearly 44 years with the California Division of Highways.

Born in Trinity County, Bigelow graduated from Weaverville High School in 1917 and immediately accepted employment with the Highway Division at the Dunsmuir district office (since, moved to Redding).

During a two-year period after World War I Army service, he worked for the federal government and the Du Pont Company.

In 1921 he rejoined the Dunsmuir staff as timekeeper. Six years later he was promoted to highway maintenance foreman and in 1930 was advanced to superintendent and assigned the Crescent City territory. He then served successfully in this capacity at Boonville, Sacramento, Woodland, Nevada City and Marysville.

H. T. BIGELOW

While assigned to division headquarters in Sacramento, Bigelow served as assistant to the State Maintenance Engineer.

Bigelow transferred to Marysville in 1948 and was assigned supervision of the district's special maintenance services which includes highway striping and marking, tree trimming, highway lighting, traffic signals, radio communication, signs, roadside plantings and equipment distribution.

Bigelow is immediate past state president of the Division of Highways Quarter Century Club and is a past president of the Mt. Konocti Chapter 19 of the California State Employees Association.

He is also a member of the Elks Club, Masonic Lodge No. 13, Marysville, Scottish Rite and the Marysville Post American Legion.

STATE OF CALIFORNIA

EDMUND G. BROWN, *Governor*

HIGHWAY TRANSPORTATION AGENCY

ROBERT B. BRADFORD . . . Administrator

DEPARTMENT OF PUBLIC WORKS . . . JOHN ERRECA, Director

FRANK A. CHAMBERS . . . . Chief Deputy Director

RUSSELL J. COONEY . . Deputy Director (Management)
HARRY D. FREEMAN . . Deputy Director (Planning)
T. F. BAGSHAW . . . . . Assistant Director
JUSTIN DuCRAY . Departmental Management Analyst
S. ALAN WHITE . . Departmental Personnel Officer

DIVISION OF HIGHWAYS

J. C. WOMACK . . . State Highway Engineer, Chief of Division

J. P. MURPHY . . . Deputy State Highway Engineer
J. A. LEGARRA . . Deputy State Highway Engineer
GEO. LANGSNER . . Deputy State Highway Engineer
LYMAN R. GILLIS . Assistant State Highway Engineer
J. E. McMAHON . . Assistant State Highway Engineer
FRANK E. BAXTER . Assistant State Highway Engineer
GEORGE A. HILL . Assistant State Highway Engineer
J. C. BURRILL . . . . . Comptroller
NEAL A. ANDERSEN . . . . Equipment Engineer
JOHN L. BEATON . . Materials and Research Engineer
C. G. BEER . . . . . Urban Planner
J. F. JORGENSEN . . . . . Construction Engineer
SCOTT H. LATHROP . Personnel and Public Information
C. T. LEDDEN . . City and County Projects Engineer
H. C. McCARTY . . . . . Office Engineer
DANA G. PENGILLY . . . . . Planning Engineer
E. J. L. PETERSON . . Program and Budget Engineer
R. V. POTTER . . . . Systems Research Engineer
E. L. TINNEY . . . . . Maintenance Engineer
W. L. WARREN . . . . . Engineer of Design
J. E. WILSON . . . . . Traffic Engineer
A. L. ELLIOTT . . . . Bridge Engineer—Planning
L. C. HOLLISTER . Bridge Engineer—Special Projects
I. O. JAHLSTROM . . . Bridge Engineer—Operations
DALE DOWNING . . Bridge Engineer—Southern Area

Right-of-Way

RUDOLF HESS . . . . . Chief Right-of-Way Agent
DEXTER D. MacBRIDE . . . . . Assistant Chief
RAY E. O'BIER . . . . . Assistant Chief
R. S. J. PIANEZZI . . . . . Assistant Chief
JACQUES T. ZEEMAN . . . . Assistant Chief

District I, Eureka

SAM HELWER . . . . . District Engineer

District II, Redding

H. S. MILES . . . . . District Engineer

District III, Marysville

ALAN S. HART . . Assistant State Highway Engineer

District IV, San Francisco

J. P. SINCLAIR . . Assistant State Highway Engineer
R. A. HAYLER . . . . . District Engineer
HAIG AYANIAN . . . . . District Engineer
C. F. GREENE . . . . . District Engineer

District V, San Luis Obispo

E. R. FOLEY . . . . . District Engineer

District VI, Fresno

W. L. WELCH . . . . . District Engineer

District VII, Los Angeles

E. T. TELFORD . . . Metropolitan District Engineer
A. L. HIMELHOCH . . . . . District Engineer
A. C. BIRNIE . . . . . District Engineer
A. W. HOY . . . . . District Engineer
R. E. DEFFEBACH . . . . . District Engineer

CALIFORNIA HIGHWAY COMMISSION

ROBERT B. BRADFORD . Chairman and Administrator, Highway Transportation Agency
JAMES A. GUTHRIE . . Vice Chairman San Bernardino
ARTHUR T. LUDDY . . . Sacramento
ROGER S. WOOLLEY . . . San Diego
ABRAHAM KOFMAN . . . . Alameda
FRANKLIN S. PAYNE . . Los Angeles
WILLIAM S. WHITEHURST . . . Fresno

JOHN ERRECA . Administrative Officer and Director of Public Works
JACK COOPER, Secretary . . . Sacramento

District VIII, San Bernardino

C. V. KANE . . . . . District Engineer

District IX, Bishop

C. A. SHERVINGTON . . . . . District Engineer

District X, Stockton

JOHN G. MEYER . . . . . District Engineer

District XI, San Diego

JACOB DEKEMA . . Assistant State Highway Engineer

State-owned Toll Bridges

CHARLES L. SWEET . . . . . Bridge Engineer

DIVISION OF CONTRACTS AND RIGHTS-OF-WAY

HARRY S. FENTON . . . . . Chief Counsel

EMERSON RHYNER . . . Deputy Chief (Sacramento)
HOLLOWAY JONES . . . Deputy Chief (San Francisco)
GEORGE C. HADLEY . . . Deputy Chief (Los Angeles)

DIVISION OF BAY TOLL CROSSINGS

BEN BALALA . . . . . Acting Chief of Division

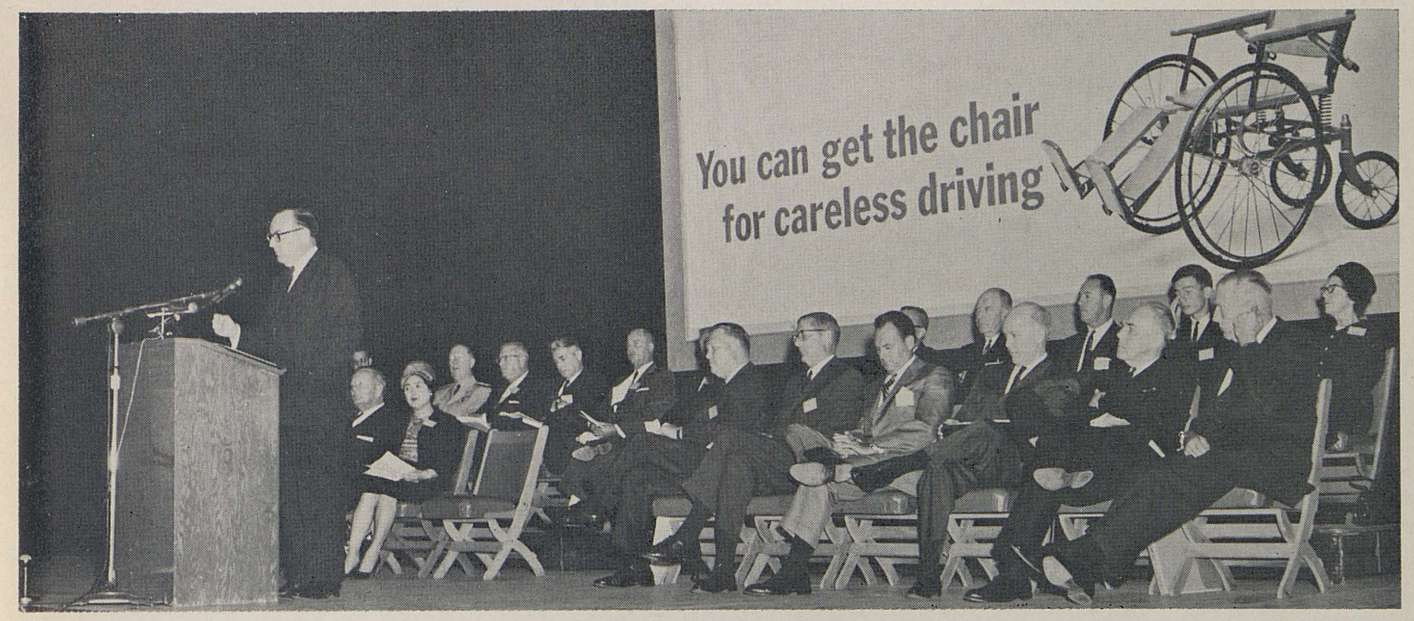
DIVISION OF AERONAUTICS

CLYDE P. BARNETT . . . . . Director, Chief of Division

95661 9-63 54M

printed in CALIFORNIA STATE PRINTING OFFICE

Traffic Safety Conference



Division chairmen and officials of the Governor's Traffic Safety Conference listened intently as Governor Edmund G. Brown delivered the keynote speech at the opening general session in the Memorial Auditorium, Sacramento, on October 3. Seated on the platform just behind the Governor is Mrs. Hideo Kodani of Pacific Palisades, general chairman.

More than 800 safety-minded Californians took part in the 1963 two-day Governor's Traffic Safety Conference which was held in Sacramento October 3-4.

After hearing an opening exhortation from Governor Edmund G. Brown to "probe for new approaches, new remedies, new programs," the participants concentrated on one or another of the 10 divisional fields of interest, with each division later reporting on its findings and recommendations at the luncheon which concluded the conference.

Other highlights of the conference included an opening-day luncheon at which President Howard Pyle of the National Safety Council commended California on winning the 1962 "Flame of Life" award for progress in traffic safety in this State; and a dinner meeting at which Assemblyman Richard Donovan of Chula Vista outlined recent legislative efforts.

The conference divisions were as follows: armed forces, citizen support, driver licensing, education, enforcement, engineering, fleet operations, judges and prosecutors, teenagers, and women's activities.

In his opening statement, Governor Brown emphasized that California's progress and recognition in traffic safety were not grounds for complacency.

He noted that the death rate in California traffic had been reduced from 6.4 persons killed per 100 million vehicle-miles of travel in 1956 to 5.2 per 100 MVM. He attributed much of this gain to the freeway construction program: "every day a life is spared and more than 65 persons are saved from injury by the safety factors built into California freeways."

"But there is no cause for pride," he continued, "in the shameful count of more than 11 dead and more than 500 injured every single day of 1963. We are still killing and injuring our people in traffic accidents that should not have happened."

The Governor announced that he was asking the Division of Highways to step up the installation of median barriers on freeways on a priority basis; the Department of Motor Vehicles to step up its driver improvement program with respect to negligent operators "and those drivers who may suffer from physical or mental disabilities"; and the Highway Patrol to use every officer with the greatest possible effectiveness—"preferably on the road."

He noted that efforts to require a chemical test for intoxication in drunk driving arrest cases did not succeed in the 1963 legislative session, and urged his audience to support this and other proposals by contacting their own legislators.

"Your legislators are men of good will," he said. "They will respond to your ideas and suggestions. This is political lobbying of the best kind."