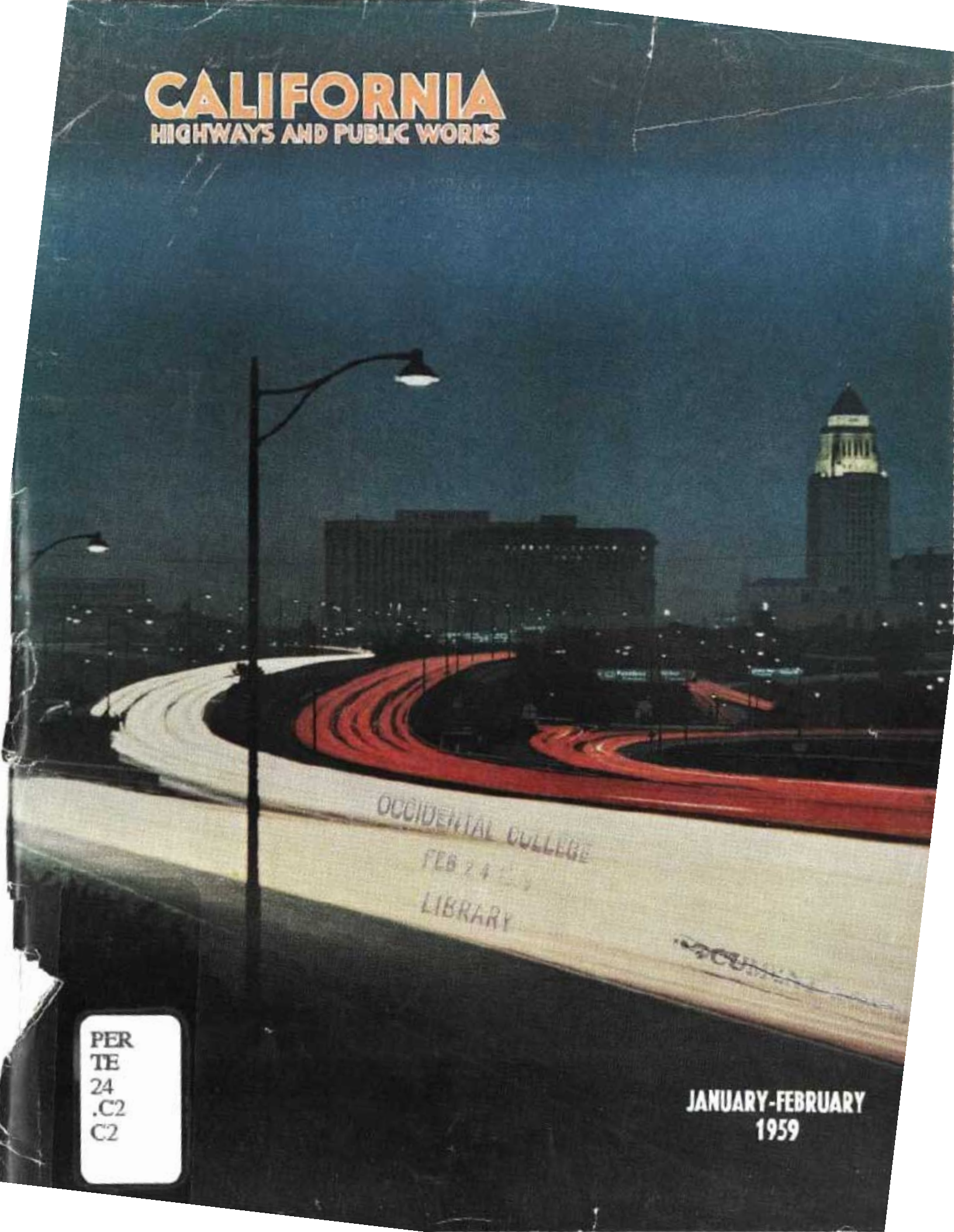
CALIFORNIA
HIGHWAYS AND PUBLIC WORKS



JANUARY-FEBRUARY
1959

California Highways and Public Works

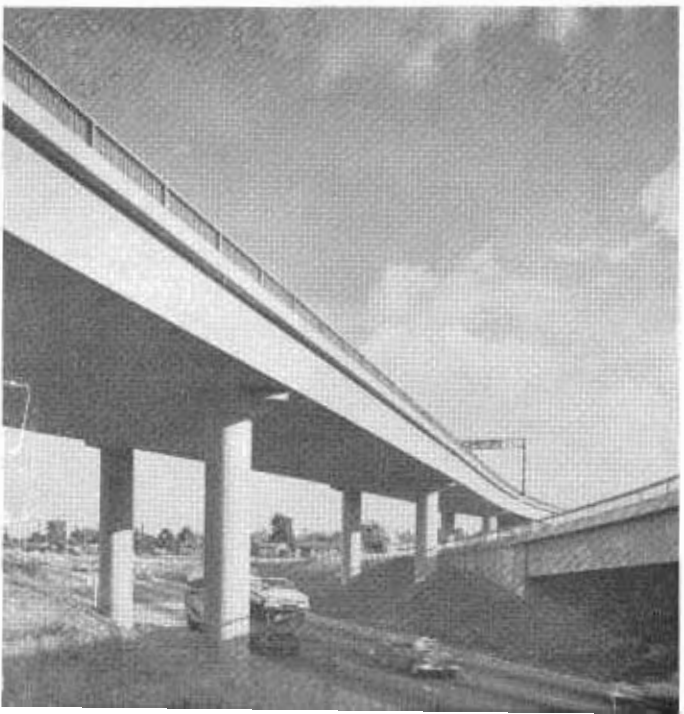
Official Journal of the Division of Highways, Department of Public Works, State of California

Vol. 38 January-February Nos. 1-2

FRONT COVER

The Civic Center in Los Angeles forms a background for this view. The white streaks were made by the headlights of autos on the Hollywood Freeway coming over the Four Level Structure and (extreme left) autos from the Pasadena and Harbor Freeways entering the Hollywood Freeway. The red streaks were made by the taillights of autos on the Hollywood Freeway going over the structure or leaving the freeway en route to the Pasadena and Harbor Freeways. (Photographer's note: Exposures were 1 minute at twilight for buildings and detail, 3 minutes after dark for vehicle and other lights.)

—Photo by Robert J. Rose



BACK COVER

Westbound traffic rolls along the Santa Ana Freeway toward downtown Los Angeles, crossing under the structure forming the northbound roadway of the Long Beach Freeway. The structure at lower right is a part of the interchange by which motorists in westbound lanes of the Santa Ana Freeway may reach the Long Beach Freeway northbound.

—Photo by Robert J. Rose

Table of Contents on Page 2

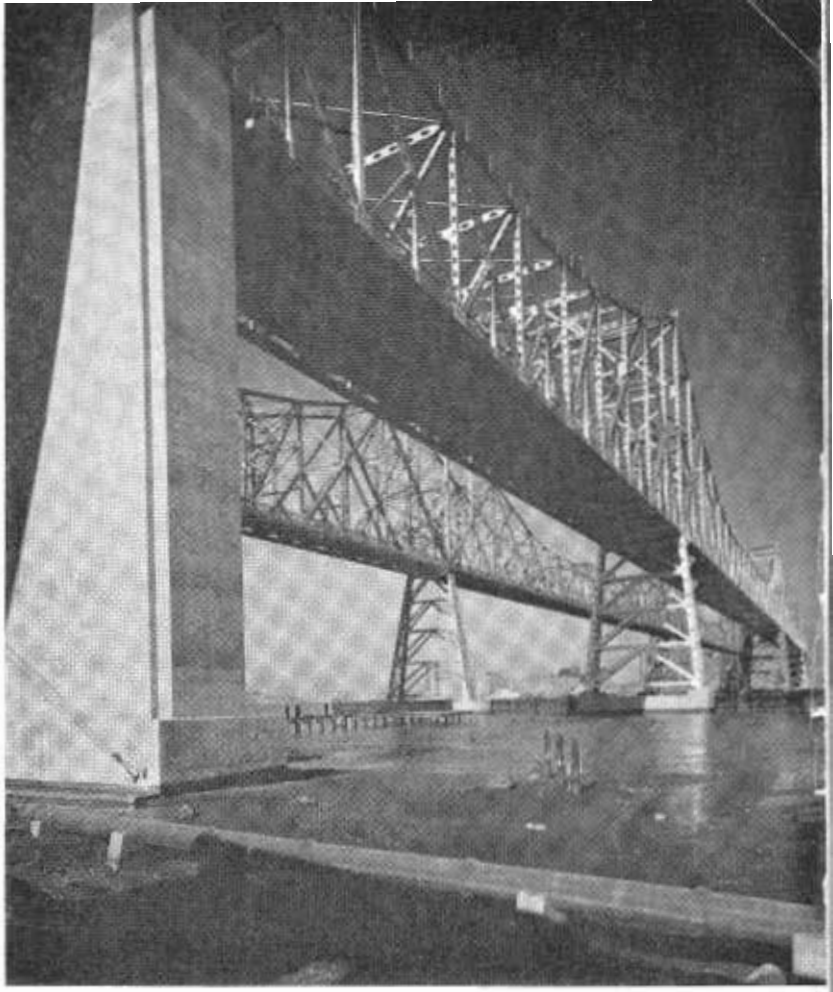
Published in the interest of highway development in California. Editors are invited to use information contained herein and to request prints of any black and white photographs.

Address communications to

CALIFORNIA HIGHWAYS AND PUBLIC WORKS
P. O. Box 1499
SACRAMENTO 7, CALIFORNIA

New Parallel Bridge

By L. C. HOLLISTER
Projects Engineer—Carquinez



The new parallel Carquinez Bridge glistens in the sunlight while her drabber sister, some 31 years her senior, stands in the background.

On November 25, 1958, the new parallel Carquinez Bridge was open to traffic, breaking one of California's most critical highway bottlenecks. It also marked the culmination of many years of effort by Senators Luther E. Gibson, George Miller, Jr., and Assemblymen Donald D. Doyle, Samuel R. Geddes and S. C. Masterson and others who sponsored the necessary legislation making this very noteworthy project possible.

Appropriate ceremonies were conducted by the Contra Costa Development Association in which then Lieutenant Governor Harold J. Powers officially cut the chain opening the bridge to traffic. Since the chain cutting ceremonies thousands of cars each day have passed through the tollgates and over the new structure. On the Sunday following Thanksgiving 45,305 vehicles used the new bridge and its modern six-lane freeway approaches.

There are several design and construction features in connection with the Carquinez Bridge and freeway approaches that have attracted a great deal of interest among highway and bridge engineers throughout the Country.

As for example the "Big Cut" involving the largest highway cut in history; the use of slip-form construction for the erection of the 120-foot-high piers for the complicated interchange and approach structure; the sinking of caissons to 132 feet below water with the difficulties and hazards encountered; the use of welded steel fabrication for the two 1,100-foot double cantilever spans; the use of high-strength bolts and a new very high-strength structural steel known as T-1. Some of these features are new developments and because they are progressive steps forward in highway construction have attracted the attention and interest of many engineers throughout the Country.

Stability Required

The "Big Cut" located immediately south of the bridge is approximately 2,500 feet long, 1,370 feet wide and nearly 300 feet deep at the deepest point. The elevation of the profile was controlled by the location of the bridge grades. To provide the degree of stability required in the type of formation encountered, the design provided for 2:1 cut slopes with a 30-foot-wide bench every 60 feet in elevation. A debris trough 40 feet wide was provided between the edge of the shoulder and the toe of the cut to allow room for maintenance to clear any sloughing that might occur without closing the traveled way. Initial construction provided three lanes in each direction and provision was made for an ultimate paved section of four lanes in each direction with a 12-foot division strip. This means that the total width of the cut from toe to toe is 204 feet and 1,370 feet from top of cut to top of cut at the widest point. At this location there were two stations that contained a million cubic yards per station. There were 8,800,000 cubic yards in the "Big Cut." The two other cuts on the three-mile project contained approximately 1,700,000 cubic yards, making a total of 10,500,-

Public Works Building
Twelfth and N Streets
Sacramento

CONTENTS

Arthur Luddy of Sacramento Appointed to Highway Commission by Governor Brown

Arthur T. Luddy, Sacramento insurance executive and civic leader, was appointed a member of the California Highway Commission in late January.

Governor Edmund G. Brown announced the appointment, which is for a four-year term.

Luddy is secretary of the California-Western States Life Insurance Company and has been a member of the Sacramento City Planning Commission.

He has also been prominent in Sacramento civic affairs.

A Democrat, Luddy was a member of Governor Brown's finance committee during the last campaign.

Luddy succeeded John O. Bronson of Sacramento, whose term on the commission expired January 15.

000 cubic yards of roadway excavation for which the contractor bid 25.6 cents. The average haul for the total project was slightly over 4,000 feet, giving a quantity of 455,000,000 station yards of overhaul for which the contractor bid 2 mills per station yard. Overhaul was measured along the centerline with no consideration for side haul. These two items combined gave the contractor a total of approximately 35 cents per cubic yard for excavation and haul. No additional payment was made for placing and compacting.

Earthquake Problem

In general the Foundation Investigation Report of the "Big Cut" showed the area to be one of high seismicity and cut by two major faults, both of which are rated as active. These are known as the Franklin Thrust and Mare Island Fault. The earthquake record of the region since 1854 shows four shocks of high intensity and 58 of lesser intensity; also that the cut section would traverse interbedded shales and sandstones of varying thickness and altitude. The sediments range from hard sandstone to friable sand, from firm silty shale to soft clay shale, and will show interbeds and cross bedding from microscopic to visual. When originally deposited the sediments were uniform and competent; but due to intensive folding and faulting, deformation and weakening of the units have taken place.

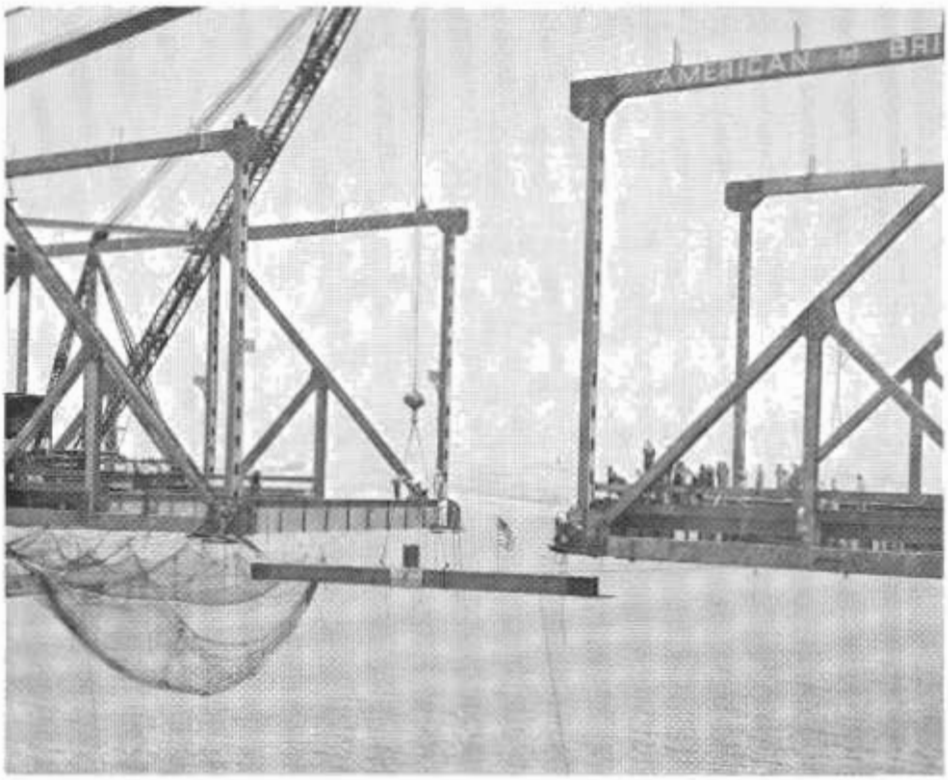
The contractors, Ferry & Crow of Los Angeles, elected to use tractors coupled with scrapers hooked in tandem to move the majority of the dirt. This was possible because of the favorable –0.5 percent grade on the long haul. The average haul from the "Big Cut" was about 8,000 feet. Each unit was capable of making about four round trips an hour, moving an average of 37 pay yards per trip. The contractor's schedule called for moving an average of 25,000 cubic yards per day; his actual average for the entire project was approximately 26,000 cubic yards per 14-hour working day. The standard equipment for push loading and ripping was a tractor equipped with ripper teeth. The use of this equipment eliminated all blasting in the "Big Cut"

with the exception of minor cracking of huge boulders. Many nests of these boulders averaging 8 to 10 feet in diameter were encountered at different elevations throughout the cut. These were pushed into piles, drilled and broken with powder to a small enough size that they could be loaded. They were then hauled to and incorporated in the fills.

Rains Cause Slide

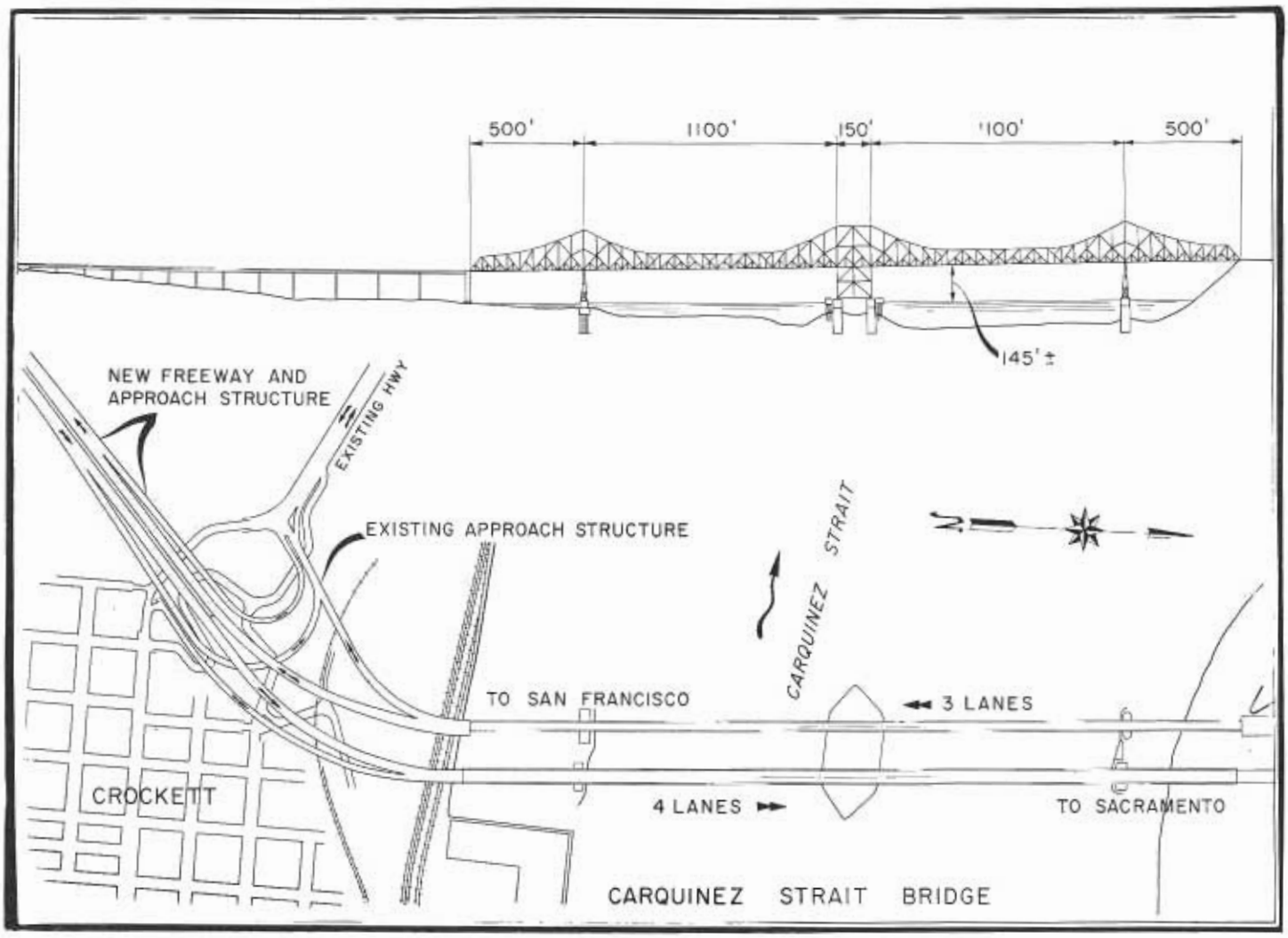
The "Big Cut" was nearly 10 percent complete prior to the heavy rains in the winter of 1957-1958. Considering the fact these were the heaviest recorded rains in 80 years, the slopes stood up remarkably well. Only one slide occurred, amounting to approximately 100,000 cubic yards. This took place at the top bench elevation and was approximately 60 feet deep. Unfortunately, it occurred in the only developed area bordering the cut and resulted in the removal of four homes. The remainder of the cut showed little signs of distress with only minor surface sloughing occurring.

The Crockett Interchange serves as a connecting viaduct between the



Starting the final closure between the two cantilever arms with the American Flag flying in the traditional custom of bridge builders throughout the Country. To make the final closure at this point six 500-ton jacks were used to jockey the suspended span into position so that bolting the final joints would be possible.

Lieutenant Governor Harold J. Powers is about to cut the chain starting the flow of 30,000 vehicles per day across the new Carquinez Bridge and its freeway approaches. Left to right are Assemblyman S. C. Masterson, Supervisor Mel Nielson, H. W. Saunders, Jo Ellen Fisher (Miss Contra Costa County), Senator George Miller, Jr., Lieutenant Governor Powers, Senator Luther E. Gibson, Wanda Kealty (Miss Solano County), Assemblymen Donald D. Doyle and Samuel R. Geddes.



General plan of the Carquinez Bridge showing principal dimensions. The old structure will carry three lanes of southbound traffic and the new bridge will carry four lanes of northbound traffic.

"Big Cut" and the south end of the main bridge. It also acts as an interchange structure providing on and off ramps for the town of Crockett.

This interchange structure is of conventional steel girder design, varying in span lengths from 120 feet to 205 feet. Girders are supported on 47 reinforced concrete piers. These piers vary in plan from 6-foot by 22-foot solid shaft to 20-foot by 76-foot boxed section shaft and in height from 20 feet to 123.5 feet, with the average height about 70 feet.

New Slip-Form Method

The piers were all designed without batter or offset so that slip-form construction could be used by the contractor if desired.

The contractor, Peter Kiewit Son's Company, investigated this method of construction for the piers and decided to proceed with slip-forms.

Slip-forms have been used before in the United States but they have been of the manually operated screw jack type. These have been cumbersome to keep level and troublesome to keep moving at a constant rate at all points.

The development of an automatic controller for operating the hydraulic ratchet jacks has greatly simplified this procedure.

These hydraulic ratchet jacks are supported about seven-foot centers by one-inch diameter high-strength steel rods. Each rod has a three-foot section of metal sleeve which protects the rod from bonding with the green concrete making it possible to salvage them after the last pour on the pier has been made.

At the start of each pier after forms have been carefully set on pier footings, the four-foot-deep forms are filled in layers of about eight inches. As soon as concrete in bottom has set sufficiently, which may be in about three hours, the jacking operations are started. Once the jacking operations are under way the forms are slipped up at the rate of 5 to 14 inches per hour with the average being about 10 inches per hour. Rate of slipping is dependent on rate of curing which changes with the ambient temperature and wind velocity. An experienced operator determines the pace at which forms are slipped by pushing a thin steel rod down into the concrete.

Forms Tapered

The forms are constructed so that the outside form of the wall is vertical,

Picture showing the "Big Cut" completed with the Carquinez Bridge in the background. To the right can be seen the 30-foot benches spaced every 60 feet in elevation going up the side of the cut. Slope of cut between benches is 2:1; that is one foot up for every two feet horizontal.

while the inside form is battered about three-eighths inch in the four feet. This makes the form three-sixteenths narrower at top and three-sixteenths larger at bottom than the nominal thickness of wall.

Comparative costs between slip forms and conventional forms are not available; however, on a job with a reasonable number of piers 40 feet and over in height there appears to be an excellent opportunity for economy. Other advantages are safety and speed of operation. Therefore, where time is of importance there is considerable advantage. Their simplicity and safety also appear to give them an advantage over the conventional methods on high piers.

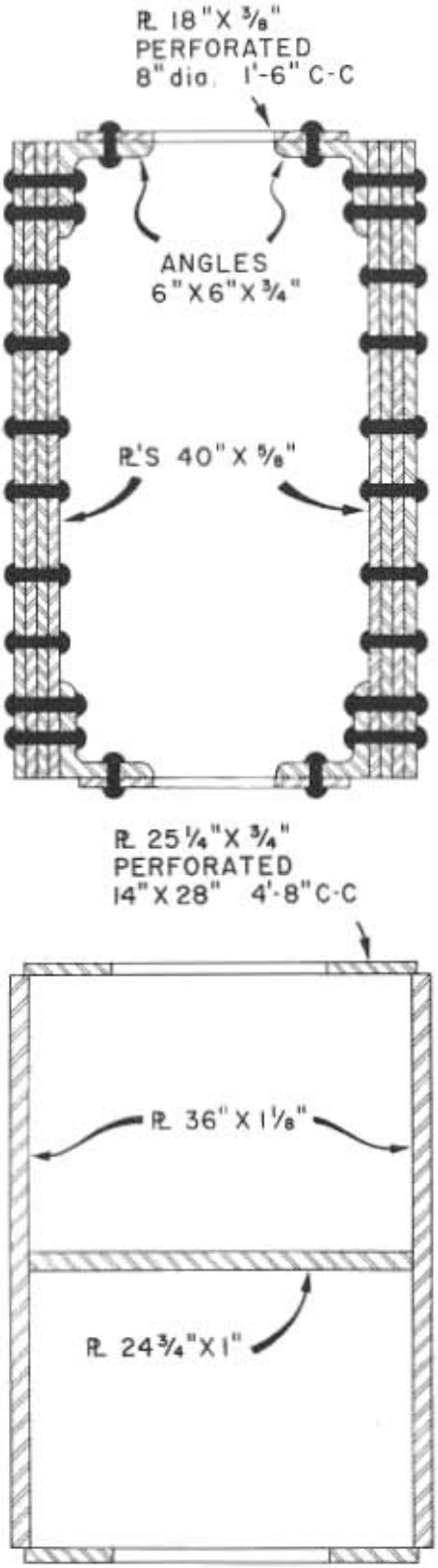
The Crockett approach structure involved the welding of over 8,500,000 pounds of structural steel for the girder spans. These spans ranged in length from 120 feet to 205 feet. The larger spans were made up of 144- by ¾-inch web plates with 24-inch flange plates top and bottom. The flange plates varied in thickness from 2½ inches at the center to one inch at the ends. Field splices were made by welding the heavy flanges and bolting the web plates with high-strength bolts.

The substructure for the main bridge consisted of four deepwater piers and two anchor piers or abutments. Three of the deepwater piers were of the caisson type lowered to bedrock 132 feet below the water surface. The other deepwater pier was of the conventional steel sheet pile cofferdam type founded on 260 heavy steel bearing piles.

Construction Hazards

Caisson pier construction is certainly not new but it is a type, nevertheless, which is not frequently used and requires special construction skills involving risks of the most hazardous type.

The Contractor Mason & Hanger, Silas Mason, Inc. & F. S. Rolandi, Jr., Inc., sunk the caissons by means of



Sketch showing comparison between the same member of the new and old structure giving a visual picture of the advantages of the new welded T-1 steel design over the old riveted silicon steel design.

UPPER—The old (A-94 steel, 840 pounds per foot) was made up of 14 component parts stitched together with over 1,000 rivets. It is 40 inches deep and required large pin connections at each end to overcome large secondary stresses.

LOWER—The new (T-1 steel, 470 pounds per foot) is made up of five plates fastened together by 340 feet of 5/16-inch fillet welds. It is only 36 inches deep and avoided the use of expensive pin connections at the ends to overcome secondary stresses. The new weighs almost half as much as the old, making transportation and erection much simpler.

jets, air lift pumps and clamshell dredging.

There were 18 dredging wells all of which were sealed at the bottom with arched laminated timbers. Through each of the timber "false bottoms" a 30-inch-diameter capped steel pipe was placed through which could be lowered a 6-inch-diameter jet pipe and a 10-inch-diameter air lift pump.

After predredging in the area of the piers to about elevation −100.00, there remained approximately 35 feet of overburden through which each pier was lowered. This overburden consisted mostly of fine sand and gravel and was removed for the most part by use of the jets and air lift pumps.

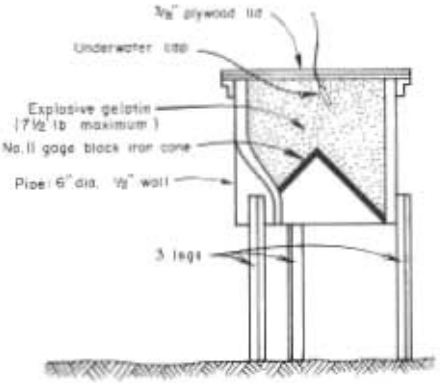
The jets and pumps were operated from the four center cells only; however, all the cells were equipped with the 30-inch capped pipes through which the jets and air lift pumps could be lowered if necessary. The jets loosened and churned up the sand and gravel permitting it to be pumped out by the 10-inch air lift pumps.

The jets were raised or lowered vertically by a work derrick. Rotation of jets was controlled by levers operated manually and movement of the nozzle was controlled manually by cables.

Shale Encountered

The bedrock at the bottom consisted of upturned layers of shale and sandstone with considerable variation in hardness. Pier No. 2 was located close to the north bank which forms a steep cliff with the layers of shale and sandstone exposed on the side wall of the cliff.

The nearness of this pier to the steep slope of the bedrock rising up to form the cliff provided very strong evidence that the plane of the bedrock



Sketch showing shaped charges used to remove bedrock at bottom of Pier 2 caisson. The charges were placed by divers at the bottom of caisson 132 feet below water.

on which Pier No. 2 was to rest would in all probabilities not be level.

The caisson did reach bedrock on the cliff side about three feet higher than bedrock on the opposite side. The specifications required that the pier must not be out of plumb more than 1 in 100. It was therefore necessary that the high side of the caisson cutting edge be lowered through the bedrock about three feet.

The contractor chose to use blasting methods to break away the rock under the north cutting edge. Because of the depth of water about 45 minutes was the maximum time for a diver to stay at the bottom. For this reason, the contractor discarded the idea of drilling and blasting in favor of shaped charges. The shaped charges could all be placed during one trip of the diver.

The contractor was aware that one of the big problems in connection with underwater blasting was to design the charge of sufficient size to fracture the rock without causing any damage to the caisson walls or steel facing for the cutting edges.

Scant Information

The contractor found that there was very little published information on the forces exerted by blasting within a closed caisson at various distances away from the charge.

The caisson was designed for rather heavy forces directed from the outside toward the inside, but was not heavily reinforced for forces and impacts directed from the inside out.

The contractor prepared a table showing the maximum safe charge plotted against the distance from the caisson walls. This table was prepared from information secured in the book "The Effects of Atomic Weapons" prepared by the Los Alamos Scientific Laboratory. Another book with information on blasting is "The Science of High Explosives" by Melvin A. Cook, director of the Explosives Research Group at the University of Utah, and published by Reinhold Publishing Corp.

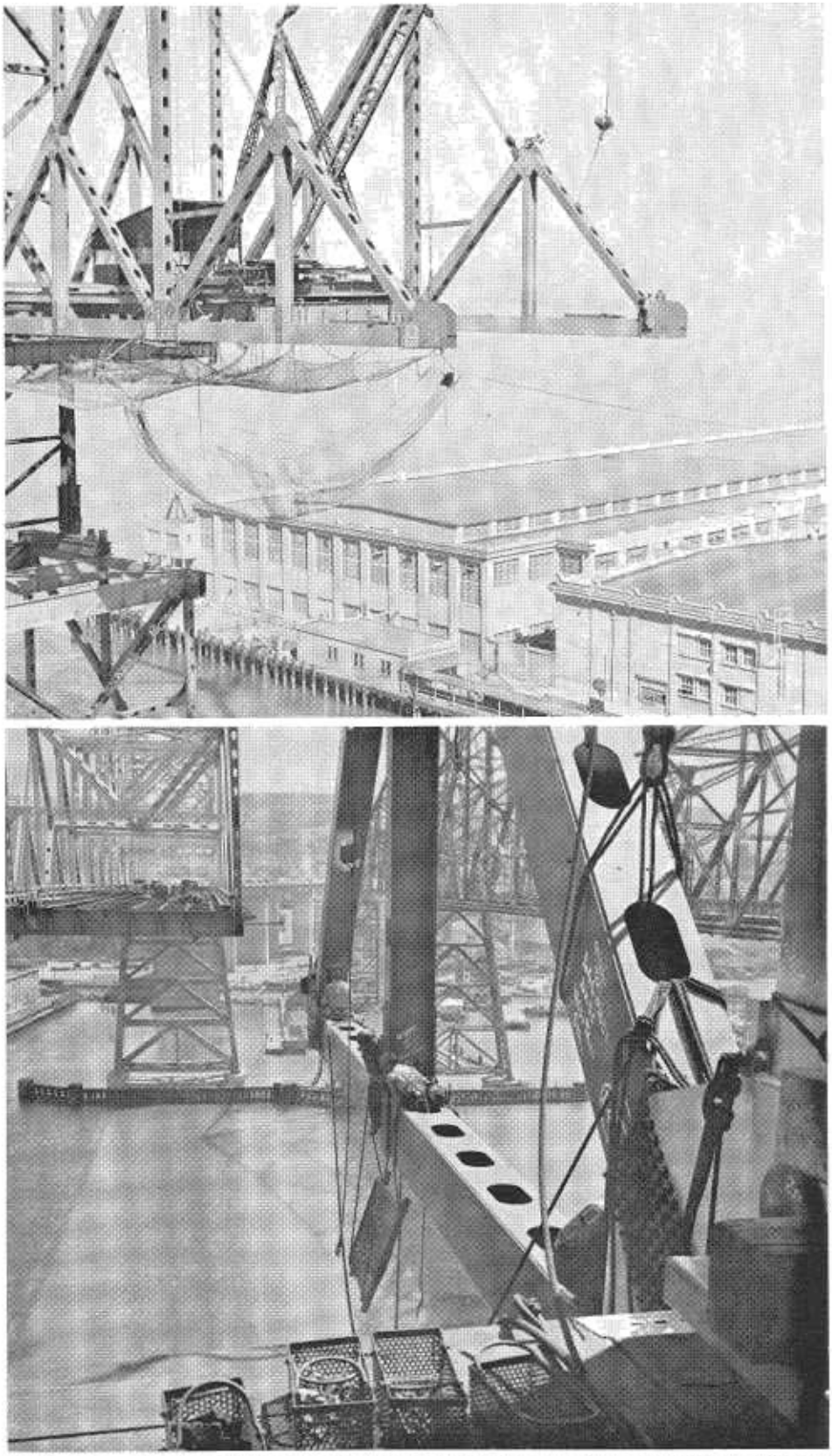
On the basis of the available literature and discussions with various people in the high-explosive field it appears that the science of underwater explosives has not yet been advanced to the point where accurate predictions as to forces exerted can be made.

We know that there is a certain amount of energy released with any particular blast, which can be determined with reasonable accuracy. The energy released is absorbed by: (1) breaking up the foundation bedrock, which is the sole purpose of the blast; (2) by raising the temperature of the water and rock, (3) by raising the elevation of the water surface and (4) by distorting or rupturing the caisson walls. The ideal condition would therefore be to have nearly all the energy of each blast absorbed by breaking up or shattering the foundation bedrock, with little or none remaining for distortion or damage to the walls.

Drill Blasting Safer

This therefore points out the advantage and safety of using drilled hole blasting methods as opposed to shaped charges. The drilled-hole method can be counted on to absorb most of the energy released by shattering the bedrock foundations. The shaped charges on the other hand will release a much greater part of their energies for distortion or even rupture of the caisson walls.

The Carquinez Strait bridge caissons were 102'-6" long by 53'-0" wide and divided into six cells lengthwise and three cells crosswise. The 102'-6" north side of the caisson was lowered through about three feet of bedrock to make it level with the south side. The shaped charges used were



UPPER—For erection of the south anchor arm, steel was brought to the site by water from the Richmond assembly yard on barges. It was lifted into place by a 146-ton tower derrick mounted on two barges and assisted by stiff leg skid travelers. Most of the steel members were erected by cantilevering out; however, near each of the end towers eight panels of the suspended span were temporarily used as falsework, a portion of which can be seen in the lower left hand corner of the picture. LOWER—The bridge grows piece by piece to join with the other half of the cantilever span 145 feet above the waters below.

This photo of the southern end of the twin bridges gives some idea of the broad sweep of line incorporated into the design of the main and approach ramps.

spaced about seven feet centers along the wall and back from the wall about four feet.

The shaped charges consisted of about six to seven pounds of explosive gelatin. The explosive charge is shaped by a sheet metal cone placed in the bottom of a six-inch steel pipe. The explosive wave of the shaped charge forms a direct jet that concentrates its force on the rock below. Short legs hold the entire assembly up about six inches from the rock for better effect.

The average crater made by each blast was approximately four feet in diameter by about two feet deep, probably approaching a half sphere in shape, and containing approximately one-half cubic yard of material. It is estimated that about 10 pounds of explosives were used for each cubic yard of material removed and there were about 40 cubic yards removed in all. This large amount of explosives is evidence that only 10 to 15 percent of the available energy went into breaking up the rock.

One of the heavy box section compression members being welded by the submerged arc process at one of the American Bridge fabricating plants.

Some Damage Caused

The maximum charge for any one blast was six 7½-pound charges located along the north wall of the caisson. A total of 10 charges placed at various locations along the wall and in various sizes from 1½ pounds per shaped charge to 7½ pounds.

In spite of the precautions used subsequent inspection disclosed that considerable damage had been done. Divers were sent down where they found some large cracks at the junction of the interior 2'-6" walls with the outside 3'-0" walls. There was also evidence that the steel plate cutting edge which encased the bottom 13 feet of the walls was ruptured at one point.

The evidence of rupture was so strong in the six northerly cells that repairs and strengthening were necessary to remove any doubt of structural stability. The bottom 25 feet of the caisson cells were to be filled with tremie concrete in accordance with the original plans. This portion of the caisson was considered satisfactory after placing of this bottom seal. To repair the six northerly cells from the top of the concrete seal upward, it was decided to fill them with concrete to a height where there was little or no damage. The two corner cells were filled to elevation 35 feet below sea level which is 76.5 feet above the seal, and the four center wells along the north edge to elevation 60 feet below sea level which is 46.5 feet above the seal course. This required a total of 2,350 cubic yards of class A concrete to be added to this caisson.

The other two caissons were lowered into position without any of the difficulties encountered at Pier No. 2.

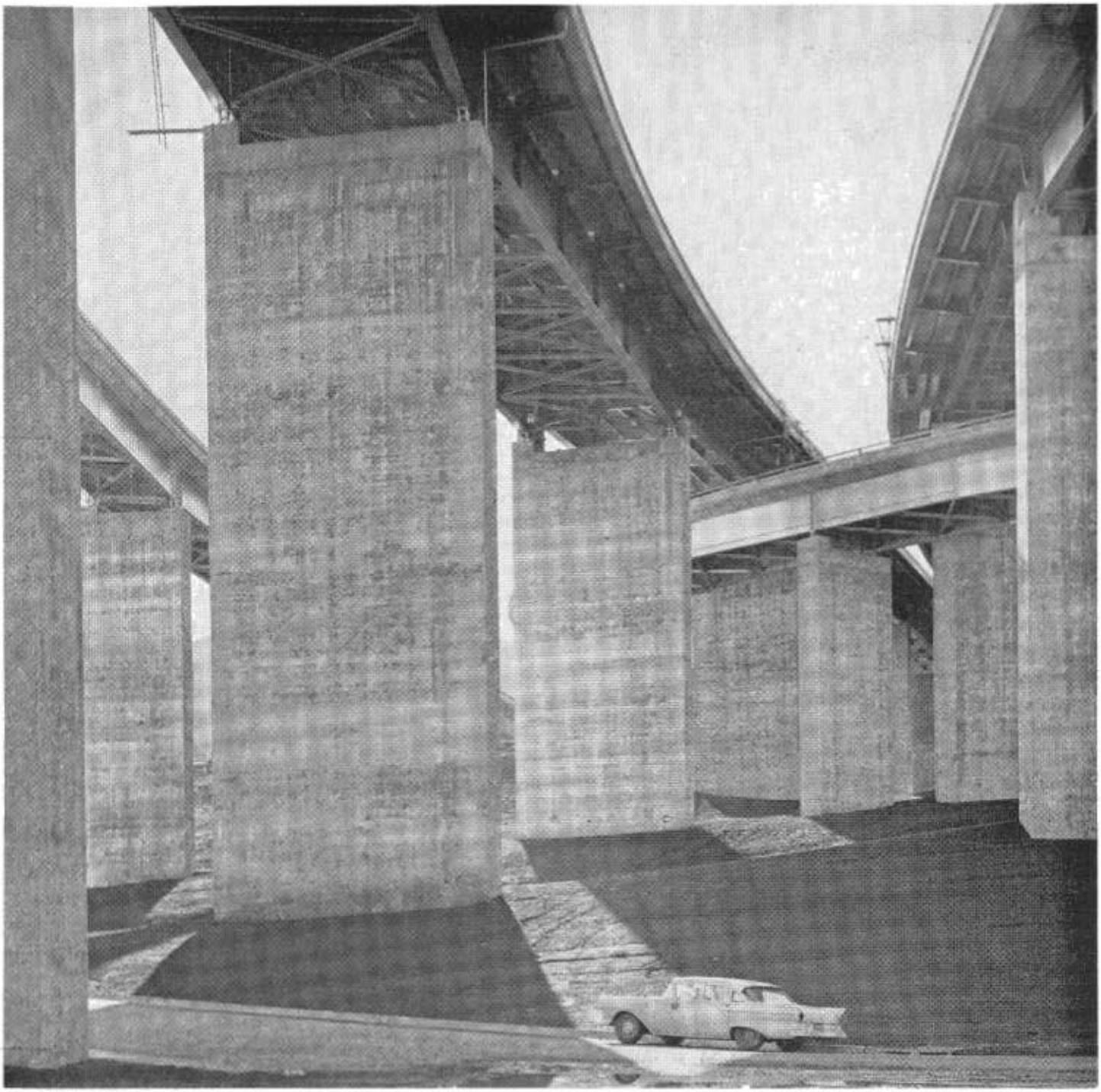
All of this points to the fact that bridge construction of the size of the Carquinez Bridge, particularly the deepwater foundations, is not accomplished without facing many problems and many hazards.

Welding Causes Interest

The design and fabrication of the two 1,100-foot cantilever spans by the use of welding rather than the conventional riveting method have attracted much interest among bridge engineers throughout the Country.

Welded fabrication of girders and beams has become a fairly well accepted practice in many states in the past few years. California, for instance, has completed over 240 all-welded steel bridge structures and has many more either under construction or ready to go to contract. These steel structures have involved the use of over 110,000 tons of welded steel fabrication. These structures have proven themselves to be completely satisfactory from a structural standpoint, they have shown considerable economy in the amount of structural steel required, their smooth surfaces have made maintenance much easier, and their smooth, clean lines have added much to the sharp, trim appearance of these bridge structures.

Because of this very favorable experience with the welded girder type of structure it was only natural that consideration be given to extending

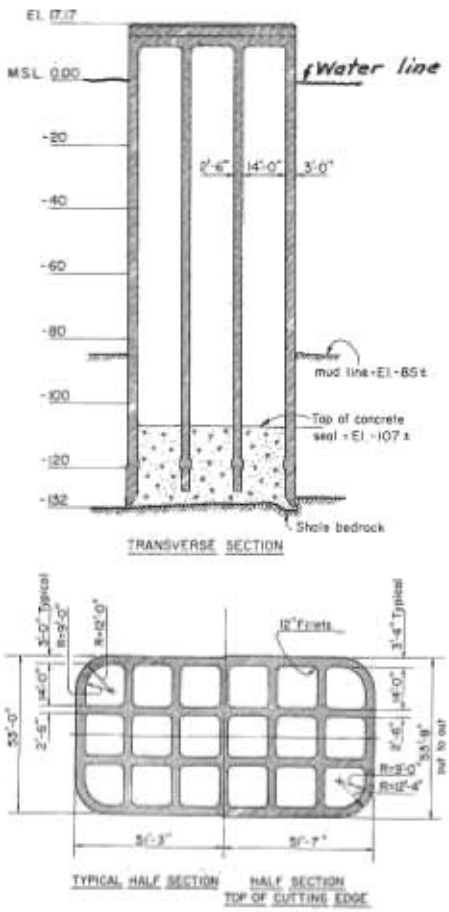


The interchange structure as seen from the streets of Crockett. Each of these pier shafts took only one week to construct. Slip-forms and modern bridge construction techniques made this speed possible.

the use of welding to the truss type of structure and thus gain these same advantages in this area of bridge construction.

Pros and Cons Weighed

There were, of course, arguments both favorable and unfavorable to such a move. In addition to the points already mentioned in favor of this move were these facts. Steel fabricating shops, over the past few years, have been continually improving their quality and efficiency in connection with their welded fabrication; our testing laboratory has done much in the past few years to standardize testing and shop inspection procedures; and one of the most important points in favor of welded fabrication for heavy bridge construction such as the Carquinez Bridge was the fact that it made possible the use of a very high-strength T-1 steel. The use of T-1 steel in itself accounted for a savings of over 4,200,000 pounds of structural steel and dead load to be carried on the bridge.



Sketch showing elevation and section of one of the three caissons. The use of explosives was necessary at Pier 2 caisson. Shaped charges were used along the north edge to remove bedrock and make this side of the caisson level with the opposite side, as seen in sketch.

On the unfavorable side were these arguments:

(1) This change from riveted to welded construction was a very definite break with past precedent, since trusses of this type and size of bridge structure had never before been fabricated by welding in this Country.

(2) There was no well established engineering precedence for member makeup or standardization of details as has been worked out for riveted fabrication over the past 50 years.

(3) Some welded structures in the past have failed including ships, tanks, and bridges.

Regarding (1) there is no question but that this was a strong break with past precedent. But the outstanding advancements made in the past 10 years in the knowledge and techniques of welding made this step now appear not only timely but also a very progressive step forward in bridge construction.

As to point (2) regarding engineering precedent for member makeup this point was discussed with the leading fabricators of the Country and practical details were worked out to the satisfaction of both the engineer and the fabricator.

Close Check Necessary

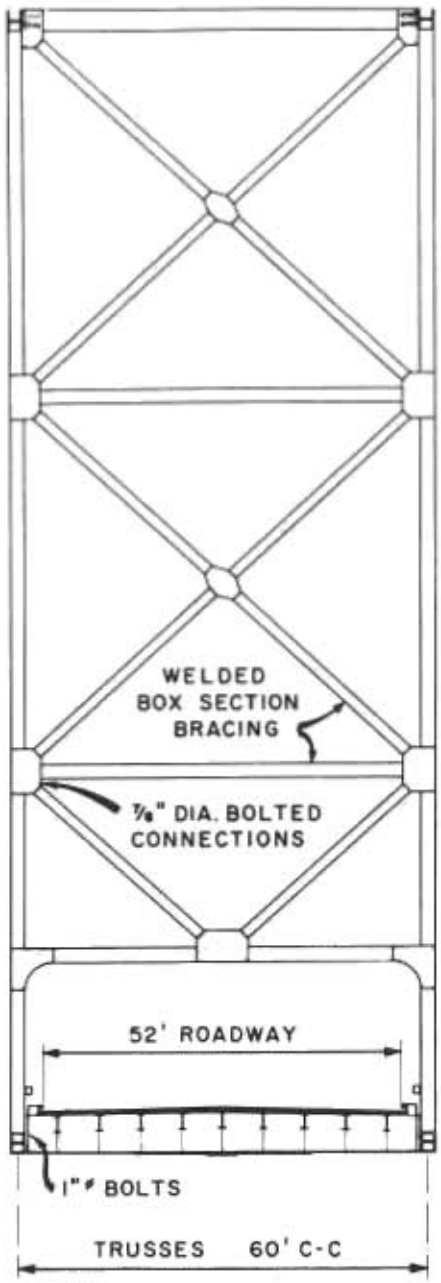
Point (3) was definitely a strong argument but there is no question that welding engineers and metallurgists throughout the Country have made such exhaustive studies sparked by the failure of a few welded ships that they now know how to overcome these past difficulties. The chemistry, particularly the carbon content of the steels to be used, would be closely checked and controlled. Truss members would be relatively small in cross section compared to ships and tanks. Members would be straight, simple in design and free from any geometric notches. Further, fatigue, rates of application of load, and operating temperatures would be very favorable. This last point in regard to operating temperatures is quite important. The lowest recorded temperature at the Carquinez Bridge site is +19 degrees Fahrenheit. This is well above the temperature at which any of the steel used on this job show any tendency toward brittleness.

These facts gave reasonable assurance that welded fabrication of truss members would be structurally reliable and therefore constitute a progressive step forward in bridge construction.

While the welded design and fabrication along with the types of steel used proved very satisfactory in every respect, the job was not completed without learning some lessons.

Damaged Plates Studied

During the latter part of April, the erection crews, due to a cable sling failure, dropped one of the heavy tension diagonals into Carquinez Strait. The member landed with the gusset plate end down, penetrating into the mud, sand and gravel for several feet. Upon recovery of the member from the bay, the gusset plates were found to be sufficiently bent to require replacement. It was decided



Sketch showing typical section of the new structure at one of the 168-foot towers. Floor beams are 66" x ½" web welded to 16" and 18" flanges. The concrete slab is 6¾" thick. Lightweight concrete was used on cantilever arms and suspended span, regular concrete on the two anchor spans.

that both the butt welds and fillet welds should be checked since the member had been subjected to severe impact. The butt welds were in perfect condition but inspection of the fillet welds revealed an occasional very fine transverse crack in the fillet weld metal.

These fine cracks were at first thought to be very minor surface cracks but further investigation re-

vealed that some of them extended through the full section of weld. Further it was determined that the cracks had occurred before the shop coat of vinyl wash had been applied.

This eliminated the possibility that the cracks had occurred during shipping or handling. And it strongly indicated that something had gone wrong with the welding procedure during at least a part of the fabrication.

Immediately the contractor started checking for flaws in the fillet welds of other members. As a final result of this check, a total of 56 H section tension members were repaired. None of the compression box section members were found with any faulty fillet welds.

All Crack Traces Removed

Repairs consisted of removing fillet welds flush to the plate surfaces with a slight trace of the fillet toe remaining to aid the repair welders in making the right size weld. If any cracks remained it was necessary to penetrate the depth of the weld fusion zone to remove all crack traces.

The fillets were removed with an Arcair gouging tool, and were made in intermittent lengths of five feet in the interior portion of beam and about 1½ feet near the beam ends.

In all there were 56 members that required repairs out of a total of more than 1,100 truss members which represented about 3 percent of the total fabrication for the job. This has led to an investigation by both the State Division of Highways Materials and Research Laboratory and the research department of the American Bridge Division to determine the cause.

These studies have not yet been completed. Possible sources of trouble which are being investigated are: (1) hydrogen entering the weld through moisture in the flux or from free moisture in the joint; (2) surging of the amperage or voltage. Neither of these factors so far has been isolated as the single source of the difficulties; (3) there is some evidence produced from other fields of fabrication that the difficulty may stem from the critical nature of the chemical and physical characteristics of the welding wire and flux. This factor or any combination of these three general factors could have been the source of the difficulties, but the crack-producing combination has not yet been singled out by these investigations. In any case all of this points to a re-emphasis of the fact that fabrication by welding of structural members from either T-1 or A242 steel is much more critical than for members of structural carbon steel such as A7 and A373.

In any event our laboratory is completely confident that such deviations from the required rigid controls can and will be detected on future jobs of this nature and corrections made on the spot.

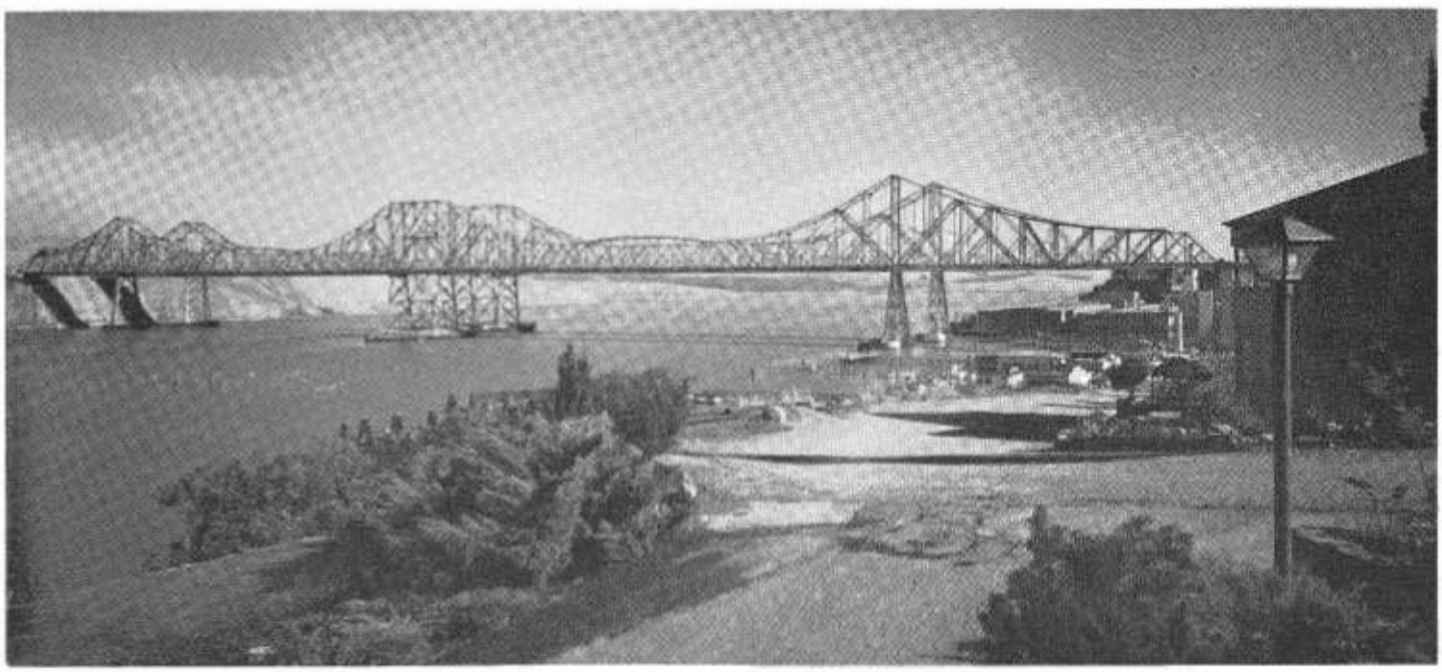
Due to the complete co-operation of the American Bridge Division of United States Steel Corporation, repairs were made to the complete satisfaction of the engineers and the job completed one month ahead of schedule.

New T-1 Steel Used

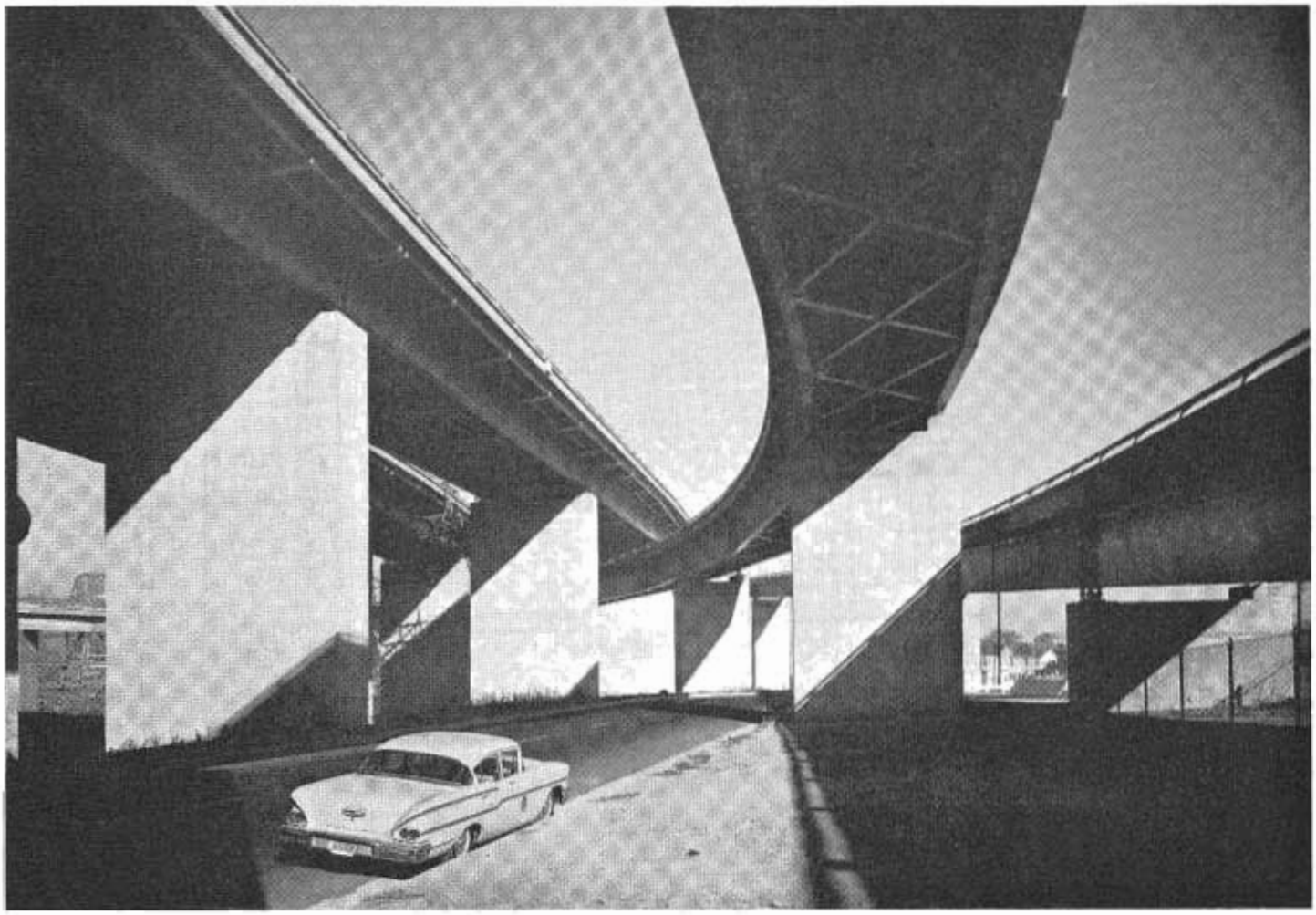
Early preliminary designs using A7-A373 and A242 steel and limiting plate thickness to 2½" indicated that the required depth for the heavily stressed members would be 40 inches. This depth of member produced rather high secondary stresses.

A steel with a higher allowable working stress was therefore considered because it would facilitate a reduction in member depth and at the same time keep plate thicknesses for most members to 2½ inches without multiple side plates.

The new quenched-and-tempered T-1 steel was therefore considered. With the minimum yield strength of T-1 steel at 90,000 psi, a conservative



This view eastward shows the similarity of the outlines of the twin Carquinez Bridges, constructed 31 years apart. The old bridge is nearer the camera.



An interesting camera study of the southern approach ramps to the twin bridges taken from one of the city streets in Crockett.

working stress of 45,000 psi in tension and comparable working stresses in compression were used in trial designs. The resulting trial member makeup for the heavily stressed members indicated they could be kept to a 36-inch depth which resulted in reducing secondary stresses considerably. In addition there was a large reduction in tonnage of steel required which amounted to 4,255,000 pounds of steel.

As a further example of the savings in steel made the weight per foot for L16L18 was reduced from 864 ppf to 492 ppf when changed from A242 steel to T-1 steel.

It was therefore decided that T-1 steel had sufficient potential qualities to make worthwhile a thorough investigation of its use for welded truss members. Our testing laboratory therefore ran extensive tests on the welding and physical qualities from 3,000 pounds of T-1 steel plates.

Several Methods Tried

From these plates, numerous specimens of butt-weld joints were made and tested from ½-, 1- and 1½-inch plates. The welds were prepared using semiautomatic shielded arc, automatic submerged arc, and three types of manual low-hydrogen processes. The conclusions of the report on these tests were that T-1 steel could be satisfactorily welded into truss members but that narrow tolerances in the operating procedure were necessary. The full report outlined the precautions that must be taken.

The allowable working stresses used for A7, A373 and A242 were the same as those used in the A.A.S.H.O. Bridge Specifications. For T-1 steel members the allowable working stress for tension members was 45,000 psi and for compression $36{,}000 - 1.75\ (L/4)^2$. The A.A.S.H.O. Bridge Committee is now considering the inclusion of working stresses for T-1 steel in the bridge specifications.

All bracing and truss joints were fastened by use of high strength steel bolts. Bracing bolts were ⅞ inch and truss joint bolts were 1 inch and 1¼ inches.

Bolts were furnished and installed in accordance with the "Specifications for Assembly of Structural Joints Using High Strength Steel Bolts" approved February 27, 1954, by Research Council of Riveted and Bolted Structural Joints of the Engineering Foundation. The specifications called for field joints to be bolted and gave the contractor the option of riveted or bolted shop joints. The American

. . . Continued on page 63

ROBERT B. BRADFORD

JAMES F. WRIGHT

FRANK A. CHAMBERS

New Officials

Director, Deputy Director, C. H. C. Secretary Appointed

Robert B. Bradford, public administrator for a quarter century and public works official for much of that time, is the new Director of the State Department of Public Works and Chairman of the California Highway Commission.

Governor Edmund G. Brown appointed Bradford effective January 5th, when the Brown Administration took office. Bradford will also serve as a member of the California Toll Bridge Authority, the State Public Works Board, State Allocation Board, and other state boards and commissions.

Governor Brown made two other appointments to the Department of Public Works.

James F. Wright, Assistant Superintendent for Administration and Fiscal Management in the New York State Department of Public Works, was appointed Deputy Director of the California State Department of Public Works.

Frank A. Chambers, a Federal Government official from 1940 until early last year when he became Northern California manager for Attorney General Brown's gubernatorial campaign, was appointed Secretary of the California Highway Commission.

Bradford succeeded T. F. Bagshaw as director. Bagshaw resumed his former position as assistant director of the department, in which he had served from January, 1957, until last November, when he became director. John H. Stanford, who was assistant director while Bagshaw was director, resumed his former position as management analyst for the department.

Bradford resigned as executive director of the Redevelopment Agency of the City of Sacramento to take his new post. He had been in the redevelopment position for a year.

From 1951 through 1957, Bradford was regional director of the General Services Administration of the Federal Government, with offices in San Francisco. Much of the U. S. Government's public works program in Arizona, California, Nevada and Hawaii was his responsibility in this assignment.

When Bradford first came to California in 1947, he served as zone administrator for eight western states for the War Assets Administration and dealt with the disposal of World War II surplus property—war plants and other real estate as well as surplus materials and equipment.

Bradford was an executive in federal agencies in Washington, D. C., for 13 years before he moved West. He was with the War Production Board during World War II and the Surplus Property Administration for two years thereafter.

Bradford was born in Indiana in 1909. He graduated from Grinnell College in Iowa in 1931, and began his career with public relations work on the college staff. He and his wife have three children: Mary, 14, who attends California Junior High School in Sacramento; Bill, 18, a Stanford University freshman, and Jane, wife of Tom Wilson of Cupertino, and one granddaughter.

Wright became Assistant Superintendent of the New York State Department of Public Works in May, 1957, and served until he took the California appointment. Previously, he was for three years Assistant Director for Personnel and Training Requirements in the Office of Analysis and Review of the Navy Department.

. . . Continued on page 61

CHC Tour

Commissioners, City Officials, See Highway Projects in S. F. Area

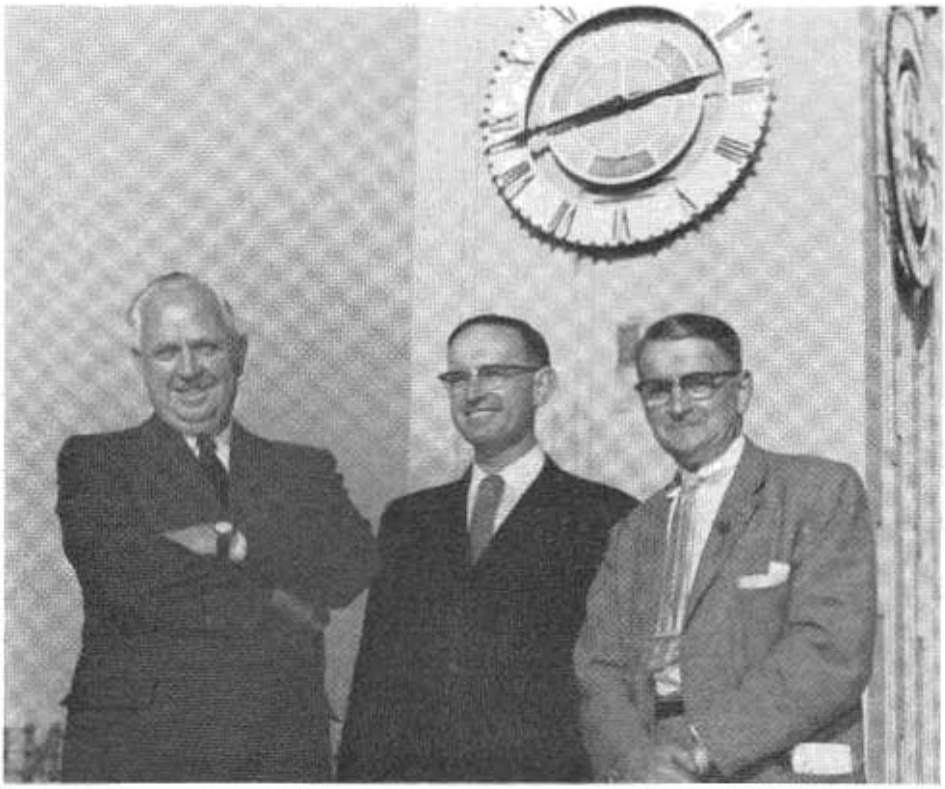
Members of the California Highway Commission familiarized themselves with highway jobs and problems in San Francisco during their regular November meeting.

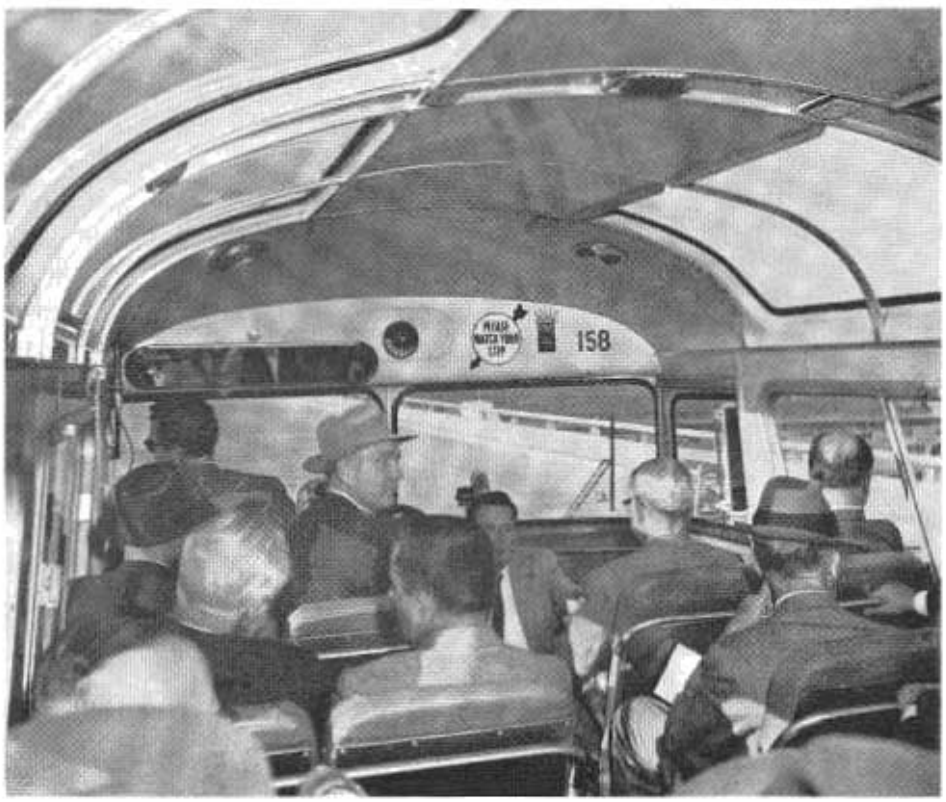
The meeting was held in San Francisco. After the paperwork was concluded on the second day of the two-day session, the commissioners went on a two-hour bus trip about the city.

The commissioners arranged the inspection in order to gain firsthand information about freeway work under way and planned.

Officials of the City and County of San Francisco met and toured with the commissioners and explained the city's viewpoint on state highway matters.

Engineers of the Division of Highways conducted the tour for the members of the commission.





UPPER—T. F. Bagshaw, then State Director of Public Works, Chairman Oscar Fisher of the Highway and Bridge Committee of the San Francisco Chamber of Commerce, and State Assemblyman Ed Gaffney (left to right) pause on the Embarcadero Freeway near the Ferry Building. LOWER RIGHT—The commissioners, state engineers, and San Franciscans were taken to the various construction projects by bus. LOWER LEFT—Highway Commissioner Robert Bishop (right) discusses highway matters with Harold Starr, Civic Development Official of the San Francisco Chamber of Commerce.

El Monte

City's Post-Freeway Progress Refutes "Chinese Wall" Fears

By JAMES K. KIMOTO
Headquarters Right-of-Way Agent

A report of the Land Economic Studies Section, Right-of-Way Department.

IT IS SAID that because of individual differences, no two persons are the same. Moreover, no particular person is today exactly the same individual he or she was some three years, five years, or any number of years, ago.

Perhaps because in large part they reflect the individuals in them, cities and towns likewise have their differences, and because here too time brings changes, a study of today's city in today's environment is most directly helpful in analyzing the more timely municipal problems.

Thus even though intensive analysis of the freeway "bypassed" city and town has been carried out by the Land Economic Studies Section of the California Division of Highways Right-of-way Department for over 12 years, careful analysis of current bypass situations still continues, despite the fact that results have consistently tended to confirm even the earliest conclusions indicated. Past experience is thereby regularly tested to see if its lessons are still valid guides to the solution of today's problems. Perhaps even more important, each "bypassed" city and town—because it is not entirely similar to others which may have already been studied—can make its own peculiar contribution to the growing fund of economic impact knowledge.

And so it was, even before freeway construction through the Southern California City of El Monte was completed on July 17, 1956, that areas own particular story had already started to unfold.

Study Situation

El Monte presented in many respects the typical "bypass" situation; nonetheless, with its own significant overtones, it had its own lusty story to tell the world.

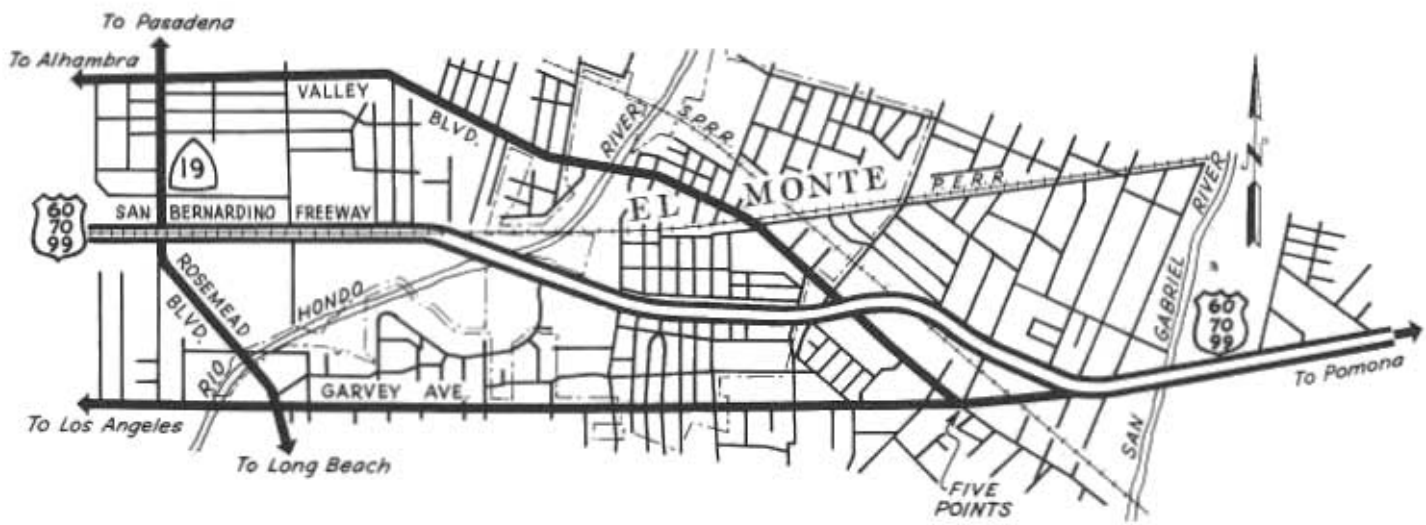
What are the peculiar effects upon abutting properties and community business and development of an *elevated* freeway bypass? Does this particular type of freeway construction create the so-called "Chinese Wall" situation—an impassible barrier to community expansion and commercial development? And what happens to the community when *two* former state highways are bypassed — *two highways whose abutting commercial developments account for over 66 percent of the total business done in the entire city?*

Rich in History

The overall picture of the changing El Monte community would be incomplete without a brief review of some of the past happenings which have shaped the city's present and future, and endowed it with its own individual character.

Founded in 1852 by some dozen families of a gold-seeking caravan headed for the "Gold Hills," El Monte began as a cattle raising community, lost out to agricultural interests, and finally emerged as a thriving Los Angeles County industrial center.

Its two-fisted history is replete with incidents that characterize the "strong rugged individualism" of its people who showed little reluctance to fight vigorously for the things they believed to be right. In the beginning there was a "range war" between the



This map shows the new freeway and other streets and highways through the City of El Monte.

cattlemen and the "squatter families" over land use and fences, a war which continued until the Fence Law of 1869. During the 1850's, with law enforcement almost nonexistent, the "El Monte Boys" rode the range, meting out decisive, though perhaps dubious, justice.

In the 1860's and early seventies, the ranchers agitated against a railroad line going from San Pedro to Los Angeles City because they felt that locomotive power would eliminate the need for horses, which, in turn, would affect the marketing of certain agricultural crops in which they specialized—barley, corn, feed, etc. During the hectic Civil War days, the community was definitely pro-South, and twice the federal troops from Wilmington had to invade the town to restore order. In 1861, 29 El Monte horsemen tried to join the southern armies by going through Texas but were caught and imprisoned for a short term at Fort Wayne.

Until the advent of the Pacific Electric Railroad in 1906, El Monte was one of the stopover points for the Pony Express, and bars and saloons did a roaring business from people passing through up to the time the temperance sentiment arose at the turn of the century. However, despite its many transients, El Monte, on incorporation date, November 18, 1912, had only 550 people, and the size of the city was a mere 1.21 square miles. Until 1945, the transition from an agricultural to an industrial community was rather slow and gradual.

After World War II, the transition to an industrial economy has been remarkably rapid. Today, there are over 750 highly diversified industrial plants in the greater El Monte area of which 20 percent are engaged in manufacturing and processing strategic military items. Today, El Monte claims recognition as the house trailer manufacturing center of the United States. It also has unrelated manufacturing industries such as ceramics, chemicals, garments, iron foundries, paints, plastics, and electrical machinery.

Other Factors

To more effectively analyze the effects of the freeway on the community, there are other pertinent and important factors that must be considered as well.

First, the tremendous industrial growth that has taken place in Southern California for the past decade has resulted in increased population for many small communities such as El Monte, and this in turn has created the need for expansion of existing facilities and construction of new facilities. Obviously, communities which were able to respond quickly to the demands of the new populace found themselves growing more rapidly than those that lagged. El Monte, with its long history of adjustments, reacted quickly to take advantage of the situation. Its citizens erected a modern civic center at a new location, provided additional recreational facilities, expanded their school system, and provided adequate housing facilities in the form of new residential subdivisions aimed at the moderate income groups. Industries were also encouraged by pointing up tax advantages, good transportation facilities, and adequate utilities.

Second, construction of the Rio Hondo Wash facility (a portion of the multi-million-dollar flood control project to tame the San Gabriel River and its tributaries), has had the effect of opening up considerable land for profitable and lasting development.

Third, El Monte has two railroad lines, the Southern Pacific and the Pacific Electric, which offer added inducement to industries seeking sound locations.

Fourth, the city's strategic geographic location itself. El Monte is ideally situated from downtown Los Angeles, only 13 miles away—a hub for the entire San Gabriel Valley area.

Methodology

This study, like most previous land economic studies, utilizes the "before and after" technique to determine the effects of a freeway on this city whose state routes, Route 26 (Garvey Avenue) and Route 77 (Valley Boulevard) were "bypassed." Sources of information include: (1) the quarterly sales tax data from the Board of Equalization; (2) verified real estate transactions; (3) the U. S. Census; (4) El Monte Chamber of Commerce data; (5) Los Angeles County Regional Planning Commission and Assessor's Office reports; (6) the Research Department of the Security First National Bank; (7) Federal WPA report entitled "A History of El Monte"; (8) El Monte Press; (9) city officials; and (10) real estate brokers, industrial plant managers, and merchandisers of El Monte.

Periods and Area Covered

Because of the complicating effects of the Monte Vista Bypass—a short bypass of the Valley Boulevard downtown shopping section which was constructed after the freeway itself (opening date—December, 1957)—this study does not cover the usual "two year before and two year after" periods. Instead a "one year before and a one year after" period has been chosen as the basis of this study. Another reason for using the shorter duration is the fact that a two-year period "after" would also take in much of the difficult-to-analyze general recession effects that commenced from the summer of 1957.

Although the City of El Monte tends to identify itself with the El Monte Postal District, an area five times its size, it was felt that for clarity the city boundaries as they were in 1955 should be utilized, and only the freeway effects on the community and the two major streets therein, namely Garvey Avenue and Valley Boulevard, which were the two former state routes as noted previously, should be considered.

"Chinese Walls"

El Monte citizens were greatly concerned that, in the "after" period, the completed freeway might easily become a figurative "Chinese Wall." The use of this expression has become widespread in planning and development discussion—it is interestingly pertinent to note the sequence by which it is derived.

To its planners and builders, the Great Wall of China was in effect an ancient type of life insurance policy. If its formidable bulk isolated the Chinese Empire from its neighbors and discouraged intruders whatever their mission and intent, it would

have served its purpose well. If it presented an insurmountable barrier to intrusion and interchange, it would have been considered eminently successful.

Modern-day planners and builders, of course, deplore structures which in any way tend to isolate and bar, and those things which would have measured the success of the old Great Wall are considered today to be highly undesirable consequences of either private or public building activity. Concern and anxiety when improvements are proposed which in fact might bring about such effects, are thus oftimes expressed by summing up the planned facility simply as a "Chinese Wall." El Monte citizens—pointing out five alleged "walls" already in existence—understandably were concerned with the effects of an elevated freeway structure.

The two former state highways with their combined 54,000 average daily traffic volumes constituted barriers one and two; the Southern Pacific Railroad and the Pacific Electric Railroad rights of way made barriers three and four, and the Rio Hondo Wash, bisecting the city in an opposite direction to the others, was barrier number five. The map of the El Monte area on page 15 graphically depicts this aspect of the overall study situation.

A view of the business district of the City of El Monte looking west on Valley Boulevard. Prior to the opening of the freeway this street was congested with traffic, making shopping difficult.

Allegations of premature obsolescence of abutting improvements, creation of isolated areas without possibility of profitable development, introduction of obstructions to further expansion and annexation, etc.—these were the predicted and implied effects of elevated freeway construction through El Monte. What then, are are facts?

Growth and Progress

The size of the City of El Monte at the time of this writing is about three and one-tenth square miles. Annexation of adjacent areas to the city cannot of course take place without the majority consent of affected landowners and residents. A divided city suffering from the many alleged ill effects of any so-called "barrier" division, would doubtless have little attraction to outlying areas. Annexation trends may thus helpfully suggest unincorporated area thinking about the future of the core city, and here is what we find:

1. Since opening of the freeway in July of 1956, annexation of adjoining areas has increased at an annual rate of over 14 percent per year. In significant contrast to this figure is the annual average trend of approximately 2 percent for the 43-year period immediately prior to freeway opening. *Almost 59 percent of the entire 43-year annexation gain for El Monte was accomplished in the two short years following freeway construction.*

2. In the area of land development, analysis reveals that since commencement of freeway construction, approximately 490 new homes have been built adjacent to the freeway. *Indeed, in this highly significant period, new residential building has shown higher totals on the average than for any other period in the last 10 years.*

3. All building permits for the city show additional remarkable gains. *In the year immediately after freeway construction, new building valuation tripled comparable totals of the year before and doubled totals for the year before that.* Activity in both the core city and annexed areas showed decided increases.

An aerial view of the San Bernardino Freeway through the City of El Monte. Peck Road interchange is in the foreground.

Population

Growth, of course, is not measured by one item alone. There are other

factors which suggest expansion. Population for instance, by itself may not be significant, but taken collectively with other factors, may well prove illuminating. Prior to the freeway, the population of El Monte was 9,713 (census of November 10, 1955). Less than two years later, the special census of October 10, 1957, discloses that the population of El Monte had grown to 11,507, an increase of 1,794 or 18.5 percent over the 1955 figure. What is more significant is the fact that prior to the freeway, from 1950 to 1955, a period of *five* years, population had only increased 20 percent. Perhaps even more significantly, three-quarters of this increase took place within the old city limits and therefore does not reflect increases due to physical annexation. (It is enlightening to note that all of the annexed areas were considered to be "uninhabited.")

Duplication and Isolation

There is no visual or statistical evidence whatsoever of any so-called "isolation" of certain areas as a result of the elevated freeway; nor is there any evidence whatsoever of tangible interference with free and convenient interchange between the two, admittedly more separate, main business streets. *Since freeway construction actually became unmistakably evident, 16 new merchants have established themselves along both of the "bypassed" thoroughfares and remain in business today.* Moreover, the distinctive character of both streets—one a pedestrian traffic, typical downtown type mercantile area, and the other a commercial strip in its usual form—has been maintained without variation, and there is little reason to suspect that any isolating influences have been at work which might conceivably change this picture.

Sales Tax Analysis

The importance of these "bypassed" business streets to the economic welfare of the entire city has already been indicated. *One hundred forty-four retail establishments along Garvey Avenue and Valley Boulevard average around 20 million dollars' worth of business a year, two-thirds of the total retail business done yearly in the entire city.* Simply stated, if these merchants had taken an "economic beating" from freeway construction and traffic changes, the entire community would have taken a "beating" as well, for there was little else to cushion the blow.

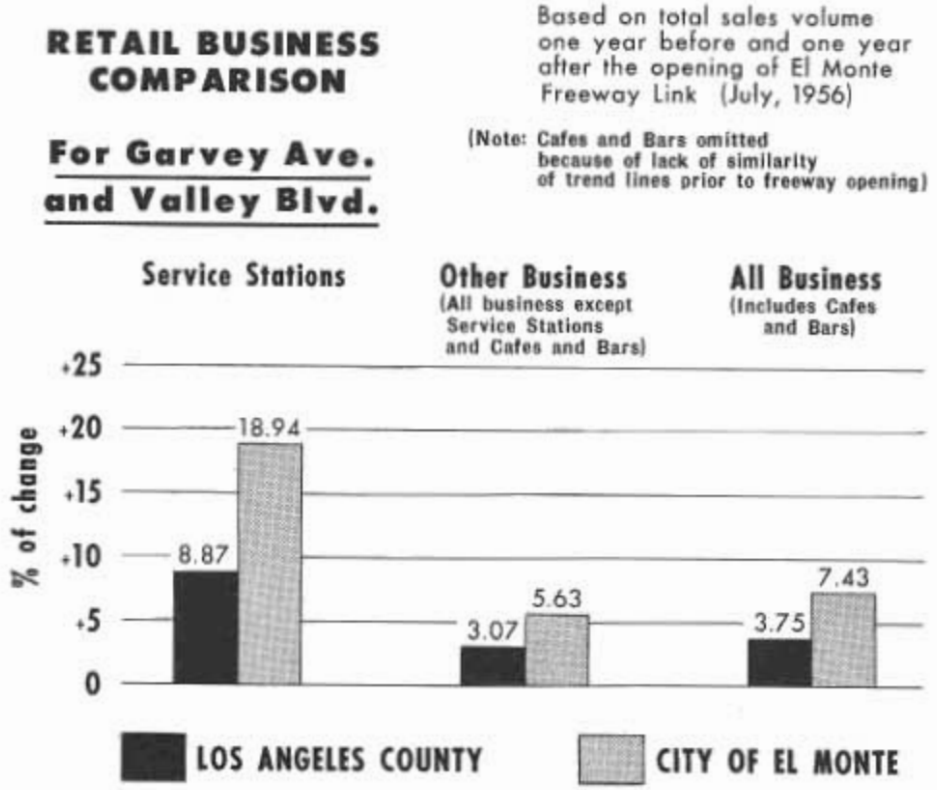
In analyzing changes in gross business volume for before and after periods, we have customarily employed the changes in the parent county as our measuring stick. This is done only after careful analysis has been made of business trends in both the city under study and its county to determine that both have consistently followed an identical trend prior to the freeway change. In the El Monte study, the County of Los Angeles proved itself to be an entirely accurate measure for all major business groups except one—the cafe and bar groups, a situation referred to in more detail hereinafter.

State sales tax data are used in determining the gross volume of business conducted by bypassed or freeway affected merchants in the "before" and "after" periods prior and subsequent to the freeway opening. Because of strict requirements of the State for honest and accurate reporting of gross sales, these sales tax data become very meaningful when they are compared with a control area or comparative base for the same periods. Any deviation in the trend lines of the two areas in the after period would denote an effect that may or may not be attributable to the freeway.

Retail Trade

In order to develop a more significant picture of the effects of an elevated freeway on the overall El Monte community, the combined gross sales of merchants on both "superseded" streets were analyzed under the following categories: (1) all businesses, (2) service stations, (3) cafes and bars, and (4) other businesses.

How well did the bypassed areas do in the year after freeway construction? *In all instances, retail business was significantly better than similar business in Los Angeles County.* The Valley Boulevard and Garvey Avenue "All Business" category registered a



The above graph shows percentage increase in volume of retail sales along the principal arterials, Garvey Avenue and Valley Boulevard, in the City of El Monte as compared with Los Angeles County during the two-year period of study.

7.43 percent gain in gross retail sales after freeway opening while all business in the county was up approximately half as much, or 3.75 percent.

For a clearer analysis of the 7.43 percent increase, the "All Business" group was broken down into three categories: (1) service stations, (2) cafes and bars, and (3) other business (other than service stations, or cafes and bars).

Service Stations

Service stations on "superseded" highways are generally good indicators of the effects of a bypass since they are highly sensitive to traffic changes. According to the sales tax report, *the service stations of El Monte along superseded highways did 18.94 percent more business in the after period as compared to the county's 8.87 percent gain. This is even more significant when one considers that traffic along the two superseded highways had dropped 36 percent whereas overall traffic within the County was up 8 percent and up only slightly less for the State as a whole over the same period.*

There was no increase in the number of stations during the "after" period.

Cafes and Bars

The other highly sensitive traffic catering businesses, cafes and bars, could not be objectively compared with the county since, as noted previously, in the "before" period El Monte's trend was dissimilar to that in Los Angeles County. (Probably one of the principal reasons for the dissimilarity may be attributed to the fact that the bypassed cafes and bars are a poor sampling of the county's cafes and bars.) Whether El Monte's gain of 47.66 percent is thus significant in the face of the county's gain of only 8.79 percent is a matter of conjecture. Perhaps the only significant statement that can be made pending further research is that the bypassed cafes and bars as a group did better in the "after" period than in the "before" period.

Undoubtedly of significance, however, is the fact that three new cafes and bars opened up in the "after" period.

Other Businesses

Other business, the nonhighway caterers if you will, was up in the after period as well. This group showed a 5.63 percent gain while similar businesses within the county were gaining only 3.07 percent.

New Developments

Admittedly, a one-year study period is ofttimes insufficient to enable slower moving developments, attributable in whole or in part to the new freeway facility, to make themselves clearly evident. Thus an entirely complete survey of such elements of the overall picture is rarely possible. Occasionally, however, exceptional developments occur which strongly indicate the trends in community development which can reasonably be expected in the "after" period. El Monte is excellently represented here.

Adjacent to the freeway at the easterly city limits of El Monte, a gigantic 35-acre Sears, Roebuck and related stores center is presently nearing completion. This development, attributable in part to the freeway improvement, will represent when completed an investment in freeway-adjacent-properties approximating some three to five millions of dollars. This sum becomes perhaps strikingly pertinent when the following facts are pointed out for comparison:

1. Between 1952 and 1955, 167 right-of-way parcels were acquired for the San Bernardino Freeway through this section for a total consideration of $2,160,000.
2. The three- to five-million-dollar investment represents, then, *in new, significantly freeway-induced development, over twice the total amount spent for right-of-way on the entire El Monte freeway project, if the latter estimate is used.*

Conclusion

Each item of the foregoing data sheds significant light upon the specific elements of the El Monte "bypass" situation which this study sought to investigate. Taken either singly or as a whole, they clearly point up that:

1. The elevated, controlled-access freeway through the City of El Monte has in no way hindered the growth of the entire community in:
   (a) Area
   (b) Population
   (c) Commercial and residential development.
2. El Monte in the "after" period has shown the exact opposite of the alleged and feared "Chinese Wall" situation.
3. The "bypass" of Garvey Avenue and Valley Boulevard—the "superseded," approximately parallel highways which generate two thirds of El Monte's business—has not been accompanied by either business decline or loss to:
   (a) The specific Valley-Garvey general business sections
   (b) The overall El Monte commercial complex.
4. Without exception, every class of business analyzed in the "after" freeway period has recorded significant gross sales gains.

OSLO, NORWAY

Editor, California Highways and Public Works

SIR: I would like to use your magazine to write to the American engineers that I have met.

I had the great opportunity and luck to be allowed to visit the United States for almost one year, from September, 1956, to August, 1957. For most of this time I studied civil engineering and traffic engineering at Yale University. In addition I visited many highway departments, turnpike authorities, and other engineering offices.

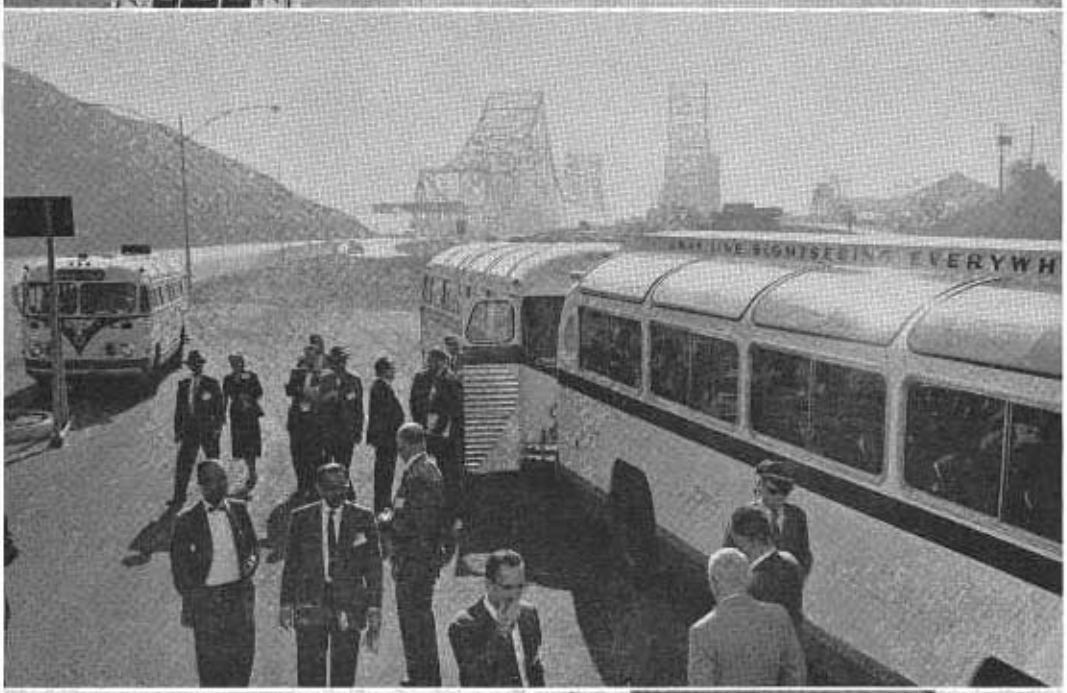
I drove through 29 states from Rhode Island to California and returned to Albany, New York. On this study tour I saw many engineers in highway departments and in other highway offices and got more and better information than I had expected to get—many books, reports, drawings, and pictures of highway building.

Because I have been in a very great hurry with engineering work here in my office in Oslo, I have had no time to write and thank the engineers and authorities who gave me such valuable assistance.

GABRIEL FROHOLM

A.A.S.H.O.

Highway Officials From All States Hold Annual Meet in San Francisco



One of the best attended annual meetings in the 44-year history of the American Association of State Highway Officials was held in San Francisco December 1st through 5th, with California as host state.

Nearly 1,600 delegates and visitors from all over the Nation attended the meeting, which included three general sessions, many committee meetings, a fashion show-luncheon for the wives, the traditional family dinner, and an all-day tour of highway projects in the San Francisco Bay area.

Dominating the delegates' discussion, apart from the wide range of technical studies and papers, was the problem of financing the Federal Government's share of the National Interstate Highway System construction program. U. S. Senators, Congressmen and other officials present pointed out that under the present financing schedule the program threatens to fall behind schedule in the next two years.

This problem was also reflected in the major resolution adopted by the association in San Francisco, which reaffirmed the ability and readiness of state highway departments to keep the interstate program on schedule if the necessary financing is forthcoming.

The association elected Ralph R. Bartelsmeyer, Chief Highway Engineer of Illinois, as its president for 1959. Boston was chosen as the site of the next annual meeting.

UPPER—T. F. Bagshaw, then State Director of Public Works, welcomes the A. A. S. H. O. delegates. Seated, left to right, are: Representative George H. Fallon of Maryland; A. E. Johnson, executive secretary of A. A. S. H. O.; Senator Albert F. Gore of Tennessee; Senator Francis Case of South Dakota. MIDDLE—The newly opened parallel Carquinez Bridge was one of the stopping points on the all-day field trip for A. A. S. H. O. delegates. LOWER—A view of the opening session. Representative Gordon H. Scherer of Ohio is the speaker. Inset shows another opening day speaker, Federal Highway Administrator Bertram D. Tallamy.

Achievement

G. T. McCoy Receives High Award at A. A. S. H. O. Meet

A HIGHLIGHT for Californians at the the opening general session of the 44th Annual Meeting of the American Association of State Highway Officials in San Francisco December 1 was the presentation of the Thomas H. MacDonald Memorial Award for outstanding achievement in the development of highways to George T. McCoy, State Highway Engineer of California.

The award, carrying with it a plaque and certificate, was established by A. A. S. H. O. in 1957 to honor the memory of the late Thomas H. MacDonald, who headed the U. S. Bureau of Public Roads for 34 years prior to his retirement in 1953.

McCoy was the second recipient of the award, and the first highway engineer in active service on whom it was conferred. The 1957 honoree was H. S. Fairbank, a retired Federal Government highway engineer.

The presentation took place before more than 1,000 highway officials and guests soon after the official opening of the weeklong annual meeting. Making the presentation was Dewitt C. Greer, State Highway Engineer of Texas, who, like McCoy, is a past president of A. A. S. H. O.

Greer said the award was based on McCoy's "long and consistent participation in national highway activities and his years of service in the important administrative post of State Highway Engineer of California, and on his wonderful achievement in the development of highways not only in California but in these United States."

At the same time Greer told the A. A. S. H. O. meeting of another tribute to "Chief" MacDonald – the start of a fund to establish a memorial chair in the Transportation Institute at Texas A. and M. College.

Responding to the presentation, McCoy commented that he had known and worked with the late "chief" over a period of 30 years, and added:

"This is a very great honor that the association has seen fit to grant me today. I consider it the highest award a man in my line of work can achieve."

State Highway Engineer G. T. McCoy, Chief of the California Division of Highways (right), is shown receiving the Thomas H. MacDonald Award of the American Association of State Highway Officials at the 44th annual meeting of the association in San Francisco. Making the presentation and congratulating McCoy is Dewitt C. Greer, State Highway Engineer of Texas.

The certificate which now hangs alongside the plaque in McCoy's office in the Public Works Building in Sacramento adds these words to the tributes paid McCoy for his accomplishments over the course of a 43-year highway engineering career:

"The American Association of State Highway Officials, on behalf of its members, presents to George T. McCoy this citation proclaiming his selection as the recipient of the Thomas H. MacDonald award in recognition of his outstanding career as a highway administrator and his great contributions to the highway field, both in his chosen state and at the national level; and in testimony to his honesty of purpose, warmth of character, breadth of vision, height of competence and generosity of counsel that assure forever his place of honor in the history of highway transportation in America."

McCoy has been with the California Division of Highways since 1927 and has been its chief since January, 1943. Under his leadership, California has attained acknowledged nationwide eminence in highway development, particularly in regard to freeways.

At its December meeting in Sacramento, the California Highway Commission adopted a resolution expressing its gratification at the recognition accorded California's State Highway Engineer by the Nation's highway leaders, and added that "this award reflects great credit on the California highway program and on all who have been associated with it."

McCoy acknowledged the commission's resolution by adding that the award "is a tribute to the people of the fine highway organization we have in this State and I feel it should have been given to them instead of to me."

County Funds

State and U. S. Aid Totals $12,997,449 to 57 Counties

APPORTIONMENT of $12,997,449 in state and federal funds to California counties for construction on county roads included in the Federal Aid Secondary System was announced today by the State Department of Public Works.

The allocation, which is for the 1959-60 Fiscal Year includes $8,724,389 from the Federal Government and $4,273,060 in state highway matching funds.

At the same time, State Highway Engineer G. T. McCoy reported that all the participating counties will succeed in meeting the deadline for obligating the additional 1958-59 federal aid secondary and state matching funds which were provided under the 1958 Federal Highway Act. The federal act requires that the added funds have to be applied to previously unscheduled projects and that these new projects must be under contract before December 1, 1958.

These additional 1958-59 funds were allocated to the counties in April. This special allocation totaled $5,191,904, including $4,098,605 in federal funds and $1,093,299 in state highway matching money.

"All of the counties that participated in this 'crash' program have obligated their funds by awarded or advertised contracts, and it now appears that the December 1st deadline will be met," McCoy said.

"The Division of Highways is proud to have been associated with the counties in this successful co-operative venture," he added.

The regular 1959-60 apportionment of $12,997,449 in state and federal funds, which was announced today, is distributed to the counties according to federal and state regulations.

The federal funds are apportioned to the various counties according to the same formula used by the Federal Government in distributing federal aid secondary funds to the states—one-third on the basis of area, one-third on rural population, and one-third on mileage of certain classes of rural mail routes.

COUNTY APPORTIONMENTS OF FEDERAL-AID SECONDARY FUNDS UNDER FEDERAL-AID HIGHWAY ACT OF 1958 AND ACCOMPANYING STATE MATCHING FUNDS, 1959-1960 FISCAL YEAR

County	FAS funds	State matching funds
Alameda	$130,807	$93,755
Alpine	43,622	31,266
Amador	43,622	31,266
Butte	150,325	100,000
Calaveras	52,992	37,982
Colusa	53,594	38,413
Contra Costa	169,548	100,000
Del Norte	43,622	31,266
El Dorado	75,613	54,195
Fresno	438,510	100,000
Glenn	66,797	47,876
Humboldt	192,897	100,000
Imperial	173,181	100,000
Inyo	218,589	100,000
Kern	404,889	100,000
Kings	100,936	72,345
Lake	58,018	41,584
Lassen	134,376	96,313
Los Angeles	450,519	100,000
Madera	119,116	85,375
Marin	53,347	38,236
Mariposa	58,449	41,893
Mendocino	167,686	100,000
Merced	170,026	100,000
Modoc	103,428	74,131
Mono	77,590	55,612
Monterey	211,426	100,000
Napa	86,676	62,124
Nevada	53,182	38,118
Orange	157,879	100,000
Placer	111,266	79,749
Plumas	82,639	59,231
Riverside	333,793	100,000
Sacramento	200,386	100,000
San Benito	59,644	42,750
San Bernardino	630,317	100,000
San Diego	318,090	100,000
San Joaquin	204,225	100,000
San Luis Obispo	153,189	100,000
San Mateo	60,812	43,587
Santa Barbara	148,478	100,000
Santa Clara	192,982	100,000
Santa Cruz	75,234	53,924
Shasta	161,998	100,000
Sierra	43,622	31,266
Siskiyou	207,538	100,000
Solano	86,008	61,646
Sonoma	213,313	100,000
Stanislaus	211,712	100,000
Sutter	59,763	42,835
Tehama	109,797	78,696
Trinity	86,371	61,906
Tulare	346,856	100,000
Tuolumne	75,983	54,460
Ventura	161,785	100,000
Yolo	80,005	57,343
Yuba	47,321	33,917
Totals	$8,724,389	$4,273,060

The money from state sources is for the use of the counties in matching the federal funds on the basis of approximately 58 percent federal to 42 percent local funds. According to state law, $100,000 is the maximum amount which may be made available in the 1959-60 Fiscal Year to a county for use in matching its federal allocation.

This $100,000 ceiling will permit 31 of the 57 eligible counties to match all of their federal allocation out of funds provided by the State, except for a small amount of county funds required for contingencies and engineering. The City and County of San Francisco is not eligible to participate in the federal-aid secondary road program because it is entirely urban.

County roads on which federal-aid secondary funds may be spent are those roads which have been designated by the county, with the approval of the California Highway Commission and the U. S. Bureau of Public Roads, as constituting the county's federal-aid secondary system.

For the most part, these roads are next in importance to state highways in terms of traffic volume and economic service to the locality, and are often referred to as "feeder roads" or "farm to market roads."

The largest federal-aid secondary allocation for 1959-60 will go to San Bernardino County—$630,317 federal and $100,000 state funds. The smallest allocations will be to Alpine, Amador, Del Norte and Sierra Counties. Each will receive $43,622 federal and $31,266 state funds.

Total motor vehicle registration in California reached 7,625,378 on November 1, 1958, as compared with 7,388,731 one year earlier, according to an end-of-the-year report of the Department of Motor Vehicles.

The 1958 motor vehicle registration sub-totals were: automobiles, 5,965,241; trucks, 864,809; trailers, 638,316; motorcycles, 59,203, and vehicles exempt from registration, 97,809.

Report From District VII

By EDWARD T. TELFORD
Assistant State Highway Engineer

THIS is the eighth annual report about freeways in District VII of the California State Division of Highways that has been published in successive January-February issues of *California Highways and Public Works*. From questions that are continually being asked of us concerning freeway development in this area, it would appear that very few persons have a clear understanding of how the personnel of the District VII organization operate in the furtherance of freeways.

It is quite generally known that for administrative purposes the State of California is divided into 11 districts, with the engineers in charge reporting to State Highway Engineer George T. McCoy in Sacramento and his two deputies J. W. Vickrey and Charles E. Waite. It is not so well known that while nine of the 11 districts are in charge of district engineers, District IV, the San Francisco district, and District VII, the Los Angeles district, both encompassing large metropolitan areas, are in charge of assistant state highway engineers.

In District VII, which comprises the three counties of Los Angeles, Orange and Ventura, the Assistant State Highway Engineer in charge, with an organization totaling over 2,300 employees, is assisted by two district engineers—L. R. Gillis and A. L. Himelhoch. The division of responsibility between these two engineers is on a functional basis and not a geographical one. Gillis has responsibility for functions under the general heading of "Planning" which includes advance planning, programing and budgeting, designing and traffic engineering. Himelhoch has charge of the functions known as "Operations," which includes surveys, materials, drainage, construction, maintenance, and, in addition, administration. In carrying out their work, the two district engineers are assisted by 10 assistant district engineers.

These assistant district engineers also operate on a functional basis. A geographical division of the district exists only in the case of the District Maintenance Department with respect to its superintendents and their crews and in the case of the three assistant district engineers engaged in design. Highway and freeway construction plans, the development of which constitutes design operations, are prepared by three engineering units each averaging around 120 employees, and each under an assistant district engineer. Design Section "A" takes care of the Los Angeles metropolitan area. Design Section "B" covers southeast Los Angeles County and all of Orange County. Design Section "C" includes roughly the northern half of Los Angeles County and all of Ventura County.

The work of the district could not go forward, particularly as to construction of new freeways, were it not for adequate rights of way upon which to build them. The acquisition of rights of way for District VII projects is the responsibility of Metropolitan District Right-of-way Agent H. W. Leonard, who is assisted by four supervising right of way agents. These supervisors divide the work along functional lines with each having responsibility for one of the following: organizational administration, right of way engineering, property

ABOVE—This view southward above the Harbor Freeway shows the Manchester Avenue interchange in the foreground paralleling the freeway are Figueroa Street (right) and Main Street (left).

appraising or right of way acquisition. Leonard reports directly to the Assistant State Highway Engineer.

District VII is the only district in the State having the advantage of an office of the Division of Highways Bridge Department housed with its own organization. The bridge engineer for the southern area is J. E. McMahon, who, under the general direction of State Bridge Engineer F. W. Panhorst in Sacramento, has responsibility for construction and maintenance of all bridges and other major structures in Districts VII, VIII, IX and XI.

For this eighth annual report on the freeway situation in District VII, particularly describing the accomplishments during 1958, Leonard for Right-of-Way, McMahon for Bridge Department and the assistant district engineers have all made contributions in their respective fields.

Mounting traffic volumes give evidence of the enthusiastic public acceptance of freeways and have resulted in an ever-increasing workload and growth for District VII. The initial organization of District VII dates back to the first payroll of February, 1912, which listed 20 men on the "Division VII" staff, as it was then called when Division VII included areas now embraced by Districts VII, VIII and XI. By the end of 1913 there were 71 employees on the staff payroll. Ten years later, in 1923, with some fluctuation in between, it happened again that there were 71 employees on the staff payroll, with expenditures during that year totaling $1,500,000. The next 10 years brought a steady increase in amounts spent and the number of employees, and in 1933 we find that with a yearly expenditure of $7,400,000 there were 218 staff employees. In the following 12 years both the yearly rate of spending and the number of employees stayed remarkably constant. In 1945 the yearly expenditure was again $7,400,000 and the number of staff employees was 239. Increased revenue resulting from 1947 Legislation furnished the impetus for continued growth. The accompanying tabulation indicates the progress made by District VII since that time.

GROWTH OF DISTRICT VII

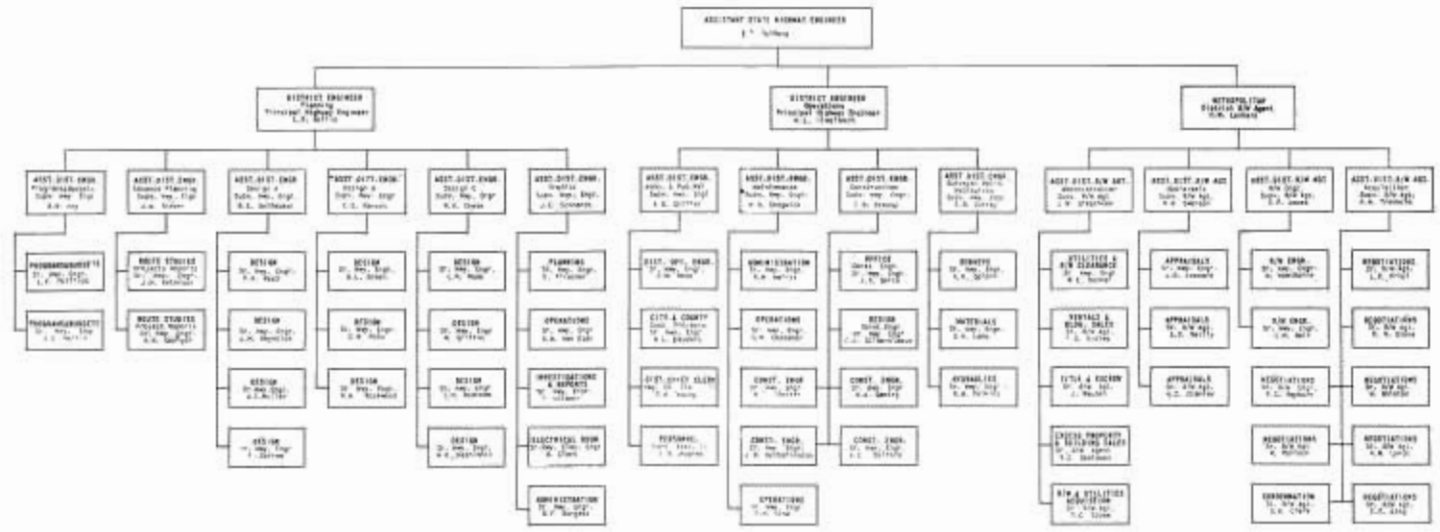
Fiscal year	*Yearly expenditures*	*Staff employees*
1945-46	$8,146,000	335
1946-47	15,486,000	454
1947-48	24,007,000	688
1948-49	35,674,000	735
1949-50	25,452,000	801
1950-51	35,532,000	957
1951-52	38,892,000	976
1952-53	45,853,000	1,040
1953-54	68,112,188	1,268
1954-55	75,411,715	1,464
1955-56	97,502,723	1,588
1956-57	122,345,757	1,776
1957-58	119,500,000	1,778
1958-59	129,650,000 (budgeted)	—
1959-60	164,293,000 (budgeted)	—

The increasing volume of work necessitating a corresponding increase in personnel caused the district staff long ago to outgrow the district offices at 120 South Spring Street. Several departments are now housed in five other offices buildings.

A $5,500,000 annex to the present district office building is now under construction. The new building will consist of basement and ground floors for parking and four floors of office space with approximately 50,000 square feet per floor. It will be ready for occupancy in the fall of 1959 and then the District VII staff will again be all under one roof.

A reference to the annual traffic counts will show a volume increase corresponding to the yearly expenditures. The annual traffic counts taken Sunday and Monday, July 13 and 14, 1958, indicate that, on some of our freeways in the City of Los Angeles approaching the Civic Center in the downtown area, the traffic saturation point has been reached. However, in the case of the four-level traffic interchange facility at the intersection of the Hollywood, Harbor and Pasadena Freeways, we find each year a steady increase in traffic use. The average daily traffic on freeways in this area for the past five years is shown by the following:

Location	*1954*	*1955*	*1956*	*1957*	*1958*
Hollywood Freeway (four-level westerly)	168,000	180,000	185,000	192,000	192,000
Pasadena Freeway (Elysian Park)	110,000	112,000	114,000	109,000	122,000
Santa Ana Freeway (Soto Street)	90,000	113,000	145,000	145,000	141,000
San Bernardino Freeway (Soto Street)	80,000	88,000	96,000	93,000	113,000
Harbor Freeway (four-level southerly)	125,000	160,000	175,000	190,000	192,000
Colorado Freeway (Linda Vista)	30,000	27,000	29,000	23,000	23,000
Long Beach Freeway (Pacific Coast Highway)	10,000	31,000	37,000	35,000	43,000
Using four-level interchange	242,000	280,000	300,000	318,000	321,000



ADVANCE PLANNING

By JOHN W. SHAVER
Assistant District Engineer

The Advance Planning Department of District VII with a staff of 40 people is charged with the responsibility of doing all things necessary at the district level to bring a freeway route from the legislative description through to adoption by the State Highway Commission. Included in this process are alignment studies, traffic estimates, construction estimates, and right-of-way estimates.

Along with the continuing evolution of State Highway Commission policy (see article on CHC hearings, page 55, *California Highways and Public Works*, March-April, 1958) in the direction of more and more local community participation in the processes of route adoption, has come an ever-increasing number of informal conferences with civic groups, chambers of commerce, local officials and their staffs, as well as more detailed public meetings and public hearings. These procedures have done much to win public acceptance of the freeway proposals locally by giving the citizens a chance to participate in the ultimate solution of the problems which the proposed freeway presents.

During the calendar year 1958, routes were adopted in District VII on portions of the Foothill Freeway, Route 79 Freeway and Pomona Freeway. These freeway routes totaled 19.0 miles and were estimated to cost $41,200,000, for construction and rights-of-way. Carried through the public meeting stage were portions of the Foothill, Antelope Valley and Artesia Freeways totaling 44.6 miles and estimated to cost $164,500,000.

Other advance planning projects under active study, totaling about 120 miles and estimated to cost 492 million dollars, include a freeway on Sign Route 134 from the Ventura

Freeway to Pasadena, portions of the Glendale Freeway, a freeway extension on Sign Route 35 near Seal Beach, a Sign Route 39 Freeway from the Santa Ana Freeway to US 101 Alternate, a US 399 Freeway from Foster Park to Ojai, a US 101 Alternate Freeway along the coast in Orange County, a Route 162 Freeway from the Hollywood Freeway to Beverly Hills, a freeway bypassing the City of Oxnard, a freeway on US 60 bypassing the City of Pomona, a freeway along the existing expressway in Santa Ana Canyon, a freeway connection in Pasadena, from Devils Gate Dam to the Colorado Freeway and a freeway from the Harbor Freeway in San Pedro to 1,000 feet east of the proposed bridge to Terminal Island.

In addition, advance planning prepared the district's part of the overall plan for future freeway development recently presented to the Legislature pursuant to Senate Concurrent Resolution 26. This included a district-wide study of a proposed freeway system totaling 1,400 miles and costing 4.25 billion dollars.

Because of the topography and differing traffic characteristics, the study in District VII was divided into three parts: Ventura County, North Los Angeles County, and the Los Angeles-Orange County Metropolitan area. For each part an estimate was obtained of the 1980 population and projected land use. Using these data and traffic generation factors based on land use, the total number of 1980 daily vehicle trips was calculated and placed on maps by means of dots.

The total land area involved was 5,700 square miles, and the total 1980 population was estimated at 13 million. The total 1980 daily vehicle trips amounted to 27.5 million. Based on average trip length this would result in 220 million daily vehicle-miles of travel in District VII by 1980.

Since no district-wide origin and destination survey was available, the traffic desires had to be synthesized. These were assigned to the proposed freeway system by manually describing each interzonal trip. Approximately 100,000 trip descriptions were written. These data were keypunched on tabulation cards and fed into the electronic computer at Headquarters. The resulting tabulation from the computer gave the 1980 traffic profile for each freeway in the system with turning movements at each interchange.

Looking north along a section of the Golden State Freeway showing construction through the City of Burbank. The cloverleaf in the foreground is the Alameda Avenue interchange.

The techniques developed in these studies have great promise for solving traffic assignment and prediction problems, particularly in cases where origin and destination information is not available.

PROGRAMS AND BUDGETS

By A. W. HOY
Assistant District Engineer

Programing basically consists of the preparing and maintaining a flexible advance construction and right-of-way program. The number of years covered by the program depends on the period as it relates to statutory budget controls. Headquarters Office furnishes the target figures for each year. These target figures are the estimated District VII total right-of-way and construction expenditures. The district recommends the allocation of this total between the three counties and also the allocation to construction projects and right-of-way acquisition. The allocations to the counties are predicated on the Mayo formula as set up by the Legislature in the Collier-Burns Act of 1947. District VII does not have a problem in meeting county minimums, as the deficiencies in all three counties are so great that the problem is one of determining priorities, and never having sufficient funds to accomplish all the high-priority projects.

In addition to the advance planning program as requested by Headquarters, it is necessary for the district to maintain an additional planning program in order that all of the steps leading up to the actual budgeting and getting the many projects

under construction can be properly co-ordinated. The explosive nature of development in the Los Angeles metropolitan area results in an everchanging and increasing need for new freeways. This, together with periodic changes in financing and estimated revenues, makes "programing" a continuous operation throughout the year.

It is essential in the programing and budgeting of freeway projects to so plan the various construction units that each unit will, upon completion, immediately become usable to the public and serve a useful purpose in improving the traffic situation.

The Programs and Budget Section maintains the monthly status of all unadvertised projects. The status shows the estimated plans, surveys and estimate date, estimated cost of project, status of right-of-way acquisition, and date right of way will be clear for advertising, and the suggested advertising date. Other pertinent data relative to status of railroad agreements, co-operative agreements, and any other matter that may affect advertising of the project are also shown.

In connection with maintaining the status of unadvertised projects, it is necessary to see that all departments involved in any particular project are keeping their portion of work up to schedule so that the project can go to contract on schedule. If it appears that some problem has developed which will affect advertising the project on schedule, the matter is placed on the agenda for discussion at the regular monthly staff meeting of District VII department heads so that any problems can be ironed out.

Other functions of the Programs and Budgets Section in connection with the furtherance of freeways are as follows:

(1) Prepare route adoption maps.

(2) Prepare and process freeway agreements.

(3) Co-ordinate the processing of relinquishment of frontage roads and State highways that are replaced by freeway construction.

(4) Review co-operative agreements and preliminary reports to maintain uniformity as to form within the district, and in order to maintain an accurate accounting of funds.

(5) Prepare the semiannual status of District VII freeway projects.

SURVEYS, MATERIALS, DRAINAGE

By E. B. CURREY
Assistant District Engineer

This section of the district organization has a total staff of 350 employees. The entire section of three departments is, in a broad sense, a service organization to the entire district staff. It furnishes the basic engineering information so that planning, design, right-of-way engineering and construction can go forward.

The *Survey Department* is headed by a district chief of surveys, assisted by seven assistant district chiefs of surveys. Their work, with 40 survey parties in the field, includes preliminary surveying, aerial surveying, right-of-way surveying and construction surveying. The office staff produces the co-ordinate control maps from field survey work, which are, in turn, used by the three district design staffs and District Right-of-Way Department. One of the fastest growing subdepartments of the office staff in the Survey Department is the aerial photogrammetric squad. Three years ago the "squad" consisted of one man. Today it is staffed by six men.

The variety and magnitude of the work involving underwater surveys has resulted in the Survey Department purchasing its own boat that enables us to take soundings to determine the elevation of the ground surface below water level.

With approximately 250 men the Survey Department is in an excellent position to train personnel for other departments. The Survey Department obtains about 60 percent of all the beginning engineering help that starts in the district. In addition, men in the Survey Department with two years or more experience are eligible to be loaned to other departments for a one-year period for training in another branch of engineering to broaden their experience. At the present time we have about 40 men loaned out to other departments. During the summer an attempt is made to place one student trainee in each survey party. The junior civil engineer rotation program assigns many of the recent engineering graduates to the Survey Department for a six-month basic training period.

The District Drainage Department is in charge of a district drainage engineer and four assistant district drainage engineers with a total departmental personnel of 30. One of these assistants devotes his time to hydrologic studies throughout the entire district. These studies are ordinarily made several years in advance of freeway construction. Each of the other assistants handles drainage design and various drainage complaints and problems in areas which correspond to the three District Design Sections. These men handle the difficult hydraulic design problems which are referred to us by the Design Sections and coordinate work with other drainage agencies such as the Los Angeles City Storm Drain Department, the Los Angeles County Flood Control District, and the U. S. Corps of Engineers.

During the past year some of the more important projects on which we have worked in conjunction with various other agencies have been the "Dorchester Channel" adjacent to the Long Beach Freeway Extension just south of the San Bernardino Freeway and the Los Angeles County Storm Drain Bond Issue Project, a longitudinal encroachment along this same route. We also worked on the "Sepulveda Canyon Channel" between Mulholland Drive and Casiano Road which is being realigned for construction of the San Diego Freeway. We were consulted on the "Caballero Creek Crossing" of the Ventura Freeway which is connected with a project of the U. S. Corps of Engineers in the Encino area. We are also working at the present time on the "Torrance Lateral" of the Dominguez Channel which crosses the San Diego Freeway and the Harbor Freeway. About 90 percent of the design work of this department is in conjunction with the freeway development.

The District VII Materials Department under a District Materials Engineer provides services to other departments. These services include the operation of a laboratory at the Central Maintenance Yard in East Los Angeles Area for testing soils and mineral ag-

gregates and the training and supervision of personnel for performing control tests on construction projects. The operation of the laboratory requires 12 to 18 persons and the control testing on contracts currently is requiring a staff of 27 employees. The control testing on construction projects includes the measurement of the density of embankments for compliance with the relative compaction specification, the sampling and grading analysis of mineral aggregates and the setting up of batch weights for portland cement concrete and for asphalt paving mixes. Probably the most important services performed by the Materials Department are the preliminary investigations made of proposed projects and the preparation of the materials report which attempts to anticipate and make recommendations for meeting the problems which will occur during the future construction and maintenance of the freeways. These investigations begin with the early preliminary location studies for the routes which are as much as five or six years in advance of construction and continue up until the time the final line and grade of the freeway has been determined by the Design Department. Preliminary materials investigations are in progress on the following freeways:

The San Diego Freeway from Culver City to Irvine, the Golden State Freeway from downtown Los Angeles to the Kern county line, the Antelope Valley Freeway from Los Angeles to the Kern county line, the Santa Monica Freeway, the Ventura Freeway through the City of Ventura to the Santa Barbara county line and the Pomona Freeway.

Some of the more interesting studies in connection with the Greater Los Angeles Freeway System have had to do with the application of soil mechanics to problems of stability for the 380-foot-deep cut at Mulholland Drive in the Santa Monica Mountains on the San Diego Freeway; for the proposed projection of the Antelope Freeway through an existing slide area; for the oilfield waste sumps along the San Diego Freeway alignment in the Long Beach area; and for peat bog areas along the San Diego Freeway between the San Gabriel River and the Santa Ana River in Orange County.

TRAFFIC

By J. E. ECKHARDT
Assistant District Engineer

In very broad terms the District Traffic Department's functions fall into two categories: one, preliminary research and studies on projects including new freeways to provide necessary information for other departments, and the other, the traffic control operations on existing state highways, including freeways.

An interesting part of the research in which the District Traffic Department recently participated was the U. S. Bureau of Public Roads study in July, 1958, using portable electronic equipment to determine the effect of trucks and grades on vehicular traffic volumes by measuring the speed, spacing and position within the lane of all vehicles. These studies were made at various locations within the district, mainly on freeways.

Considerable advances have been made in providing proper temporary connections at the ends of freeways within the Los Angeles metropolitan area where traffic volumes are extremely heavy. Liberal use of barricades, reflectors and signs, as well as flashing lights, have been found to be necessary, and with the traffic volumes involved, the expense has been more than warranted.

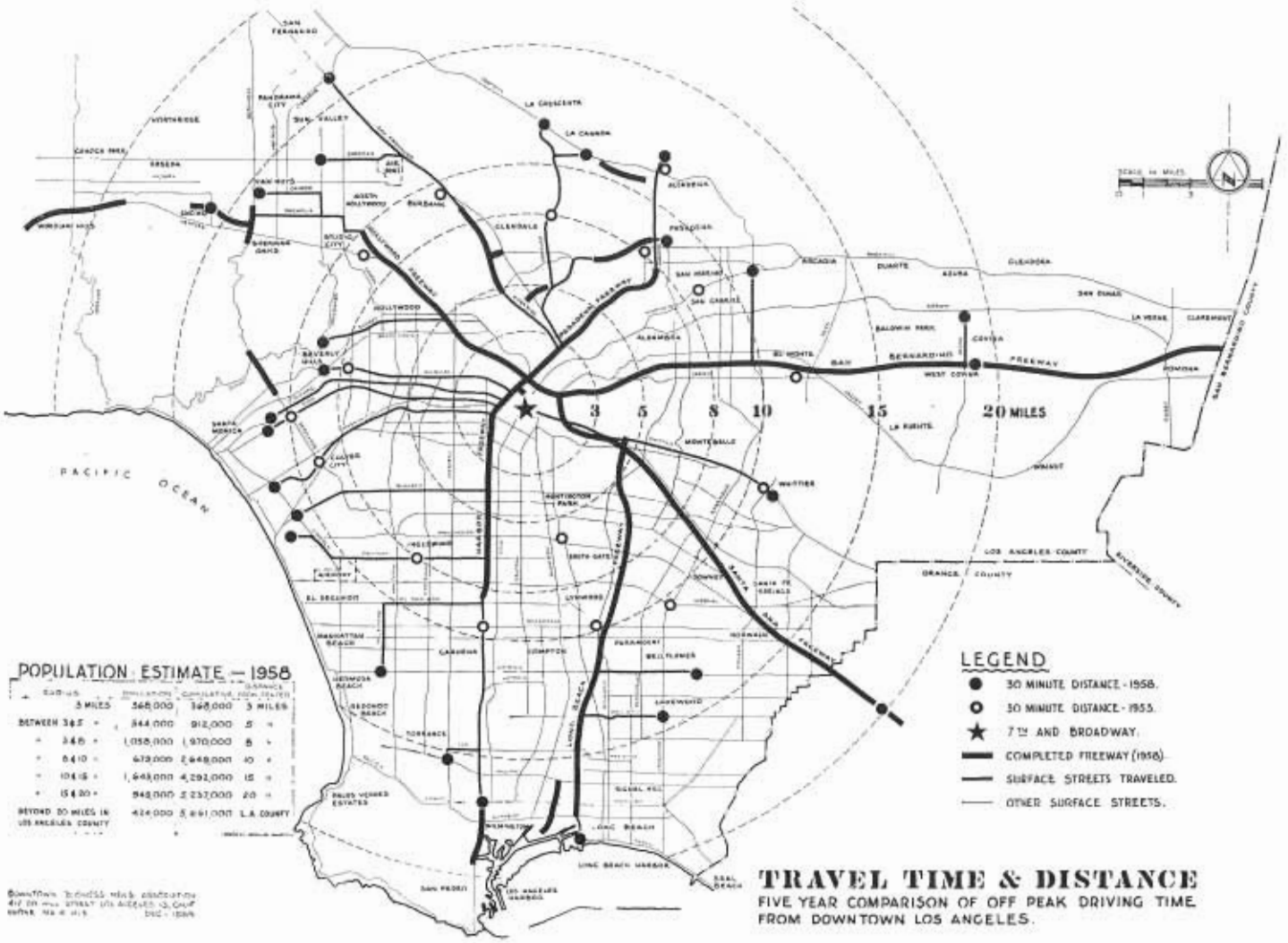
An origin and destination survey was conducted in the Los Angeles harbor area, during July and August, 1958, in co-operation with the Bridge Department and the firm of Coverdale and Colpitts, Consulting Engineers of New York City, to secure traffic data to be used for a study of the proposed San Pedro–Terminal Island Toll Crossing. Approximately 100,000 roadside interviews were recorded under the supervision of traffic department personnel, over a period of three weekends during late July and early August. The information obtained from an analysis of this survey will be valuable in determining future freeway routings in the harbor area.

Several improvements worked out by the District Traffic Department have been undertaken during the past year to eliminate the causes of traffic delay on the freeways. These include, among others, the construction of a connection for the southbound collector road adjacent to the Harbor Freeway just south of the four-level structure so that in the peak hours the existing three-lane section between the beginning of the collector road and the Fifth Street onramp, where a lane is added, can be bypassed and traffic then will be able to use the collector road getting back on the freeway at the Fifth Street onramp. Not only will this provide additional lanes for traffic, but it should reduce the amount of weaving between the traffic from the Hollywood and Santa Ana Freeways crossing the traffic from the Pasadena Freeway. This construction was completed on December 1, 1958.

On the Santa Ana Freeway just east of the four-level structure, a fourth lane has been added on the upgrade for westbound traffic in the so-called "slot" adjacent to the Los Angeles Civic Center. While there is a short section of three lanes still remaining in the vicinity of the Los Angeles Union Railroad Depot, the added lane on the upgrade with the various on and offramps has been a very noticeable help in the reduction of traffic congestion in the area.

Farther to the east, also for the benefit of westbound traffic on the Santa Ana Freeway, by a minor revision in a traffic island near the Union Depot, it has been possible to provide continuous four-lane operation from the junction of the San Bernardino–Santa Ana Freeways all the way to the Alameda Street offramp. The relief to traffic on both the Santa Ana and San Bernardino Freeways during the morning peak because of this relatively minor improvement has been very satisfactory.

In order to properly guide motorists on heavily traveled freeways, the best signing possible is always desirable. With this in mind action is being taken as financing becomes available to bring old signing up to current standards. Bids were opened on December 4, 1958, for a $55,000 project to provide new directional signing on the Hollywood Freeway inbound be-



TRAVEL TIME & DISTANCE
FIVE YEAR COMPARISON OF OFF PEAK DRIVING TIME FROM DOWNTOWN LOS ANGELES.

tween Glendale Boulevard and the four-level structure. Improvements are also being made by the City of Los Angeles on the signing from city streets to freeways throughout the Los Angeles metropolitan area.

As many of the freeways in the metropolitan area of Los Angeles have been built with somewhat narrow medians for the high volume of traffic being handled, consideration has been given and plans prepared for the installation of median barriers at certain locations. Funds for such an installation beginning on the Hollywood Freeway near Benton Way and extending to a point on the Santa Ana Freeway east of Lakewood Boulevard in the amount of $290,000 were budgeted by the California Highway Commission in October, 1958.

Performing any type of work on the major freeways once they are open to public traffic presents a very serious problem. When it was determined that as a part of the Santa Monica Freeway construction, it would be necessary to detour the 180,000 vehicles per day on the Harbor Freeway in the vicinity of Venice Boulevard, it was decided that the detour would have to be a full eight-lane divided freeway. This detour was built between Washington Boulevard and Pico Boulevard providing a temporary wooden bridge structure to carry Venice Boulevard over the eight-lane detour. The detour falls within the area of the future Santa Monica-Harbor Freeway interchange and the earth temporarily used in the detour will be incorporated in permanent embankments in the interchange area. The detour was opened to traffic in August, 1958, and has been giving very satisfactory service.

DESIGN "A"

By R. E. DEFFEBACH
Assistant District Engineer

The work of designing freeways and other state highway projects to carry out a construction program of upwards of $100,000,000 per year in District VII, for administrative reasons has been divided into three geographical sections.

Design "A" with a staff of approximately 140 people is responsible for the preparation of construction contract plans for state highways and particularly freeways within the central Los Angeles metropolitan area.

The "East Loop"

Included among the more important freeway projects under preparation by "Design A" during the past year are those required for the completion of the Golden State–Santa

Monica Freeway loop to the east around the Los Angeles downtown area.

A 4.7-mile length of the Golden State Freeway from Ash Street in Burbank to Glendale Boulevard in Los Angeles was completed and opened to public traffic during 1957. Two Golden State Freeway projects totaling 3.4 miles in length from Sixth Street to Mission Road and from Mission Road to Pasadena Avenue, are currently under construction. Two additional projects, 1.0 mile long from Pasadena Avenue to Arnold Street and 2.0 miles long from Arnold Street to Glendale Boulevard, provided for in the 1959-60 Fiscal Year budget, will complete the Golden State Freeway to a connection with the Santa Monica Freeway on the east side of Los Angeles. This connection is made in the "East Los Angeles Interchange," the Bridge Department model of which has recently received wide publicity. This facility provides connections between the Santa Monica, Golden State, Santa Ana, and Pomona Freeways. From this traffic interchange, three projects on the Santa Monica Freeway financed in the 1959-60 Fiscal Year budget in addition to the Los Angeles River bridge and overhead now under construction, will be required to complete the extension of this freeway to a connection with the Harbor Freeway.

The "East Loop," when completed about two years hence, will offer an alternate route for through traffic now using the Hollywood Freeway, bypassing the four-level interchange and the freeways in the Los Angeles downtown area that are so badly overloaded. It is believed that this alternate route will do much to relieve the traffic pressure on the present existing freeway facilities. Some measure of the importance of this loop is indicated by the fact that eight different freeways are involved. These freeways are the Golden State, the Glendale, the Pasadena, the San Bernardino, the Santa Ana, the Pomona, the Santa Monica, and the Harbor. Of these, only the Pomona Freeway has not yet been adopted throughout its entire length.

These six projects (two on the Golden State Freeway, the East Los Angeles Interchange, and three on the Santa Monica Freeway), which are all financed in the 1959-60 Fiscal Year budget, will have an estimated total construction cost of approximately $75,000,000. Plans, specifications and estimates on four of the projects have been submitted, and design of the other two projects is scheduled for completion early this spring.

San Diego Freeway (North)

Of equal importance is the design work on the unconstructed sections of the San Diego Freeway. Currently open to traffic is the 2.0-mile section between Casiano Road and Ohio Avenue in the West Los Angeles area, completed in 1957, and the 1.2-mile section between Valley Vista Street and Burbank Boulevard on the San Fernando Valley side of the Santa Monica Mountains, which was completed in July of 1958. The last section includes the traffic interchange with the Ventura Freeway.

Two projects which will extend the San Diego Freeway southerly of Ohio Avenue to Jefferson Boulevard in the West Los Angeles area are presently under construction by Guy F. Atkinson Company.

It is anticipated that the first contract, betwen Venice Boulevard and Ohio Avenue, with a construction allotment of $6,200,000, will be completed and opened to traffic in February, 1959. The second contract, extending from Venice Boulevard to Jefferson Boulevard, with an allotment of $5,258,000 will be completed early in 1960. During the past year, plans have been pushed toward completion for the balance of the San Diego Freeway between the Harbor Freeway in the southerly portion of Los Angeles, and the Golden State Freeway at the northerly end of the San Fernando Valley.

Other Freeway Projects

Next in order of planning priority is the 13-mile length of the Santa Monica Freeway, from the Harbor Freeway westerly to Pacific Coast Highway in the City of Santa Monica, which is scheduled for completion of design within the next two years.

Additional freeway projects in the Los Angeles area are being currently worked on by Design "A," getting contract plans in shape so that construction can be carried out at some later date, after financing has been provided. These freeway projects include the following:

(1) Widening and improving the San Bernardino Freeway between the Golden State Freeway and the Long Beach Freeway Extension.

(2) Construction on Hollywood Freeway Extension from Ventura Freeway to Golden State Freeway.

(3) Construction on Harbor Freeway from Pacific Coast Highway (US 101 Alternate) to 190th Street in Los Angeles City.

(4) Construction on Ventura Freeway from the Golden State Freeway to the Hollywood Freeway Extension.

(5) Construction on Glendale Freeway from Glendale Boulevard to the Golden State Freeway.

DESIGN "B"

By E. G. HANSON
Assistant District Engineer

The area for which Design "B," with a staff of about 110 people, is responsible, includes southeast Los Angeles County and all of Orange County. In this area there are 10 freeways.

Santa Ana Freeway

During 1958, seven road contracts and one landscaping contract were completed on the Santa Ana Freeway. The road contracts totaled about 22 miles in length, and involved widening the existing four-lane freeway to six lanes between Lakewood and Rosecrans, completion of the six-lane freeway from Buena Park to Anaheim, and completion of approximately 9.2 miles of four-lane freeway southerly of Santa Ana. A 2.8-mile landscaping project in the vicinity of Santa Ana was completed. The total cost of work on this freeway completed during 1958 approximated $15,000,000.

The Santa Ana Freeway between El Toro in Orange County and the Los Angeles Civic Center, is now free of crossings at grade throughout

The much photographed yet always intriguing four-level structure in downtown Los Angeles. The camera looks south along the Pasadena-Harbor Freeway.

its entire length of approximately 43 miles. It is an interstate route.

At the present time, two reconstruction contracts are under way between Rosecrans Avenue and Buena Park, having a length of 4.3 miles and costing approximately $1,300,000. These contracts are for flood control bridge structures and widening from four lanes to six lanes. Upon completion of these contracts, scheduled for May, 1959, the Santa Ana Freeway will be completed to six- and eight-lane standards between the Los Angeles Civic Center and the City of Anaheim, and to four-lane standards southerly thereof.

San Diego Freeway (South)

During 1958, steady progress has been made on the design and construction of various sections of the San Diego Freeway from Long Beach to the Orange–San Diego county line at San Clemente.

In Orange County through the southerly portion of San Clemente, 2.3 miles of the San Diego Freeway was completed at a cost of $2,724,000 and opened to public traffic on October 20, 1958. Then on November 24, 1958, a four-mile section in the vicinity of San Juan Capistrano, passing to the east of the mission and costing $4,230,000, was completed and opened to public traffic. There is under construction in Orange County at the present time a contract on this freeway between Trabuco Creek and Niguel Road, having a length of approximately eight miles and an estimated cost of $4,104,900. It is anticipated that this contract will be completed in July, 1959.

There is included in the approved 1959-60 Fiscal Year budget, an item of $7,000,000 covering the construction of 7.7 miles between Capistrano Beach and San Clemente in Orange County. This will close the gap and complete the section of the San Diego Freeway from its junction with the

Santa Ana Freeway near El Toro, to the Orange–San Diego county line.

There are also included in the 1959-60 Fiscal Year budget, the construction of approximately 1.3 miles of freeway in and adjacent to the City of Long Beach at a cost of approximately $6,500,000 and another project in the City of Long Beach covering the construction of some 17 bridges, a pedestrian separation, pumping plants and incidental retaining walls, at an estimated cost of $8,500,000.

There are under design, sections of the San Diego Freeway between Harbor Boulevard in Orange County and the Long Beach Freeway in Los Angeles County totaling some 20 miles. The San Diego Freeway is on the interstate system.

Long Beach Freeway (South)

During 1958, six miles of the Long Beach Freeway were constructed at a cost of $9,000,000, completing this freeway and opening it to public traffic between Pacific Coast Highway in Long Beach and the Santa Ana Freeway at Olympic Boulevard, a total length of 16.5 miles. Details of the design work that had been previously accomplished on this freeway were described in the November-December 1957 issue of *California Highways and Public Works*. The details of construction covering this south section of the Long Beach Freeway were described in the September-October 1958 issue of this magazine.

Laguna Freeway

This is the official name given Route 185 between the City of Laguna Beach and the Santa Ana Freeway. It is 8.4 miles long.

Two miles of the freeway were completed to expressway standards during 1958 at an estimated cost of approximately $500,000. This construction covered two lanes of the ultimate four-lane freeway.

Route 19 Freeway

This route, extending 16.6 miles between the Santa Ana Freeway and Pomona Freeway, was declared a freeway by the California Highway Commission in 1956. This freeway traverses the Cities of Orange, Santa Ana, Placentia, Anaheim, Fullerton, as well as Los Angeles and Orange Counties. Preliminary design is now under way.

Route 176 Freeway

The routing and adoption of the Route 176 Freeway between Yorba Linda Boulevard and the Newport Freeway was covered by resolutions of the California Highway Commission dated January 15, 1952. The length of the freeway is approximately three miles. A two-lane bridge has been completed over the Santa Ana River, together with approaches, at a cost of $280,000. Design of this freeway is now under way.

Artesia Freeway

During 1958, design has been proceeding on the Artesia Freeway easterly of the San Gabriel River to the Santa Ana Freeway. Design is practically complete on 7.6 miles. On November 12, 1958, a public hearing was held in Los Angeles to cover the location of the Artesia Freeway between Alameda Street and Palo Verde Avenue, traversing portions of the Cities of Compton, Long Beach, Bellflower and Dairy Valley.

Riverside Freeway

The California Highway Commission, in 1952 and 1953, declared this section a freeway, between the Santa Ana Freeway and Route 43. The commission, in October, 1957, named this route the Riverside Freeway, from the Santa Ana Freeway in Buena Park to the San Bernardino Freeway near Colton.

During the calendar year of 1958, the Griffith Company completed a contract on the Riverside Freeway between the Santa Ana Freeway and Spadra Road, (State Highway Route 2). The length of that improvement was approximately 3.6 miles and cost

This view northeast toward downtown Los Angeles shows the detour now in operation on the Harbor Freeway while bridges for the future interchange with the Santa Monica Freeway are being constructed.

approximately $3,300,000. This freeway was completed to six lanes with a 22-foot median strip.

Easterly of Spadra Road, Ukropina, Polich and Kral have a contract under way covering 2.7 miles of freeway to Placentia Avenue, with a construction cost of approximately $2,500,000. Upon completion of the latter contract, a full freeway will exist on this route for a length of 6.3 miles. Easterly of the going contract, to the Riverside county line, a length of about 14 miles is completed to expressway standards.

Garden Grove Freeway

In 1954 and 1957, the California Highway Commission adopted routings and declared Sign Route 22 a freeway between US 101 alternate in Long Beach and the Newport Freeway easterly of Orange. The freeway was named the Garden Grove Freeway by the commission, on October 22, 1957. At the present time a divided highway project is under construction on the Garden Grove Freeway for a length of 3.4 miles, at a cost of $1,400,000. The construction is being handled by Cox Brothers Company and J. E. Haddock, Ltd., and is scheduled for completion during the latter part of 1959.

Design is under way on the Garden Grove Freeway between Knott Street and the Santa Ana Freeway and we are preparing to proceed with design easterly of the Santa Ana Freeway to the Newport Freeway.

Newport Freeway

The Newport Freeway was declared a freeway by action of the California Highway Commission by various actions between 1947 and 1954. Included in the 1959-60 Fiscal Year budget is an item covering the construction of frontage roads for the Newport Freeway in and adjacent to the City of Costa Mesa between 19th Street and Palisades Road; the length of the project will be 2.6 miles, and it is estimated to cost $450,000. Between Newport Beach and Costa Mesa, 3.3 miles of the route have been completed to expressway standards.

At the present time we are engaged in the design of the Newport Freeway between the Santa Ana Freeway and its junction with the Riverside Freeway. The length of freeway under design at the present time is approximately seven miles.

DESIGN "C"

By R. V. CHASE
Assistant District Engineer

Covering all of Ventura County and the portion of Los Angeles County northerly of Los Angeles City is the assigned duty of Design "C".

Design "C" staff averages about 120 to 130 people in engineering classifications. The section organization consists of the assistant district engineer, four senior highway engineers, and 20 project engineers. The project engineers are given the responsibility of preparing the construction contract plans, the specifications, and the estimates of a project. In most cases the project design engineers work on two or more projects simultaneously. A resume of the projects currently under way follows:

Ventura Freeway

The Ventura Freeway (US 101) between the west city limits of Los Angeles at Mulholland Drive and the Santa Barbara county line is in various stages of design and construction.

One section between Conejo Grade Summit and Fifth Street in Camarillo, a distance of five miles, is now being constructed to four- and six-lane freeway standards, a contract which is nearing completion at a cost of $3,500,000.

An item of $6,000,000 has been included in the 1959-60 Fiscal Year for construction of the Ventura Freeway through the City of Ventura between 0.25 mile east of Telephone Road and Palm Street. The remaining cost of approximately $3,000,000 for this project is to be financed in the 1960-61 Fiscal Year.

Scheduled for future financing is the extension of the Ventura Freeway westerly to a junction with the existing highway two miles west of the Ventura River. This project also includes an interchange joining the Ojai and Ventura Freeways. The cost is estimated to be $6,900,000.

The entire length from 0.25 mile east of Telephone Road to 2.0 miles west of the Ventura River involves two separations of the Ventura Freeway with the main tracks of the Southern Pacific Railroad and one separation of the Ojai Branch line. There will also be two ramp separations with the main tracks and one structure carrying the Ojai Freeway ramp connection over the Ojai Branch. There will be a total of 22 bridges including the above railroad structures and two pedestrian separations.

Conversion to full freeway of the expressway sections between the west city limits of Los Angeles and Conejo Grade Summit, a length of approximately 19 miles, and between Fifth Street in Camarillo and a point 0.25 mile east of Telephone Road, a length of 11 miles, are in the preliminary design stage. Development to an ultimate eight-lane freeway by stages is proposed. Preliminary designs are well along and it is expected that freeway agreements with Los Angeles and Ventura Counties can be completed in the near future.

West of the Ventura River to Santa Barbara county line, including a realignment out in the ocean at the Chanslor-Western Refinery is also in the early design stage. Construction to four-lane freeway on right-of-way for an ultimate six lanes is proposed. Public meetings are to be held this spring to acquaint the people of the area and local governmental agencies with the proposed plans.

Golden State Freeway (North)

Construction of the 1.3 miles of this freeway between Alameda Avenue and Burbank Boulevard in Burbank is tentatively scheduled for completion on or about October 1, 1959. A contract for landscaping from the Los Angeles River to Ash Street in Burbank is tentatively scheduled for completion on or about March 1, 1959. The 1958-59 Fiscal Year budget also included $6,000,000 for construction between 0.25 mile east of Burbank Boulevard and 0.2 mile west of Roscoe Boulevard. This project has been advertised with bid opening scheduled February 13, 1959.

The 1959-60 Fiscal Year budget includes funds totaling $1,225,000 to

complete the financing on this section. Included in this project is the construction of the portion of the Burbank-Western Flood Control project between Burbank Boulevard and Roscoe Boulevard, by incorporating the United States Engineering Department plans with our freeway plans. The flood control channel and the freeway are so interwoven that one could not be built independently of the other. The construction and right-of-way costs are borne by each agency in accordance with the formal agreements covering the details thereof. Bridge construction on this project includes the Burbank Boulevard Overcrossing of the freeway and an overhead structure over the Southern Pacific Railroad, which is financed by the City of Burbank, Southern Pacific Railroad, and the State of California and will provide the third overcrossing within the City of Burbank of the freeway and the railroad, the others being Olive and Magnolia.

Also included in the 1959-60 Budget is an item of $4,700,000 for construction between 0.2 mile southeast of Roscoe Boulevard and 0.2 mile northwest of Lankershim Boulevard. Plans for this section have been completed, and the project is tentatively scheduled for advertising early in 1959.

The 1959-60 Budget also includes $90,000 for landscaping between Alameda Avenue and Burbank Boulevard.

Plans for the remaining 8.3 miles of this freeway between Lankershim Boulevard and the junction with San Fernando Road are scheduled for completion in 1959 and will include 22 vehicular structures and seven pedestrian structures.

It is proposed to improve the "Ridge Route" portion of the Golden State Highway between the north city limits of Los Angeles and the Kern county line to eight-lane freeway standards under the Federal Interstate Highway Program. The section from the north city limits of Los Angeles to Parker Road, a length of approximately eight miles, is now in the process of design.

A project from 1.25 miles south of Sign Route 126 to Castaic, a distance of 3.9 miles, is being prepared for construction when funds are available. This first project is proposed primarily to eliminate the substandard alignment and grades at the bridges of the Southern Pacific Railroad and the Santa Clara River.

Included in the project will be portions of cloverleaf-type interchanges with Sign Route 126 to Santa Paula-Ventura area.

Foothill Freeway

The portion of the Foothill Freeway between Filbert Street west of San Fernando and Foothill Place west of Sunland, was adopted by the Highway Commission on March 26, 1958. Preliminary design and negotiations for the freeway agreement for this 9.7-mile section are progressing satisfactorily.

Antelope Valley Freeway

This freeway routing of 54 miles in Los Angeles County on US 6 between the Golden State Freeway and the Kern county line has been adopted in three separate sections by the Highway Commission on June 20, 1955, March 21, 1956, and October 20, 1957. The preliminary estimate of construction and right-of-way costs for this route is 60 million dollars.

Design work on this freeway has included the conducting of detailed engineering studies for the determination of exact right-of-way needs and the working out of details sufficient for execution of freeway agreements with Los Angeles County. The alignment will provide a minimum of 60 miles design speed with maximum uphill gradients of 4½ percent. Initial construction will provide for additional truck-passing lanes where necessary.

There will be one railroad overhead required at the Southern Pacific Railroad crossing just southerly of the Santa Clara River.

Plans for the portion in the vicinity of Sierra Highway and Soledad Canyon Road for a distance of about 15 miles, traversing Escondido Canyon to Sierra Highway near Red Rover Road, will be completed August, 1959. This section, for convenience of construction, will be processed in three separate contracts.

This section bypasses the spectacular Vasquez Rocks area, traversing mountainous terrain for which an estimated eight million yards of excavation will be necessary. Cuts and fills to a maximum height of 240 feet and 180 feet respectively will be encountered. Extensive studies to determine the feasibility of separated roadways have also been made in this section.

San Bernardino Freeway (East)

The 1959-60 Fiscal Year budget includes the following items for construction on the San Bernardino Freeway, an interstate route:

1. $1,500,000 for widening from four to six lanes for a distance of 5.7 miles between 0.2 mile east of San Dimas Avenue to the San Bernardino county line, including widening of five bridges.
2. $2,250,000 for widening from six to eight lanes for a distance of 6.5 miles from Rosemead Boulevard to Puente Avenue, including widening of 11 bridges.
3. $2,000,000 for widening from six to eight lanes for the 5.3 miles between the Long Beach Freeway and Rosemead Boulevard, including widening of 13 bridges.
4. $100,000 for landscaping between the San Gabriel River and the West Covina city limits.

Completion of the widening projects listed above will provide a continuous eight-lane facility from the Long Beach Freeway to Puente Avenue and a six-lane facility from Puente Avenue to the San Bernardino county line.

Pomona Freeway

This freeway, consisting of Legislative Route 172 and a portion of Legislative Route 19, traverses the unincorporated territory of the County of Los Angeles and the incorporated Cities of Los Angeles, Monterey Park, Montebello, City of Industry, and Pomona. The limits, as defined by the California Highway Commission on November 16, 1955, are from the junction of the Santa Ana Freeway to the junction of Sign Route 7 (Corona Freeway).

The California Highway Commission on November 20, 1958, adopted the portion of the Pomona Freeway easterly to Woods Avenue from the junction of the Santa Ana Freeway

near the proposed interchange with the Golden State Freeway and Santa Monica Freeway in the Boyle Heights district of Los Angeles. The previously adopted portion of this freeway extends from Potrero Grande Drive to Ninth Street in Pomona by actions of the California Highway Commission on April 21, 1954; April 20, 1955; and June 21, 1955.

Preliminary design has been completed on the easterly portion of the Route 172 section, and freeway agreements have been submitted to the County of Los Angeles and City of Industry for execution. Completion of the preliminary design has made it possible to review plans of local agencies and developers to insure that the freeway route is protected from improvements and that development with the surrounding properties is compatible.

The alignment will provide a minimum of 60-mile-per-hour design speed with maximum gradients of 3 percent. The typical section provides for initial construction of eight lanes between the Santa Ana and San Gabriel River Freeways, with the easterly portion based on initial six-, ultimate eight-lane construction. Major interchanges with four additional freeways are required for this route. They are the Long Beach Freeway at which a four-level interchange is being considered, the San Gabriel River Freeway, the Route 19 Freeway, and the Corona Freeway.

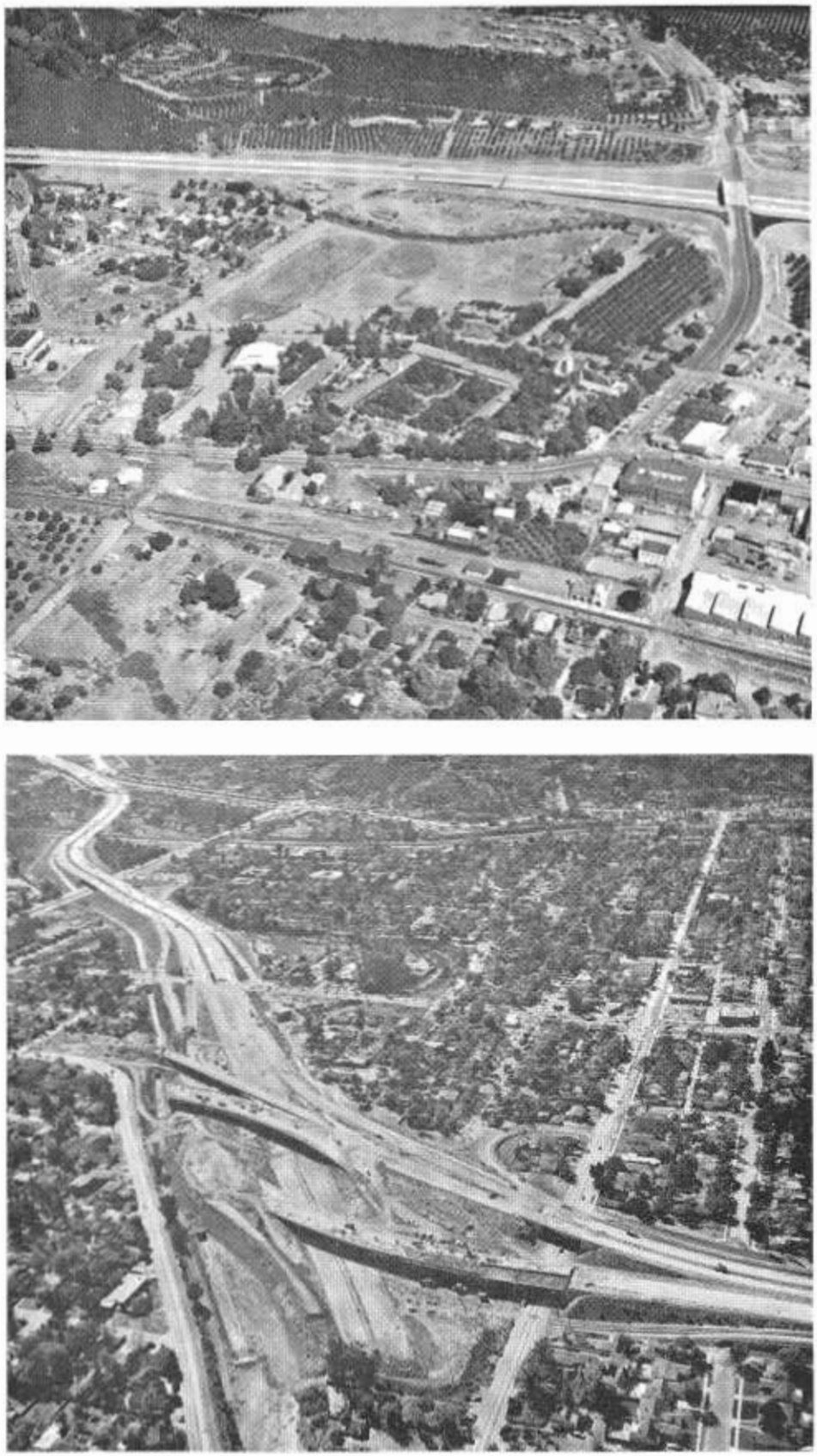
Separations or interchange facilities will be provided at most of the city and county master plan highways.

Corona Freeway

A 3.2-mile section of the Corona Freeway (formerly known as the Temescal Freeway) was completed to four-lane expressway standards in June, 1958, between Fifth Street in the City of Pomona southeasterly into San Bernardino County to a point one mile south of Riverside Drive.

Construction of a pedestrian overcrossing at Grier Street in the city of Pomona is presently under way financed in the 1958-59 Fiscal Year at a cost of $53,000. This structure has just been completed.

Plan work has been started for the conversion of the Corona Freeway to



UPPER—An aerial view eastward showing the Ortega Highway interchange crossing over the San Diego Freeway (right). The buildings in the middle ground are the San Juan Capistrano Mission. LOWER—Construction is now under way on the Ventura Freeway-Hollywood Freeway interchange. This view southward shows the northern end of the Hollywood Freeway.

full freeway standards from the San Bernardino Freeway to the San Bernardino county line, a length of 4.6 miles.

Construction of bridges at Holt Avenue, Valley Boulevard, Bellevue Avenue, and Fifth Avenue are involved. Widening of the bridges over the Southern Pacific Railroad and the Union Pacific Railroad will also be required. Interchanges with Holt Avenue, Valley Boulevard, and Fifth Avenue are proposed. The construction cost of converting this section of the Corona Freeway to a full freeway is estimated at $2,500,000.

Santa Paula Freeway

Preliminary plans for the 14-mile length of the Santa Paula Freeway in Ventura County from US 101 to the east city limits of Santa Paula are well advanced. Freeway agreements have been executed with Ventura County and the City of Santa Paula. Interchange designs have been prepared and right-of-way acquisition is in the early stage over the entire length.

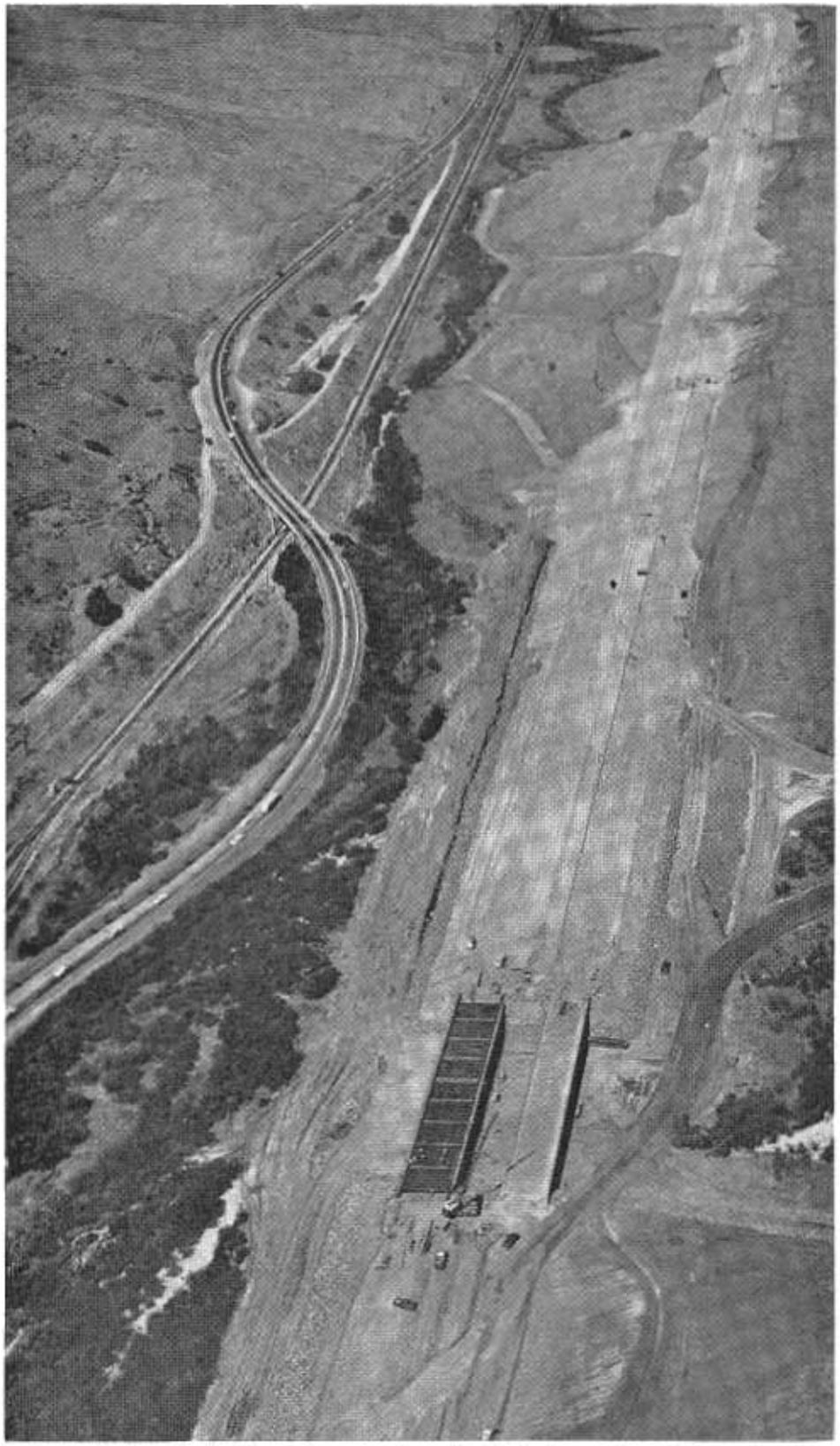
The proposed alignment is located approximately one-half mile south of existing Sign Route 126 (Telegraph Road). The terrain in general is relatively flat and grades are easy, the maximum grade being 3 percent.

Ojai Freeway

A section of the Ojai Freeway in Ventura County between existing US 101 in the City of Ventura and a point 0.4 mile south of Mill School was completed to four-lane freeway standards in 1956. Studies are well along for improving the section between 0.1 mile south of the Southern Pacific Railroad and Foster Park to four-lane freeway on right-of-way for an ultimate six lanes.

Long Beach Freeway (North)

Construction on a 3.6-mile section of the Long Beach Freeway will be started early in 1959) (bid opening February 5th). This six-lane freeway will extend from the present completed northerly terminus at the Santa Ana Freeway northerly to the San Bernardino Freeway and also involve construction of a flood control channel financed by the Los Angeles County Flood Control District and sanitary sewers financed by the City of Monterey Park. Rights-of-way have been acquired for construction of an ultimate eight-lane freeway with



Looking north along the San Diego Freeway under construction in Orange County between San Mateo Creek and Niguel Road. The Oso Creek bridges are in the foreground. The present highway and Galivan grade separation over the Santa Fe Railroad are on the left.

the additional lane to be constructed in the median when warranted by increased traffic.

The estimated construction cost for this section of the Long Beach Freeway totals $7,750,000, of which $6,482,000 is financed by the State and the remainder by the Los Angeles County Flood Control District and the City of Monterey Park.

Plans are being prepared for the extension of the Long Beach Freeway northerly from the San Bernardino Freeway to Norwich Avenue, a distance of 1.4 miles. A six-lane freeway is proposed with sufficient rights-of-way for an ultimate eight-lane freeway. The estimated construction cost of this portion of the Long Beach Freeway is $3,500,000.

San Gabriel River Freeway

Preliminary plans are being prepared for approximately 20 miles of the San Gabriel River Freeway, a part of the Interstate System, from the Orange county line to the San Bernardino Freeway, and approximately two miles from the Orange county line southerly to Garden Grove Boulevard. Interchanges will be provided with the San Diego, Garden Grove, Artesia, Pomona and San Bernardino Freeways and with major county roads and city streets.

Freeway agreements have been executed by the City of Norwalk, the City of Santa Fe Springs, the City of Baldwin Park, and the City of Long Beach, and it is anticipated that freeway agreements will be executed by the County of Los Angeles, the City of Dairy Valley, the City of Downey, and the City of Industry in the near future.

DISTRICT RIGHT-OF-WAY DEPARTMENT

By H. W. LEONARD
Metropolitan District Right-of-Way Agent

The right-of-way staff in District VII consists of 132 right-of-way agents, 159 engineering classifications and 178 clerical, a total of 469 persons. In charge of this group is a metropolitan district right-of-way agent assisted by four supervising right-of-way agents, Mr. E. P. Jones, Right-of-way Engineering; Mr. R. A. Swanson, Appraisals; Mr. K. M. Trenholm, Acquisition, and Mr. J. W. Greathead, Administration.

The Right-of-way Engineering section prepares all maps for appraisal reports, condemnation complaints, relinquishments or abandonments or superseded highways, and prepares all legal descriptions for the conveyance of property by deed or condemnation. The Right-of-way Engineering Section also maintains complete map records of the rights-of-way of all highways within the district. The appraisal section makes preliminary estimates of right-of-way costs for all contemplated projects and later prepares a detailed appraisal report on each parcel of property to be acquired. The acquisition section negotiates the purchase of all properties needed for highway or public works use.

The Supervising Right-of-way Agent, Administration, in addition to being assistant to the Metropolitan District Right-of-way Agent supervises the removal and relocation of utilities in the highway rights-of-way; relocation of buildings and other improvements; the sale of buildings to be removed from rights-of-way, or contracting their demolition when necessary; the securing of title reports and escrow service for processing payments; the rental of properties in the interim between acquisition and removal of the improvement for construction; the sale of remainders of land outside the right-of-way, and general supervision of the clerical personnel. Under his supervision a current record is kept of the status of acquisition of each parcel to be acquired for each construction project together with the maintenance of a record of program expenditures, and preparation of the yearly right-of-way budget; also vouchering for reimbursement for right-of-way acquisition for Federal Interstate Highways.

The Right-of-way Department comes into the freeway picture very early in the program. In connection with the studies of alternate lines for a proposed freeway the Advance Planning Section forwards maps of the lines being studied to the Right-ofway Appraisal Section for the preparation of cost estimates of right-of-way on each of the proposed routes including the costs of moving and relocating utilities and demolition of buildings obtained from the Utilities and Right-of-way Clearance Section. After the necessary public hearings have been held and the route adopted by the Highway Commission, the estimated costs of right-of-way, including utilities and demolition, are forwarded to the Right-of-way Administration Section for inclusion in the proposed budget for the following fiscal year. Funds for the project may be programed over several years, depending on the extent of the project. The proposed right-of-way program is forwarded to the district program and budget section for incorparation in the planning and next fiscal year programs.

Usually funds are first provided in the budget for the purchase of title reports and the making of appraisals. Following the inclusion of this item in the budget the design engineers transmit a preliminary map showing the proposed alignment to the Right-of-way Department. The Right-of-way Engineering Section prepares a map showing the properties affected compiled from the records of the county assessor. Parcel numbers are assigned to these ownerships and prints of this map showing the ownerships outlined in various colors are forwarded to the Right-of-way Title Section for ordering preliminary title reports from the title companies. Copies of these title reports are forwarded to the Right-of-way Engineering Section as received.

As the design of the project proceeds the design engineers forward maps to the Right-of-way Department showing the right-of-way necessary for construction of the highway project. The Right-of-way Engineering Section prepares maps showing the parcels to be acquired and forwards these maps together with copies of the title reports to the Appraisal Section and at the same time proceeds with the writing of the deeds. Upon completion of appraisal reports they are forwarded to the Metropolitan District Right-of-way Agent and to the Assistant State Highway Engineer in charge of the district for approval and

forwarding to Headquarters Office for review and approval by the assistant chief right-of-way agent – Appraisals. Upon receipt of the approved appraisal report from Headquarters Office it is immediately transmitted to the Acquisition Section and in turn to one of the senior nogotiating right-of-way agents in accordance with their assigned negotiating areas.

The senior negotiating agent in turn makes a field review of both the properties to be acquired and comparable properties contained in the report with the right-of-way agent who made the appraisal and the right-of-way agent whom the senior assigns to these particular negotiations.

Following the negotiation and the purchase of a property by the right-of-way agent, the right-of-way contract defining the terms of the transaction, the deed and the auxiliary documents are transmitted by memorandum to the senior negotiating agent for his review and recommended approval and forwarded to the supervising right-of-way agent – Acquisitions, for recommended approval. The transaction is then forwarded to the Administration Section for entry in the acquisition record and forwarded to the Assistant State Highway Engineer for his recommended approval and transmittal to Headquarters Office for final approval. Following receipt by the district of an approved copy of the right-of-way contract from Headquarters Office, three copies are executed by the Assistant District Engineer–Administration and an executed copy is forwarded to the property owner. A copy of the approved and executed right-of-way contract goes to the Right-of-way Accounting Section, then to the Title and Escrow Section for scheduling which initiates payment procedures by the State Controller, and setting up the escrow with the title company. At the same time the Escrow Section forwards a notice of improved properties for rent to the property management section. If the acquisition is a partial taking of the property and the right-of-way contract provides for work to be done by the State a notice of the work to be done is forwarded to the Utilities and Right-of-way Clearance Section for preparation of plans and specifications and advertising for bids and awarding the contract.

In the event the State is unable to acquire the property by negotiation, which occurs only in a small number of cases, the senior negotiating agent so advises the supervising right-of-way agent–acquisition, and right-of-way engineering is advised to prepare a request to the State Highway Commission to pass a resolution authorizing condemnation of the subject property. Upon receipt of a copy of the Highway Commission's resolution authorizing condemnation, descriptions and maps are prepared and forwarded to the condemnation attorneys for preparation of the condemnation complaint and summons. Following the filing of the condemnation action and service of the summons on the property owner, appraisers, nonstaff, are engaged to appraise the property for condemnation and serve as expert witnesses.

George C. Hadley, Assistant Chief Counsel, maintains offices at 3540 Wilshire Boulevard in the Tishman Building, with a staff of 27 attorneys who handle all the right-of-way condemnation cases for Districts VII, VIII and XI. A branch office is maintained in San Diego. By far the greater portion of their efforts are spent in acquiring rights-of-way needed for District VII freeways by eminent domain proceedings. Hadley reports direct to Robert E. Reed, Chief Counsel and head of the State Division of Contracts and Rights-of-way in Sacramento.

More and more, as recruitment and training of personnel permits, staff appraisers are used as expert witnesses in the condemnation actions. It is sometimes necessary to secure a court order of immediate possession to permit awarding the construction contract. Advertising for construction is permitted when a resolution has been passed by the Highway Commission authorizing the condemnation of any unacquired parcels. Award of the contract can be made when a court order for immediate possession has been secured on the unacquired parcels.

During the interim between the acquisition of the rights-of-way and the time the properties must be cleared of improvements for construction, the properties acquired are rented in order to recover as much of the acquisition cost as possible and to prevent vandalism until such time as the improvements are to be disposed of.

When the time approaches that the necessary rights-of-way must be cleared for construction, the buildings to be removed are sold at public auction on the site.

The current fiscal year right-of-way budget for this District VII is 75 million dollars. Additional funds in the amount of approximately 2½ million dollars have been budgeted for advance acquisition of properties, the acquisition of which has not yet been budgeted in the regular right-of-way program but on which the owners contemplate immediate development; if these properties were not acquired, the cost of the right-of-way to the State would be greatly increased. Also the Right-of-way Department will acquire additional properties valued at approximately four million dollars for the State Public Works Board. It is anticipated that this fiscal year the District Right-of-way Department will acquire approximately 3,500 parcels of property. Incidentally, only about 4 percent of the total parcels acquired last fiscal year were by condemnation action including those by stipulated judgment. Last fiscal year the property management section collected more than 2½ million dollars in rents from properties between the time of their acquisition and when the improvements had to be removed to clear the rights-of-way. The building and excess land sales section last year collected nearly three million dollars from the sale of buildings to be removed from rights-of-way and from the sale of remaining lands in excess of the right-of-way.

The 5½ million dollars received from rents and sales is a byproduct of the Right-of-way Department's main activity, that of getting rights-of-way cleared so that freeway projects can go forward to construction.

BRIDGE DEPARTMENT, SOUTHERN AREA

By J. E. McMAHON
Bridge Engineer

Every week, on the average, a major structure is completed in District VII.

The Bridge Department of the State Division of Highways is geared to keep pace with this extensive bridge-building program occasioned by freeway development. The functions of the Los Angeles office are divided into six sections: Advance Planning, Preliminary Investigations, Foundations, Construction, Maintenance, and Special Studies.

In the early stages of highway planning, the Bridge Advance Planning Section works closely with the district to the end that the influence of structures on road location may be given proper consideration.

After the location of the highway has been established, complete information regarding each structure site is assembled. This information is used in proportioning the structure and in arriving at the most economical and efficient type of bridge. The assembling of this information is the work of the Preliminary Investigations Section.

At the same time the Foundations Section investigates subsurface conditions at each bridge site in order that the structures may be supported on foundations that are adequate and economical.

All preliminary information is compiled in report form and forwarded to the Sacramento office of the Bridge Department, where all bridge design work is performed.

Following the award of a construction contract in District VII, the Construction Section of the Los Angeles office of the Bridge Department is responsible for the structural phases of the contract work. The Bridge Department Construction Section maintains close liaison with the district construction.

It is the responsibility of the Bridge Maintenance Section to see that completed bridges on the State Highway System are kept in a safe and serviceable condition. Each of the 1,300 state bridges in District VII is inspected annually by members of the Bridge Maintenance Section.

The Special Studies Section of the Bridge Department makes investigations and prepares reports on structural matters of a special nature, such as proposed tubes and toll bridges.

Since the beginning of the freeway program, an increasing percentage of grade separation structures has been built, as compared with stream crossings. At present, about 75 percent of the structures consists of grade separations on the freeway system.

The complexity of freeway bridge design has increased with the improvement in freeway standards. Examples: the four-level structure in Los Angeles and the 30 structures required to provide for the proposed interchange between the Santa Ana, Golden State and Santa Monica Freeways.

The largest single structure for District VII is the Santa Monica Freeway Viaduct in the City of Los Angeles which will connect the Santa Ana Freeway and Harbor Freeway. This viaduct, portions of which are now under construction, is over three miles in length and has a total estimated cost in excess of $30,000,000.

DISTRICT VII CONSTRUCTION DEPARTMENT

By F. B. CRESSY
Assistant District Engineer

The singular and combined efforts of the many district departments about which you have been reading eventually culminate in an end product whereby the Construction Department begins to play its part in the fulfillment of the district's ever-expanding freeway program. This major objective is completed plans for a project that is ready to be advertised for bids, which soon will become a construction contract. It is at this stage that the Construction Department really begins to make its presence felt in its annual handling of over 50 million dollars worth of freeway contracts. Here the assistant district engineer in charge of the department begins his plans for assignment of engineers to the contract, sets up the administrative program for the project, and arranges for showing the job to prospective bidders.

Actually the construction story begins somewhat earlier in the stage development of a freeway project. In a continuing attempt to improve design

This view to the northeast along the Ventura Freeway shows the interchange with the San Diego Freeway.

plans and specifications as they relate to construction, the Construction Department reviews plans, preliminary reports, and dummy specifications as these features are completed, to insure that latest construction techniques and methods can be utilized in the proposed design and/or specifications. Serving in this capacity is one of the six district construction engineers whose many duties also consist of maintaining continued liaison and coordination with all district departments so that the problems which continually arise as planning and design progress, can be worked out in time so that oversights are reduced to a minimum before the job is let to contract.

Of the six district construction engineers, two are assigned to the construction office, one being in charge of administration, with the other duties as just described. The other four construction engineers are detailed to the field, of whom two are assigned territories to supervise—each territory comprising about half the district. The remaining two construction engineers are assigned as senior resident engineers to the larger district freeway contracts.

Assisting the district construction engineer assigned to the office are six engineers who handle various administrative functions, including handling and preparing progress and final estimates and the final report upon completion of the contract. A secretarial and clerical staff of about 12 people round out the office.

Assisting the district construction engineers in the field are approximately 35 resident engineers and 170 assistant engineers and engineering aids, who perform the inspection, engineering, and administrative duties on the respective contracts.

The year of 1958 was significant in seeing completion of the Long Beach and Santa Ana Freeways to full freeway standards, although widening work in certain locations is still under way on the Santa Ana Freeway. A total of 18 major freeway contracts was completed and opened to traffic in 1958 as compared to seven contracts in 1957. These sections, including a major widening contract on the Santa Ana Freeway, are as follows:

	Miles	*Cost*
SANTA ANA FREEWAY		
Coyote Creek to Ball Road—Orange County	6.5	$6,060,000
Laguna Canyon Road to Browning Avenue—Orange County	5.7	3,380,000
Niguel Road to Laguna Canyon Road, plus 1.2 mile on Laguna Freeway —Orange County	4.2	2,220,000
10th Street to La Palma Avenue—Orange County	1.7	2,050,000
Widening—Lakewood Boulevard to Bloomfield Avenue—Los Angeles County	—	870,000
LONG BEACH FREEWAY		
Imperial Highway to Dozier Street in East Los Angeles	3.8	4,080,000
Rosecrans to Imperial Highway in East Los Angeles	1.9	2,290,000
Atlantic Avenue to Rosecrans	1.2	1,400,000
SAN DIEGO AND VENTURA FREEWAY		
Sepulveda Boulevard to Encino in San Fernando Valley	3.5	7,110,000
GOLDEN STATE FREEWAY		
Glendale Boulevard to Los Angeles River in Los Angeles City	3.2	5,130,000
HOLLYWOOD FREEWAY		
Lankershim Boulevard to Moorpark Avenue in San Fernando Valley	1.6	2,110,000
VENTURA FREEWAY		
Kelvin Avenue to Calabasas in West San Fernando Valley	4.0	3,480,000
Conejo Grade Summit to Fifth Street—Ventura County	5.0	3,990,000
HARBOR FREEWAY		
124th Street to 88th Place in South Los Angeles City	2.6	5,710,000
SAN DIEGO FREEWAY		
San Mateo Creek to Avenida Cadiz in San Clemente	2.3	2,570,000
Sign Route 74 to Trabuco Creek—Orange County	4.1	4,230,000
RIVERSIDE FREEWAY		
Santa Ana Freeway to Route 2 Spadra Road in Orange County	3.6	3,310,000
CORONA FREEWAY		
Fifth Avenue to Riverside Drive near Pomona	3.6	700,000
GLENDALE FREEWAY		
Los Angeles River to Eagle Rock Boulevard	1.0	2,830,000
Total	59.5	$63,520,000

As the above contracts were being completed during last year, new freeways were advertised and awarded, so that there was no slack in the construction program. Although slightly fewer in number than those awarded in 1957, the dollar volume is still large due to five contracts topping the five-million-dollar mark.

Representative of this group is the 4.8-mile contract on the Ventura Freeway between Laurel Canyon Boulevard and Sepulveda Boulevard, which involves an estimated cost of $8,900,000.

On page 41 are the freeway contracts that were awarded during 1958 in the chronological order of bid openings:

The two contracts on the Ventura Freeway shown in the list, which are now under way, will close the last two remaining gaps on this important system, and the completion of these sections will provide a continuous freeway and expressway between the cities of Los Angeles and Ventura, a distance of some 65 miles.

Upon the award and subsequent approval of a district freeway contract such as those listed on page 41, the Construction Department phase begins in earnest. The resident engineer and several assistants will move onto the project, locate the field office, and attend to the myriad duties preliminary to construction. In order to gain maximum advantage of his time, the contractor will usually move quickly onto the project and begin actual work. The resident engineer will thus find little time to get established before he finds himself completely engulfed in a seemingly endless series of meetings, discussions, and conferences with not only the contractor, but also five or six utility companies, public agencies, usually a railroad agency, the public and several district departments who are interested in start-of-job problems.

	Miles	Estimated Cost	Estimated Completion Date
SANTA MONICA FREEWAY From Oak Street to Figueroa Street in City of Los Angeles	0.3	$1,600,000	Sept. 1959
GOLDEN STATE FREEWAY From Sixth Street to Mission Road in City of Los Angeles, and improvement of San Bernardino Freeway	1.7	7,600,000	Jan. 1960
SAN DIEGO FREEWAY From 0.4 mile south of Trabuco Creek to 0.3 mile north of Niguel Road in Orange County	7.9	4,100,000	July 1959
SANTA MONICA FREEWAY Overpasses across Union Pacific and Santa Fe Railroad near Los Angeles River in City of Los Angeles	0.5	3,400,000	Dec. 1959
GOLDEN STATE FREEWAY From Mission Road to Pasadena Avenue in City of Los Angeles	1.2	3,000,000	Dec. 1959
SANTA ANA FREEWAY Widening existing freeway from four to six lanes from Rosecrans Avenue to Coyote Creek in Los Angeles County		1,800,000	May 1959
VENTURA FREEWAY From Laurel Canyon Boulevard to Sepulveda Boulevard in San Fernando Valley–City of Los Angeles	4.8	8,900,000	Feb. 1960
GARDEN GROVE FREEWAY From 0.1 mile west of Los Cerritos Channel to Knott Avenue in Orange County	5.5	1,700,000	Nov. 1959
RIVERSIDE FREEWAY From 0.4 mile west of Route 2 to 0.1 mile east of Placentia Avenue in cities of Anaheim and Fullerton	2.7	2,600,000	Dec. 1959
VENTURA FREEWAY From 0.3 mile east of Encino Avenue to Kelvin Avenue in San Fernando Valley–City of Los Angeles	3.9	5,600,000	Feb. 1960
HARBOR FREEWAY From 190th Street to 124th Street in South Los Angeles City	4.9	8,100,000	Aug. 1960
SAN DIEGO FREEWAY From Jefferson Boulevard to Venice Boulevard in and near Culver City and West Los Angeles City	2.3	5,300,000	May 1960
TOTALS	35.7	$53,700,000	

By the time these meetings level off, the job has gathered a full head of steam and the resident engineer finds himself requiring additional assistants, a full-time materials man, a survey party, and the field representatives furnished by the Bridge Department who will handle all major structure work on the project.

On freeway contracts it has been found necessary to assign an experienced engineer as a principal assistant to the resident engineer with a primary duty of keeping abreast of the over-all problems in the contracting and assisting in assigning personnel to the individual items of work. The necessity for this is obvious when it is realized that freeway contracts are now running into millions of dollars and the resident engineer cannot handle all problems efficiently if he is also burdened by too many details.

As the job progresses the resident engineer's responsibilities resolve themselves into settling policy matters on construction features with the contractor, keeping track of job progress, determining the need for change orders and the preparation of change orders for approval by the State Highway Engineer, and getting out the monthly progress estimate for the contractor's progress payment, to mention but a few.

The inspection of work and accurate accounting of contract quantities in permanent field records is handled by the assistants and is a full-time duty. As the contract nears completion, the key item for the resident engineer to handle is the writing of the final report with its attendant "end of job." The end-product, the completed job, is then turned over to "maintenance."

FREEWAY MAINTENANCE

By W. D. SEDGWICK
Assistant District Engineer

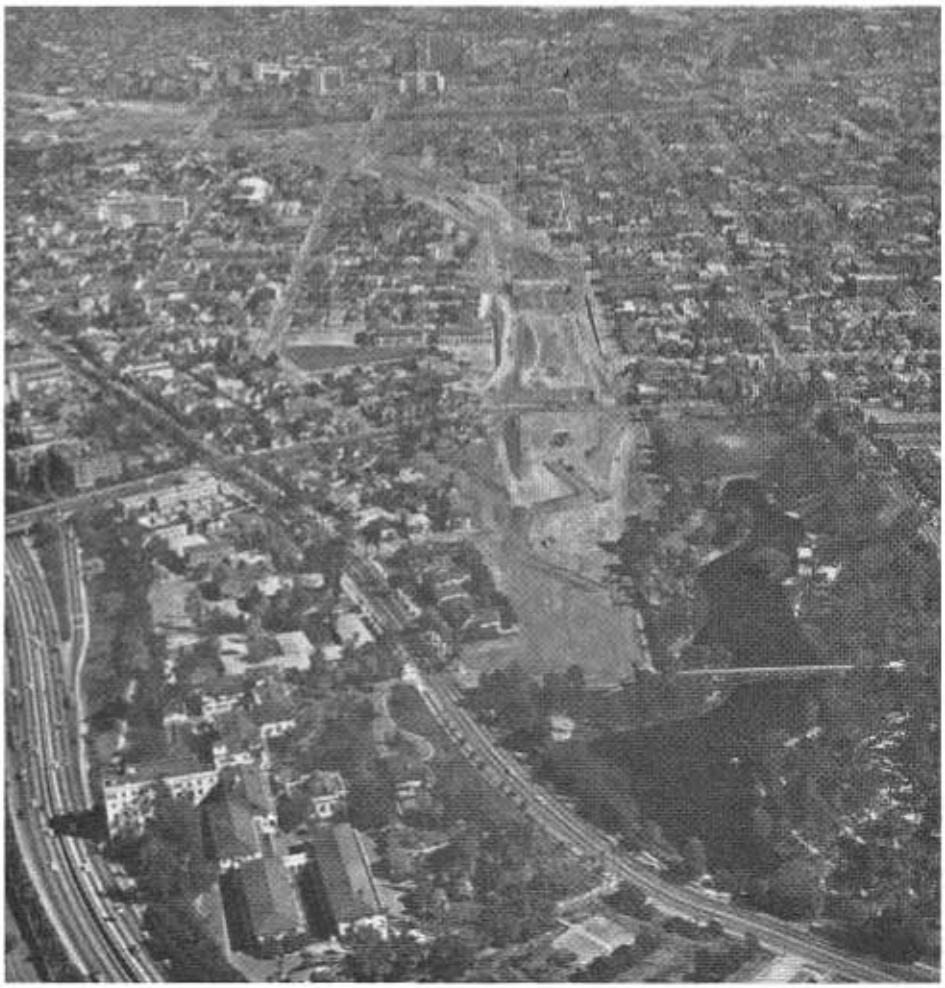
The maintenance of the freeways and highways in District VII during the 1957-58 Fiscal Year required a staff and field force of 449 state employees to accomplish work involving a total expenditure of $4,318,761. In addition, the State reimbursed the various cities maintaining state highways, other than freeways, in cities, for their cost in the amount of $719,487, and therefore the total of the program administered by the Maintenance Department was $5,038,248 for the last fiscal year.

The freeways are rapidly increasing the acreage of landscaped roadsides to be maintained as well as the added surface area due to long on- and off-ramps, and the multilane divided highways as compared to the conventional undivided highway.

The divided highways with curbed medians double the curbed miles of gutters to be swept as compared with the normal curbed streets or highways that they replace.

The traffic demand for all of the freeway lanes is so great that much of the maintenance required on freeways can only be done during early morning hours on Sundays, between daylight and church time. This includes traffic striping and patching.

The maintenance of the trees and landscaping is increasing to the extent that there will soon be as many field employees on this work as on maintaining the traveled way. In 1940 there were 15 field employees on trees and landscaping and 247 field employees on regular maintenance crews, with 10 employees on the sign and striping



Construction on the Golden State Freeway is under way in the Boyle Heights area of East Los Angeles. Hollenbeck Park is in the right foreground; Los Angeles County General Hospital in the background.

crew. At the end of the fiscal year on June 30, 1958, there were 112 field employees on trees and landscaping, and 258 on regular maintenance, with 38 more on signals and safety lighting and also 37 on signs and striping. It is anticipated that about 150 men will be on trees and landscaping at the end of this fiscal year and 230 men at the end of the next fiscal year.

Emergency items are those which the public recognizes as major Maintenance Department responsibilities. The removal of snow and sanding of icy pavements on the Ridge Route as well as on the Angeles Crest Highway are major operations during and after storms, in order to keep the highways open to traffic. This also applies to removal of earth and rock slides on the mountain and coast highways.

The problem of replacing miscellaneous safety devices knocked down by vehicles has increased appreciably in the last few years. The annual cost has gone up from about $40,000 per year in 1952 to nearly $160,000 per year.

Besides the maintenance fund items, day labor forces are called upon to organize and take the huge annual traffic count which requires 2,275 additional temporary employees for the two-day count each July. Also accomplished are minor improvement jobs which are either of an emergency nature or do not lend themselves well to contract. Maintenance forces provide services for other governmental agencies not organized to accomplish them efficiently, in the total amount of $30,000 per year. Field forces are also called upon to inspect encroachment permits, involving a similar expenditure.

In studying the maintenance expenditures by various categories, it is interesting to note that the approximate annual maintenance cost per mile of about 140 miles of completed freeways was $9,950, while the cost of maintaining 31 miles of fully landscaped freeways was $21,200 per mile. Although the freeways are only 9.52 percent of the state highways in District VII, the cost of their maintenance was 27.36 percent of the total. Also in the same approach, although the metropolitan fully landscaped freeways checked on are only 2.13 percent of the district mileage, the maintenance cost was 13.06 percent of the total.

There were 122 miles of expressways which averaged nearly $4,000 per mile to maintain, which totaled 8.37 percent of the mileage and 9.64 percent of the total cost. Combining the freeways and expressways to obtain the divided highway averages, there is a total of 262 miles, with

A view eastward along the Riverside Freeway in Orange County. The interchange in the foreground is with Brookhurst Avenue.

an average maintenance cost of $7,150 per mile, which is 17.89 percent of the miles with 37 percent of the total cost. This leaves 1,196 miles of undivided highway at an average cost of $2,653 per mile, which is 82.11 percent of the mileages and 63 percent of the total cost. Maintenance expenditures in District VII totaled $5,038,248 for 1,456.81 miles of state highways.

ADMINISTRATION

By A. D. GRIFFIN
Assistant District Engineer

Administration, which now includes 165 employees, is perhaps the one department not working in some way directly on freeways. We are unable to point to any specific thing about freeways and say, "This we did." Administration is strictly a service organization to facilitate the work of other District VII departments, to help engineering units of other governmental agencies (cities and counties) carry out their projects, and to provide essential information to the public. Its work is carried out through the District Personnel Department, the District City and County Co-operative Projects Department, the District Chief Clerk and the District Office Engineer.

As a part of Administration, the District Personnel Department computes the time worked, vacation and sick leave allowances, and prepares the payrolls for over 2,300 employees. Personnel keeps the inservice training program in active operation and makes the necessary arrangements for rotation of employees to broaden their experience and to increase the value of their services to the State. Personnel also carries out a comprehensive recruitment service.

Another important unit of Administration is the District Accounting Department. It is a function of this department to see that all freeway and other state highway expenditures in the district, which for 1958 will approximate $120,000,000, are detailed and properly charged to the various individual jobs. This work involves the preparation of hundreds of service agreements covering utilities, equipment rentals and minor contracts, the preparation of thousands of requisitions and purchase orders to supply the various needs of the entire organization, the preparation of schedules to process documents in payment of these services and purchases, the preparation of the salary and equipment cost detail of the entire staff organization. It also involves the record keeping of some 30,000 to 40,000 items of miscellaneous equipment, thousands of buildings, plants and lands inventory records, and property survey reports to write off obsolete, damaged and lost equipment. Also, the supervision of the work of eight field offices, the audit of daily extra work reports on contract, and the checking of contract final reports.

The State Division of Highways, in the course of its business, finds it necessary to accomplish work for other agencies which is closely related to its own work and this involves the receipt of from two to six million dollars a year of money paid by these other agencies. Agreements for such work must be closely scrutinized and procedures set up to see that proper follow-through is performed. There are other "accounts receivable" involving large amounts of money for the rental of state property, the sale of excess land and improvements thereon, and reimbursement for claims for damage to state property in highway accidents.

The District City and County Co-operative Projects Unit reviewed plans and administered the spending of $15,000,000 during the past year for co-operative projects on major city streets and on county roads. Some of these construction projects were necessitated by reason of changed conditions due to freeway development, and others were to improve traffic conditions on roads and streets that in many cases may be regarded as feeders to the state freeway system.

The District Office Engineer's staff opens the bids not only for all District VII contracts but also for the major construction contracts of Districts VIII and XI. During the past 12-month period, 711 bids were opened with a total value in excess of $80,000,000. In the case of 24 demolition bids that were opened during this period, contractors paid the State a total of $5,231 for salvage.

The District Reproduction Section is now doing $25,000 to $30,000 worth of business per month. During the month of October, 1958, a record was set when it was found that reproduction of maps and plans by Ozalid, Vandyke, and blueprinting processes if spread out would cover over six acres, and sheets reproduced by multilithing if placed end to end would extend seven miles.

The District Highway Information Section, consisting of a staff of seven, carries on an active program in dealing with the information-seeking public. During the past 12 months the District VII Highway Information Office has answered 8,246 personal and 16,811 telephone inquiries, or a total of 25,057 inquiries regarding highways and particularly freeways.

Speaking engagements under the general heading of "Activities of the State Division of Highways in District VII" at luncheons and evening meetings, before official and professional groups and service clubs numbered 108 for the year. In all, since 1950, when this phase of disseminating highway information was first introduced, more than 800 speeches on highway and freeway subjects have been given.

Besides inservice audiovisual training programs, the Highway Information staff have been directly concerned in innumerable freeway opening ceremonies, press conferences and interviews with people on the staffs of television and radio stations, newspapers and magazines. The Highway Information staff have also handled the drafting of many local press releases, articles (both for *California Highways and Public Works* magazine and for private publications), and official letters in response to public inquiries. Another important activity is the conducting of freeway tours for visiting engineers from such places as Abyssinia, Trinidad, Japan, India, Lebanon and South America.

The prospect for the current year, 1959, is one of broader and more accelerated activity on the part of the District VII staff. The keen interest of the public in freeway development as the Greater Los Angeles Freeway

STATUS OF DISTRICT VII PROJECTS—JANUARY 1, 1959

Freeway name	Total miles	Completed projects		Under construction		Right-of-way costs	Total obligated costs to date
		Miles	Construction costs	Miles	Estimated construction cost		
Pasadena Freeway 4-Level Structure to Glenarm St. in Pasadena	8.2	8.2	$10,821,000	.....	.....	$1,009,000	$11,830,000
Hollywood Freeway Spring St. via Cahuenga Pass to Junction on Golden State Freeway near Wentworth St.	17.2	10.5	33,814,000	0.4	$703,000	33,680,000	68,197,000
*Santa Ana Freeway Junction of San Diego Freeway near El Toro to Spring St. in Los Angeles	42.6	42.6	60,605,000	.....	1,818,000	19,551,000	81,974,000
*San Bernardino Freeway Santa Ana Freeway in Los Angeles to San Bernardino County Line in Claremont	30.6	30.6	36,635,000	.....	220,000	18,089,000	54,944,000
Harbor Freeway Battery St. in San Pedro to 4-level Structure	22.2	13.1	35,112,000	4.5	8,089,000	52,067,000	95,268,000
Long Beach Freeway Pacific Coast Highway in Long Beach to Huntington Dr. in South Pasadena	21.5	16.8	28,182,000	.....	.....	23,261,000	51,443,000
*Golden State Freeway Santa Monica Freeway-Santa Ana Freeway Interchange to Kern County Line	70.3	51.2	26,683,000	3.8	16,309,000	62,657,000	105,649,000
Ventura Freeway Junction Golden State Freeway to Santa Barbara County Line	75.5	48.0	26,741,000	9.3	17,554,000	32,135,000	76,430,000
*San Diego Freeway San Diego County Line to Junction Golden State Freeway near San Fernando	88.9	11.5	17,045,000	12.7	16,569,000	50,398,000	84,012,000
Colorado Freeway Eagle Vista Dr. in Eagle Rock to Holly St. in Pasadena	2.3	2.3	6,394,000	.....	.....	2,296,000	8,690,000
*Foothill Freeway Junction Golden State Freeway to Foothill Place and Hampton Rd. to Montana St.	12.0	2.3	2,270,000	.....	.....	628,000	2,898,000
Glendale Freeway Ardmore Ave. to Vermont Ave. and Glendale Blvd. to Ave. 36	3.2	1.1	2,882,000	.....	.....	4,600,000	7,482,000
Artesia Freeway Normandie Ave. to Santa Fe Ave. and Palo Verde Ave. to Santa Ana Freeway	12.5	4.9	2,455,000	.....	.....	2,972,000	5,427,000
Riverside Freeway Junction Santa Ana Freeway to Riverside County Line	19.1	17.0	7,553,000	2.2	2,609,000	5,344,000	15,506,000
Ojai Freeway Junction Ventura Freeway in Ventura to 0.4 mile North of Foster Park	6.0	4.0	2,140,000	.....	.....	1,170,000	3,310,000
*Santa Monica Freeway Junction Pacific Coast Highway to Junction Santa Ana Freeway	14.9	.....	477,000	0.3	5,010,000	44,114,000	49,601,000
Pacific Coast Freeway Junction San Diego Freeway to Serra Junction; Newport Freeway to 3000' Wly of Rte. 171; Los Angeles County Line to South C/L of Oxnard and North C/L of Oxnard to Junction of Ventura Freeway	24.3	7.2	2,519,000	.....	.....	2,347,000	4,866,000
Garden Grove Freeway Pacific Coast Highway to Junction Newport Freeway	17.9	.....	.....	.....	1,473,000	3,741,000	5,214,000
Other Freeways Covered by Resolution of Adoption by Highway Commission	181.2	6.8	3,114,000	.....	37,000	10,731,000	13,882,000
Totals	670.4	278.1	$305,442,000	33.2	$70,391,000	$370,790,000	$746,623,000

* Interstate Highways

System expands and as the intensified construction program, made possible by heavier allocations of state and federal funds, gets under way there is assurance of another busy year—a year given to the dissemination of essential freeway information to a steadily growing population of freeway-conscious citizens.

SPECIAL DRIVING-TIME STUDY

The Downtown Business Men's Association of Los Angeles has recently completed a study indicating that freeways have brought nearly all areas five miles closer to Downtown Los Angeles than they were for a 30-minute driving period in 1953. This fact is indicated by the map prepared by

. . . continued on page 64

California Highways . . . 1958

An Annual Report

By G. T. McCOY, State Highway Engineer

The report which appears on Pages 45 through 60 basically covers the 1957-58 Fiscal Year, but has been revised to include important developments extending to December 31, 1958. Copies of this report may be obtained upon request.

MOBILITY provided by millions of motor vehicles is a key feature of California living and a vital element in the State's spectacular record of continuing economic growth.

In a typical California household the automobile is an important factor in nearly every phase of family life from routine homemaking to the annual vacation.

For the State's widely diversified economy, motor transportation often provides the only practical link between fields, factories and markets.

As a result, California has more cars and trucks than any other state, about 7,650,000. This is more than one motor vehicle for every two of the State's 15,000,000 citizens.

In a society where motor transportation plays such an important role in everyday living, good highways are essential.

California citizens have long recognized this fact and through the years have given strong support to a broad and continuing program of state highway development.

On the basis of several comprehensive traffic and financing studies, the State Legislature has implemented pay-as-you-go highway development through realistic user taxes. At the same time it has delegated to the California Highway Commission the authority and responsibility to determine highway routings and to allocate construction funds, subject to certain geographical controls.

These legislative policies have insured continuity in long-range planning and fostered the steady and orderly progress which has characterized California's highway improvement program.

Symbolizing California's spectacular progress in highway development is the parallel Carquinez Bridge on US Highway 40 at Crockett (right) and its extensive freeway approaches which were opened in November, 1958. Construction began on the $46,000,000 toll project in late 1955.

The result has been a network of state highways widely recognized to be the best in the Nation.

The significant progress in recent years toward meeting the State's still mounting highway needs is continuing at a rapid pace with new improvements completed nearly every day.

The Division of Highways, a unit of the State Department of Public Works, is in charge of the planning, right-of-way acquisition, construction, operation and maintenance on state highways. The division's activities cover the entire range of highway work from large-scale freeway and

bridge construction to small but essential maintenance chores.

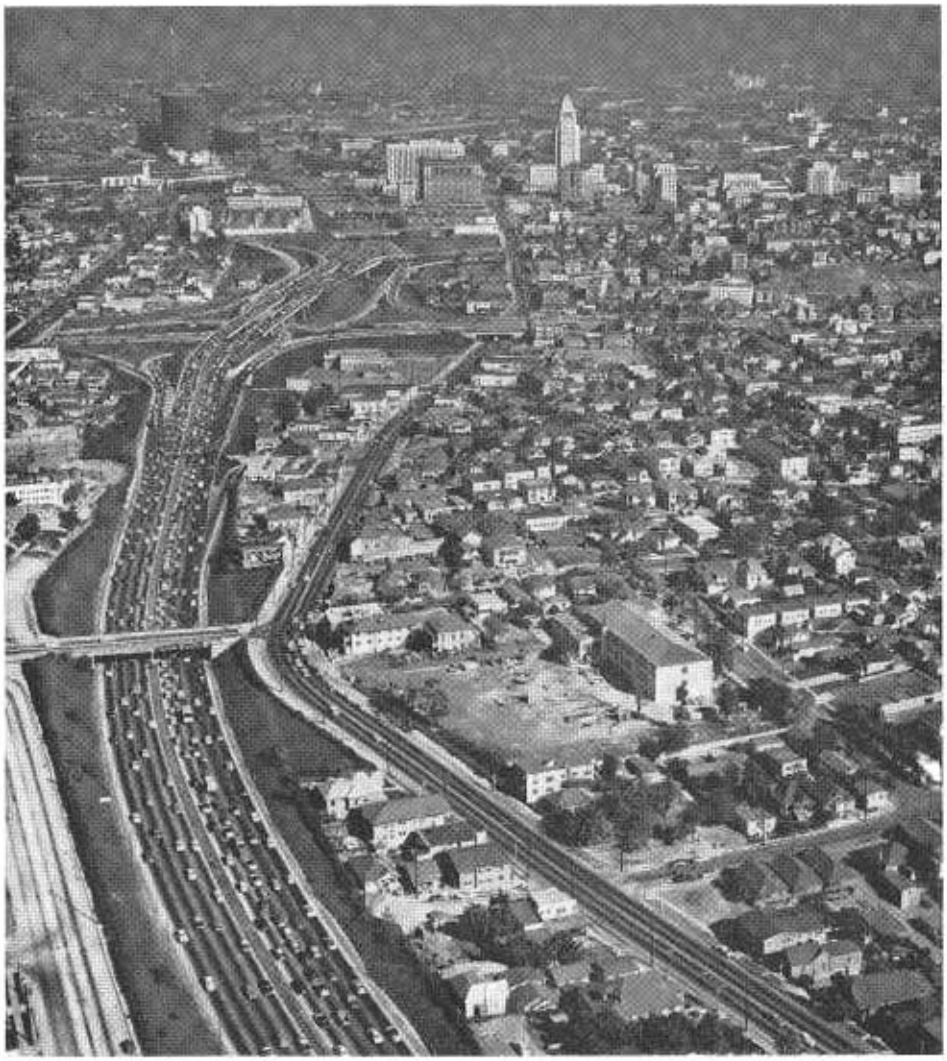
State highway development and operation for the fiscal year ending June 30, 1958, are reported in the Twelfth Annual Report to the Governor by the director of public works. This report contains sections on each phase of the highway program. It also includes detailed financial tabulations, contract statistics and other data. (Some of this information, together with other more recent data, is included here.)

Three significant developments, touching upon the major areas of planning, financing and construction, highlighted the past year:

1. A plan for a statewide freeway and expressway system was completed and presented to the Legislature's Joint Interim Committee on Highway Problems. The committee has now completed a series of public hearings on this "California Freeway System" in preparation for legislative recommendations.

2. Congress acted to provide for the apportionment of federal interstate highway funds on the basis of the relative needs of the various states instead of the old area-population-post road mileage formula. This resulted in a substantial increase in the apportionment to California.

3. Many important construction projects were completed or under construction to close freeway gaps on heavily traveled intercity and through routes and to provide new links in the basic freeway networks of major metropolitan areas. Largest of these completed projects was the parallel Carquinez Bridge and freeway approaches.



The most heavily traveled section of freeway in the State is this portion of the Hollywood Freeway near the Los Angeles Civic Center. Traffic conditions on this route and other central Los Angeles freeways will be improved by a series of current and budgeted projects on the Golden State and Santa Monica Freeways, which will provide a close-in bypass east of the downtown area. (Note absence of congestion on adjacent Temple Street, a major city thoroughfare.)

SCR 26 Report

The master plan for the California Freeway System is the first highway plan of its type ever attempted on a statewide basis without regard to city, county or state jurisdiction.

Studies leading to the plan were requested by the 1957 Legislature in Senate Concurrent Resolution No. 26.

The resolution called upon the Department of Public Works to undertake a study which would provide the basis for an overall plan of freeways and expressways. It specified that potential routes were not to be limited solely to state highways, but should also include city streets and county roads.

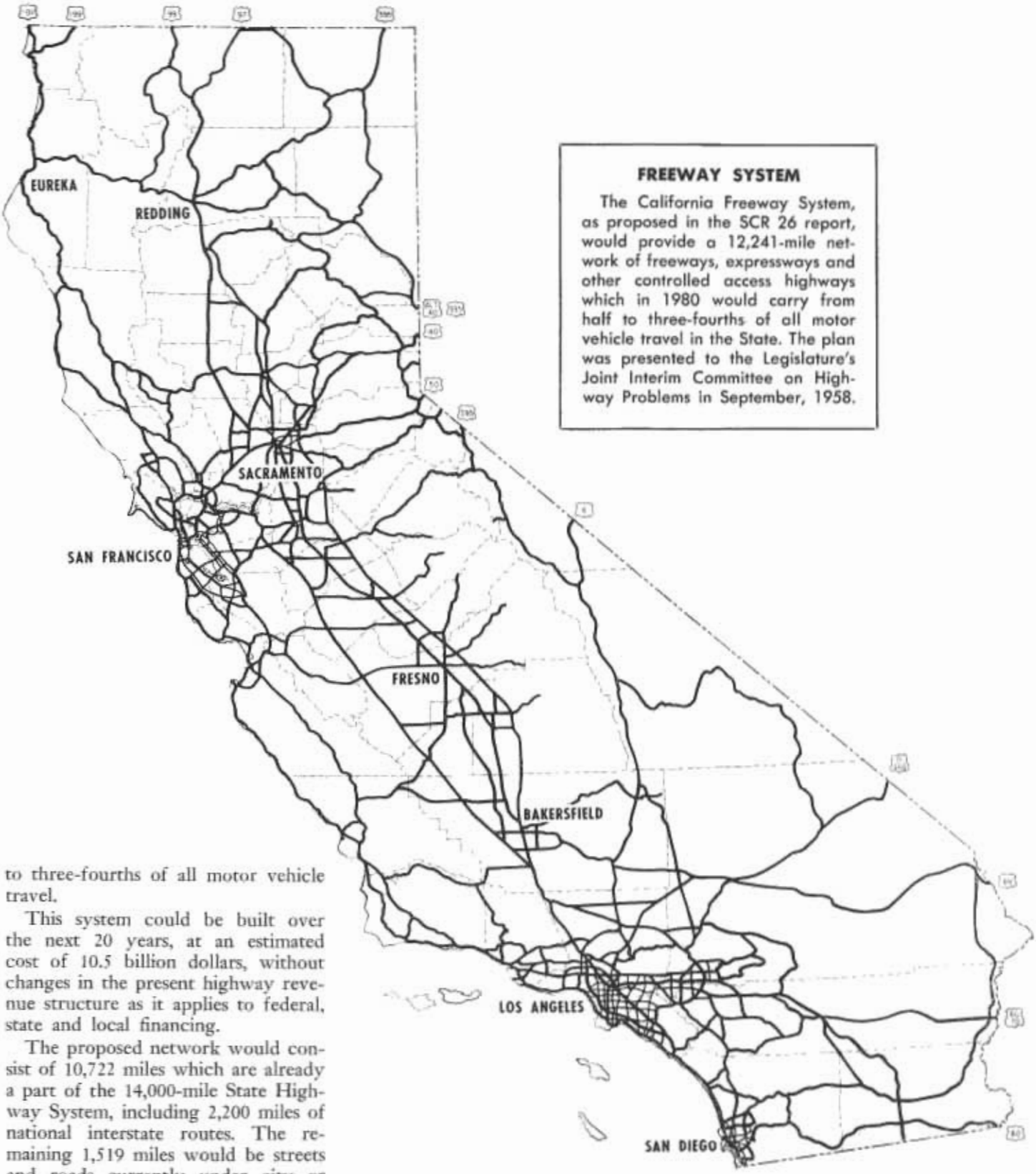
The 18 months of intensive work that went into the plan involved the most comprehensive analysis of motor vehicle traffic, population, and economic conditions ever undertaken in California for highway planning purposes.

In preparing the plan, the Division of Highways worked closely with a Legislature-appointed committee of city and county officials which acted in a technical advisory capacity. The Automotive Safety Foundation of Washington, D. C., and the Institute of Transportation and Traffic Engineering of the University of California also assisted.

County and city engineering staffs extended full co-operation. In a number of instances the division joined with counties and their incorporated cities in hiring engineering consultants to formulate regional highway master plans for use in connection with the statewide study.

A total of 23 separate meetings were held, involving 730 county representatives and officials from 280 cities.

The plan, as presented to the Legislature in September, 1958, in the SCR 26 report, proposes a 12,241-miles network of freeways, expressways and other controlled-access highways which in 1980 would serve every city of 5,000 or more in population and which would carry from half



FREEWAY SYSTEM

The California Freeway System, as proposed in the SCR 26 report, would provide a 12,241-mile network of freeways, expressways and other controlled access highways which in 1980 would carry from half to three-fourths of all motor vehicle travel in the State. The plan was presented to the Legislature's Joint Interim Committee on Highway Problems in September, 1958.

to three-fourths of all motor vehicle travel.

This system could be built over the next 20 years, at an estimated cost of 10.5 billion dollars, without changes in the present highway revenue structure as it applies to federal, state and local financing.

The proposed network would consist of 10,722 miles which are already a part of the 14,000-mile State Highway System, including 2,200 miles of national interstate routes. The remaining 1,519 miles would be streets and roads currently under city or county jurisdiction or not yet constructed. (See accompanying map.)

The plan is geared to an estimated population in 1980 of 31,000,000, and to motor vehicle registration of 17,000,000 with yearly travel by cars and trucks of some 200 billion vehicle-miles. (The current annual travel in California is an estimated 65 billion vehicle-miles.)

Commenting on the need for such a freeway plan, State Senator Ran-

dolph Collier, Chairman of the Joint Interim Committee on Highway Problems, has said that "a comprehensive freeway system for California is the next logical development in the effort to secure for the entire State an efficient transportation system to accommodate the economic expansion that is bound to occur in the years ahead."

Interstate Needs Formula

The 1958 Federal Highway Act, which was passed by Congress last year, put into effect the original provision of the 1956 Highway Act which called for the apportionment of federal interstate highway funds to the various states on the basis of their relative needs.

Approximately 10 percent of the motor vehicles in the United States are in California, and it has been found, in studies approved by the U. S. Bureau of Public Roads, that about 10 percent of the Nation's total interstate highway needs are also found in this State.

Thus, the apportionment of interstate funds according to need means that California, which previously received only about 6 percent of the national interstate apportionment, gets approximately 10 percent of the national total for 1959-60 and 1960-61.

As a result of the change, the State's 1959-60 interstate apportionment is approximately $137,000,000 more than the original 1958-59 apportionment, which was made under the old distribution formula.

Although the needs formula was activated for only two fiscal years (1959-60 and 1960-61), Congress is expected to consider applying this apportionment basis to future years in accordance with the intent expressed in the 1956 Federal Highway Act.

Construction Progress

From a construction point of view, the past year saw tremendous and gratifying progress on many major highway routes as California extended its national leadership in mileage of toll-free multilane divided highways.

When work is finished on several current and budgeted projects, this recently completed portion of the Ventura Freeway in the San Fernando Valley will be part of 90 miles of continuous full freeway on US Highway 101 from Calabasas, through Los Angeles, to the San Diego County line south of San Clemente.

By the end of 1958, California had 1,973 miles of this type of highway in operation and another 359 miles under construction as compared to 1,810 miles in operation and 358 under construction a year earlier.

The construction emphasis in recent years has been on freeways because of their time-tested ability to handle more traffic with greater safety than any other type of highway. This is possible through the control of access, the elimination of cross traffic and left turns at grade, and the separation of opposing traffic. Unlike conventional highways, freeways retain their capacity characteristics undiminished through time by adjacent development.

A total of 626 miles of full freeway was in operation at the end of the year, and another 218 miles were under construction.

In addition, most of the State's 864 miles of expressways, which have some intersections at grade, are designed for future conversion to freeway status. A number of controlled-access two-lane highways have been built in recent years, and most of these are also designed for ultimate conversion to full freeway or expressway.

In 1958 the highway construction program resulted in freeway improvements which enhance previously completed projects and add to the driving pleasure, comfort and safety of motorists throughout the State.

In the Los Angeles area, which generates 43 percent of the State's motor vehicle travel, the basic routes of the metropolitan region freeway network are virtually completed, and the emphasis of the construction program is being shifted to freeways which will skirt the central area and provide considerable traffic relief.

During the past year a total of 22 miles of freeway was completed and opened to Los Angeles traffic. Another 24 miles were under construction at the end of the year.

Projects under way or budgeted on the Ventura Freeway in the San Fernando Valley and on the San Diego Freeway in Orange County will complete U. S. Highway 101 as full freeway for some 90 miles from

At the end of 1958 work was nearly completed on this section of the double-deck Embarcadero Freeway in San Francisco. In the background is a portion of the San Francisco-Oakland Bay Bridge.

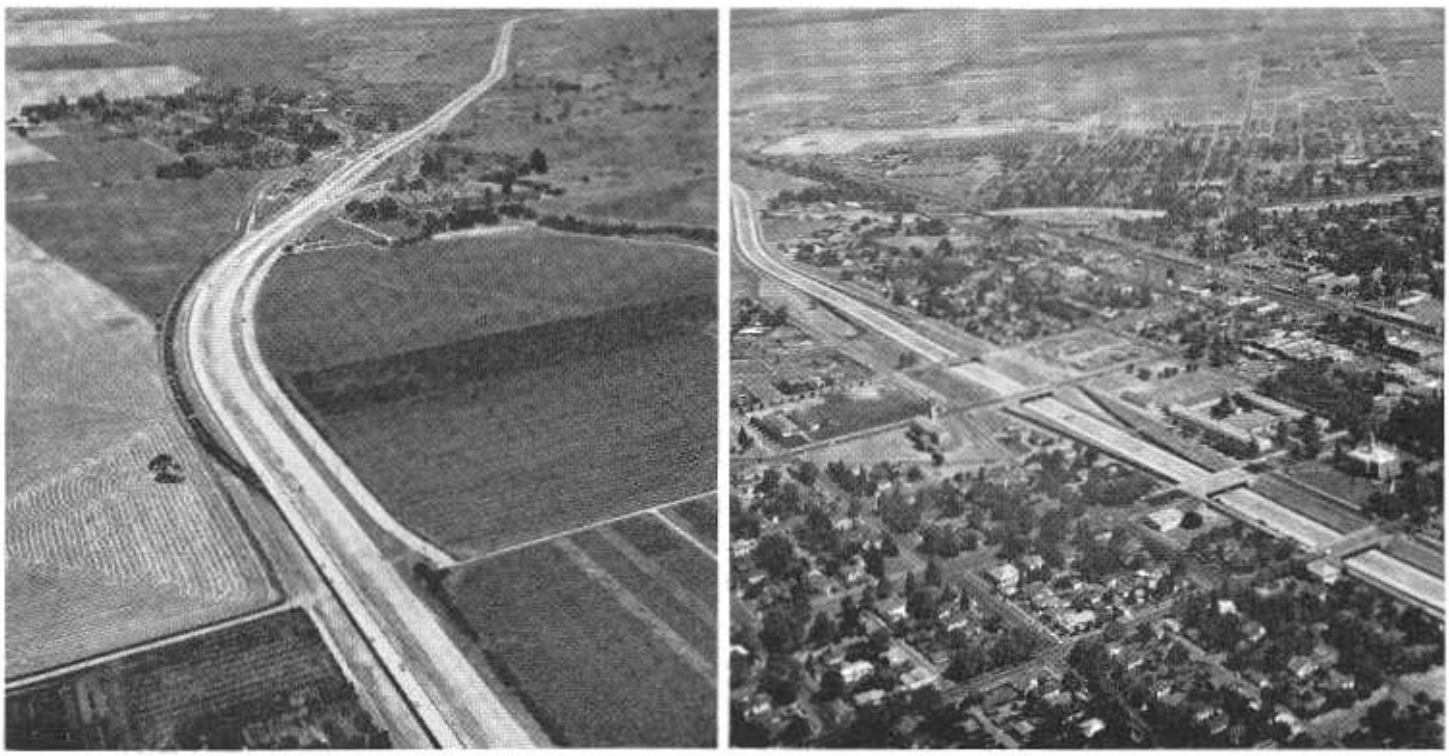
Calabasas to San Clemente. This includes the completed portions of the Hollywood and Santa Ana Freeways through and south of Los Angeles.

The San Bernardino Freeway is completed to freeway standards between Los Angeles and east of Ontario, a distance of about 38 miles, and work is now in progress on the conversion from expressway to freeway for an additional 14 miles to Colton.

In the past year construction on the Long Beach Freeway closed the final freeway gaps in a 17-mile stretch between the Santa Ana Freeway and Long Beach.

The Harbor Freeway was extended as far south as 124th Street near Compton, and at year's end construction of an additional five miles to 190th Street was under way. Freeway projects were also completed or under construction on the Riverside Freeway.

The 1959-60 State Highway Budget provides funds for a spectacular series of freeway projects on the Golden State and Santa Monica Freeways which, with projects under construction in 1958, will complete a close-in bypass of downtown Los Angeles.



Two important freeway projects completed in the past year were the Los Alamos Bypass on US Highway 101 (left) in Santa Barbara County and the new freeway section on US Highway 99 through Madera.

At the end of 1958, the major circumferential route, the San Diego Freeway, was being extended southward from the completed section in West Los Angeles. The 1959-60 budget contains large allocations for additional San Diego Freeway projects.

In San Diego County, work continued on the conversion from expressway to freeway on U. S. Highway 80 between US Highway 101 in San Diego and El Cajon. Projects included in the 1959-60 budget will complete the conversion and provide 17 miles of continuous full freeway. Funds are also budgeted for the first unit of the north-south freeway on US 101 through San Diego.

New stretches of freeway were opened to traffic in Riverside and in San Bernardino; and in December traffic on US Highway 91-66 began using 29 miles of freeway between Victorville and Barstow, the longest section of freeway ever constructed in California under one contract.

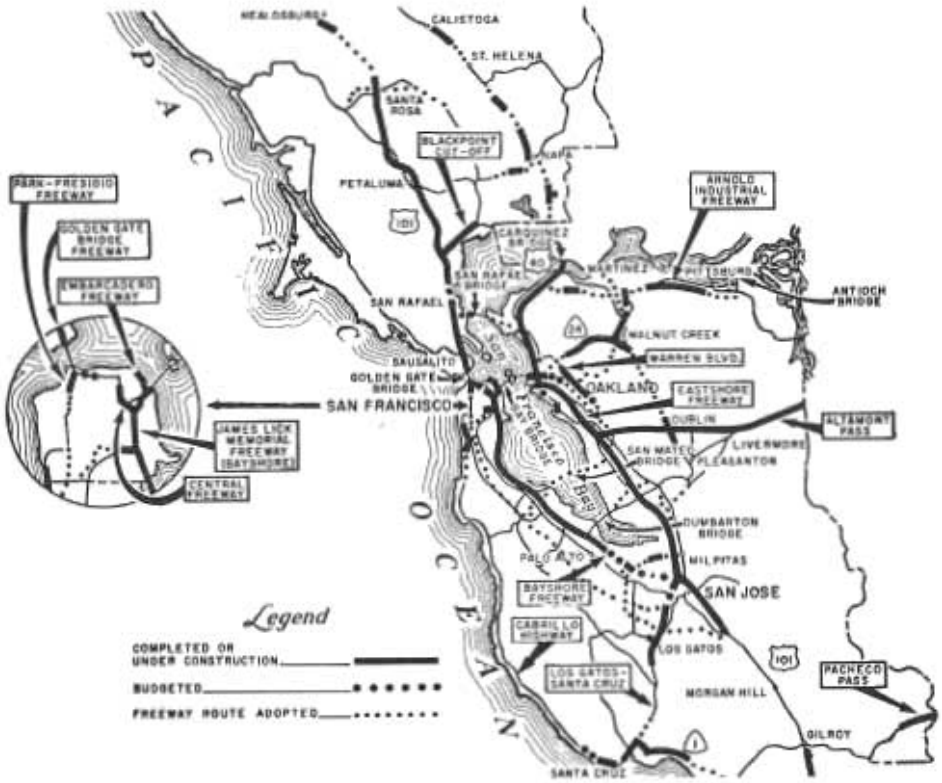
The rapid development of US Highway 101 to freeway and expressway standards continued with new projects completed or under way in each of the coastal counties between Los Angeles and the San Francisco Bay region, as well as in Marin, Sonoma, Mendocino and Humboldt Counties to the north.

This new stretch of freeway west of Auburn was one of four freeway sections completed during 1958 on US Highway 40 east of Sacramento. Completion of other current and budgeted projects on this route will leave only one 11-mile gap in continuous freeway and expressway between the state capital and Nevada. (Note old highway winding through Auburn Ravine at right.)

In the San Francisco Bay area US 101 Bypass (Bayshore Freeway) was completed as freeway for 35 miles between the San Francisco-Oakland Bay Bridge and Palo Alto. The final gaps in 46 miles of continuous full freeway on State Sign Route 17 (Nimitz Freeway) between Oakland and San Jose were also closed.

In San Francisco work was nearly completed on another section of the elevated Embarcadero Freeway and construction was continuing on the Central Freeway and on the first unit of the long-planned Southern Freeway.

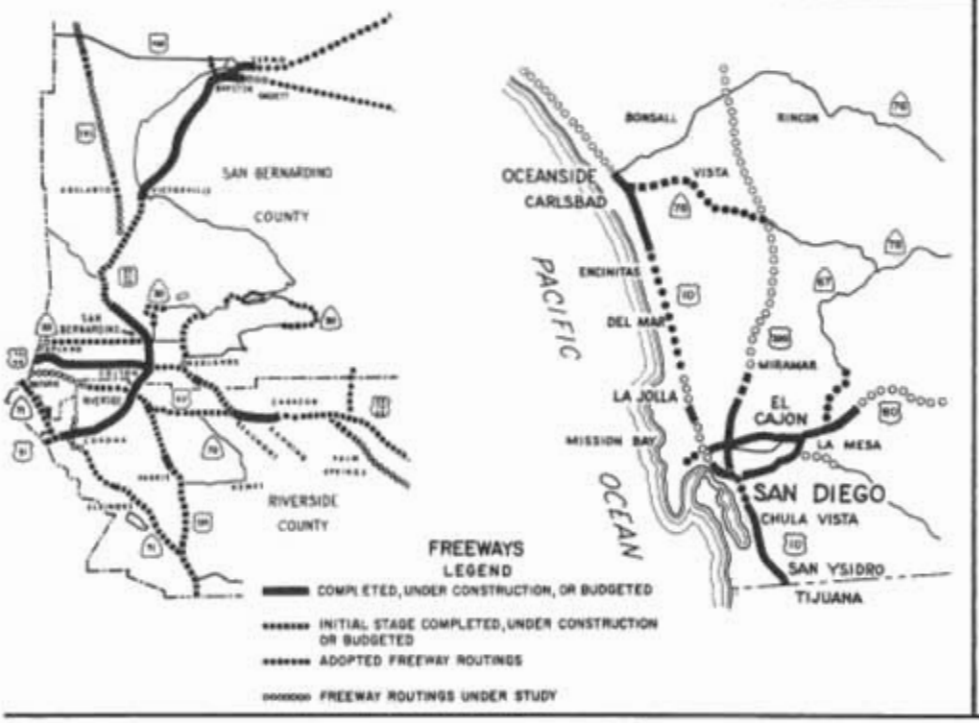
North of San Francisco the last gap in continuous freeway on US 101 south of San Rafael was eliminated,

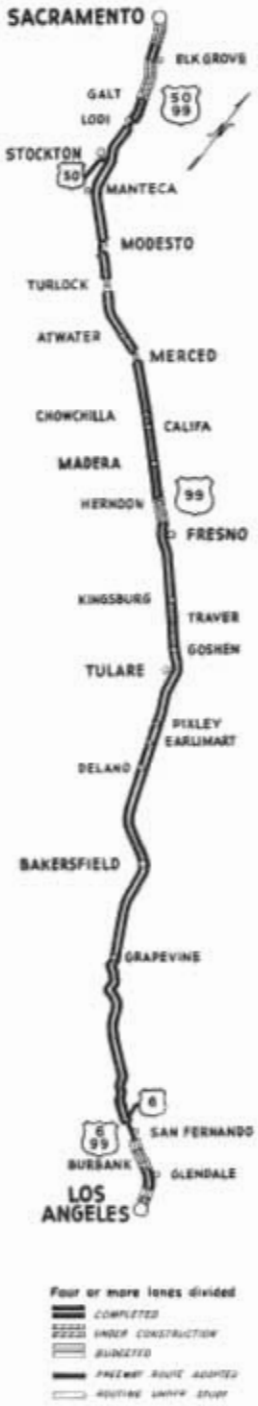


FREEWAY MAPS

The maps on these pages show the expanding freeway and expressway networks in the San Francisco, Los Angeles, San Bernardino-Riverside and San Diego areas as well as the status of two important routes, US Highway 99 between Los Angeles and Sacramento, and US Highway 40 from the San Francisco Bay area to the Nevada state line.


LOS ANGELES
GLENDALE FREEWAY
FOOTHILL FREEWAY
PASADENA FREEWAY
HOLLYWOOD FREEWAY
SANTA MONICA FREEWAY
SAN BERNARDINO FREEWAY
RIVERSIDE FREEWAY
LONG BEACH FREEWAY
CABRILLO HIGHWAY
SAN GABRIEL RIVER FREEWAY
ORANGE
SAN DIEGO
Legend
COMPLETED OR UNDER CONSTRUCTION
EXPRESSWAYS
FULL FREEWAYS
BUDGETED
ROUTE ADOPTED


SAN BERNARDINO COUNTY
RIVERSIDE COUNTY
OCEANSIDE
CARLSBAD
VISTA
BONSALL
RINCON
ENCINITAS
DEL MAR
PACIFIC OCEAN
MIRAMAR
LA JOLLA
EL CAJON
MISSION BAY
LA MESA
SAN DIEGO
CHULA VISTA
SAN YSIDRO
TIJUANA
FREEWAYS
LEGEND
COMPLETED, UNDER CONSTRUCTION, OR BUDGETED
INITIAL STAGE COMPLETED, UNDER CONSTRUCTION OR BUDGETED
ADOPTED FREEWAY ROUTINGS
FREEWAY ROUTINGS UNDER STUDY


SACRAMENTO
ELK GROVE
GALT
LODI
STOCKTON
MANTECA
MODESTO
TURLOCK
ATWATER
MERCED
CHOWCHILLA
CALIFA
MADERA
HERNDON
FRESNO
KINGSBURG
TRAVER
GOSHEN
TULARE
PIXLEY
EARLIMART
DELANO
BAKERSFIELD
GRAPEVINE
SAN FERNANDO
BURBANK
GLENDALE
LOS ANGELES
Four or more lanes divided
COMPLETED
UNDER CONSTRUCTION
BUDGETED
FREEWAY ROUTE ADOPTED
ROUTING UNDER STUDY


SAN FRANCISCO
OAKLAND
RICHMOND
VALLEJO
VACAVILLE
DAVIS
ROSEVILLE
SACRAMENTO
PENRYN
LOOMIS
NEWCASTLE
AUBURN
APPLEGATE
COLFAX
GOLD RUN
EMIGRANT GAP
AIRPORT
HAMPSHIRE ROCKS
SODA SPRINGS
TRUCKEE
Donner Lake
SQUAW VALLEY
FLORISTON
Lake Tahoe
NEVADA
40
89
Four or more lanes divided
COMPLETED
UNDER CONSTRUCTION
BUDGETED
FREEWAY ROUTE ADOPTED
ROUTING UNDER STUDY

making this route nearly all freeway or expressway for some 50 miles to Santa Rosa.

A significant event in the freeway development on US Highway 40 was the November 25th opening of the parallel Carquinez Bridge and freeway approaches in Solano and Contra Costa Counties which eliminated a long-standing traffic bottleneck on this important interstate route.

Between San Francisco and Sacramento US 40 is now continuous multilane divided highway, except for three short four-lane undivided sections, one of which is presently being converted to freeway.

East of Sacramento work was completed on four new sections of freeway on US 40, and five other freeway projects were under construction. Three additional US 40 freeway jobs are in the 1959-60 State Highway Budget, including the relocation of this route as a freeway over the 7,135-foot Donner Pass.

When these projects are completed, there will be only one 11-mile gap in continuous freeway and expressway on US 40 between Sacramento and the state line.

On US Highway 99, the heavily traveled north-south valley route, new freeway sections were opened in Madera, in the vicinity of Chowchilla and north of Lodi; and construction started on freeway projects on the Grapevine Grade in Kern County and on a section north of Fresno. This latter project will eliminate one of the few remaining gaps in continuous multilane divided highway between Los Angeles and Sacramento.

On the north state portion of US 99 projects were completed, under construction or budgeted at year's end to provide 30 miles of continuous freeway and expressway in the Sacramento River Canyon from north of Shasta Lake to north of Dunsmuir.

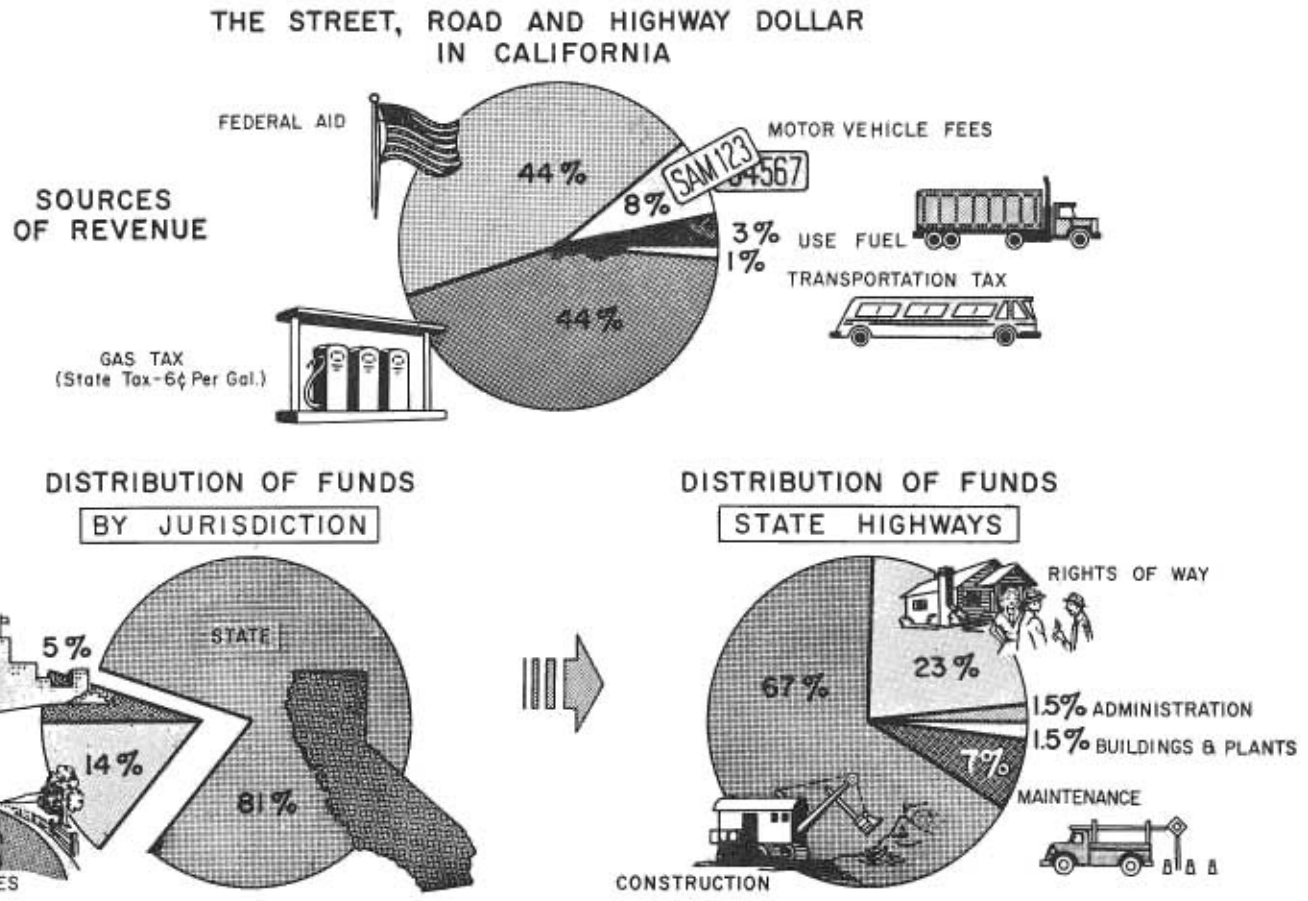
The freeway projects referred to in the preceding paragraphs are only a few of the hundreds of improvements on all types of state highways which have recently been completed or which are now budgeted or under construction.

Not covered are extensive developments on less-traveled highways which are nevertheless important arteries in rural and scenic areas. Work on these routes during the past year resulted in many miles of new highway, completed reconstruction, realignment and other improvements.

Highway Financing

A total of $356,000,000 was allocated for construction and rights-of-way on state highways in the 1957-58 Fiscal Year. The total for the current (1958-59) fiscal year is $381,000,000, and the 1959-60 State Highway Budget, as adopted in October, 1958, provides $491,000,000 for construction and rights-of-way. The effect of increased federal aid, chiefly due to the introduction of the needs formula, is evident from these budget totals.

The backbone of California's highway financing structure is the state gasoline tax of 6 cents a gallon. Four cents is applied to state highways,



1⅜ cents goes for county roads, and ⅜ cent for city streets.

In addition to the gasoline tax, other sources of highway revenue in California are use (diesel) fuel taxes, transportation taxes, and motor vehicle, registration and weight fees. (Revenue sources and distribution for road purposes are indicated in the accompanying charts.)

According to the statutes, 55 percent of the state highway construction and right-of-way funds must be allocated to the 13 southern counties each year, with the remaining 45 percent going to the northern 45-county group. Each county is guaranteed a minimum share of the construction funds in a specified period of years. Federal highway funds must be applied to routes included in the various federal aid systems of secondary, primary, urban or interstate highways.

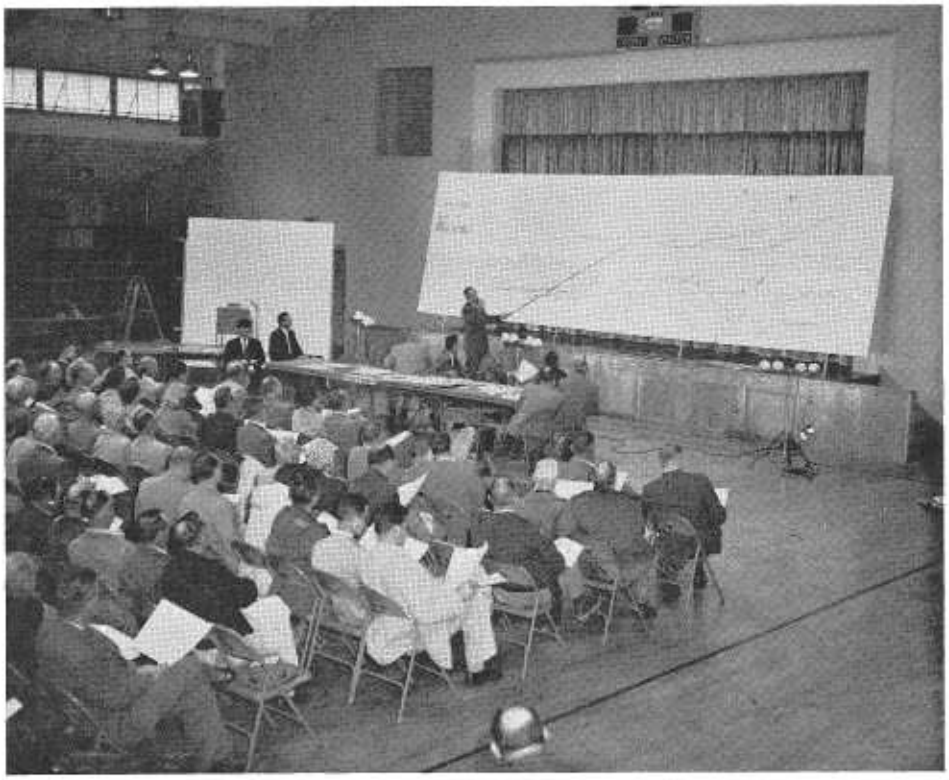
In preparing the annual state highway budget, the commission each year must review hundreds of high-priority projects and attempt to choose those which will meet the most acute local and regional needs, comply with federal requirements, and at the same time fit logcially into the long-range program of highway development on a statewide basis.

Thorough and conscientious study of all available data, including comprehensive statistics and information on traffic volumes, accidents, population changes, road conditions and other factors, is required.

The job of the commission is a difficult and exacting one with never enough money in a given year to do all the work that should be done.

Two provisions of California law are particularly helpful in expediting the financing and construction of highway projects.

One permits the award of construction contracts for highway projects as early as January 1st, six months before the start of the fiscal year in which the project is budgeted. Last year 159 contracts were awarded before the start of the 1958-59 Fiscal Year, thereby allowing a longer construction season and advancing the completion date on many projects.



Full public discussion of proposed freeway routes is a long standing policy of the Division of Highways and the California Highway Commission. Here a division engineer explains possible westside freeway routes at a public meeting in Los Banos early in 1958. The route was adopted by the Commission later in the year.

The other (split financing) makes it possible to finance certain large and complex projects in more than one state budget.

Under the "split financing" provision, contracts are awarded for an entire project, but the budget covers only the estimated expenditure during the pertinent fiscal year. Thus, more jobs can be budgeted since large amounts are not needlessly tied up in extensive projects.

Planning

The Division of Highways prepares plans and estimates on highway projects well in advance of the time when construction is actually expected to start.

This long-range planning program has in recent years enabled the Highway Commission to put to immediate use all money made available for state highway purposes. This program paid off dramatically again last year.

When additional funds were apportioned to California on short notice under the 1958 Federal Highway Act (the antirecession program), no time was lost in putting these funds to work in the form of going construction.

Plans and specifications were ready, the right-of-way had been acquired, and the division was able to advertise for bids on the newly financed projects shortly after the additional money was apportioned.

Under the antirecession program, 23 state highway projects with a total estimated construction cost of $29,-700,000 were placed under contract well ahead of the December 1, 1958, deadline specified in the federal act. (Additional projects were undertaken on county roads, as described later in this report.)

Such rapid utilization of funds has resulted in huge savings to Californians due to early completion of projects, because it means savings in fuel and upkeep to motorists who enjoy earlier use of improved highways, and most important, it has resulted in earlier elimination of outmoded highway sections which often have had high accident rates.

Constant improvements are being made in the design and placement of directional signs on freeways to make it easier for motorists to find their destinations. At left is an overhead illuminated sign bridge typical of those now used extensively on freeways. At right is a sign showing distances to the next three turnoffs Standard plans and specifications for freeway sign structures have been developed and are included in major freeway construction contracts.

Freeway Route Discussions

Advance highway planning depends upon early determination of freeway routes by the Highway Commission. In most instances routings are adopted several years before construction funds are available.

The commission establishes freeway routes only after painstaking consideration of all available data, including review of extensive studies by the Division of Highways and information developed at a series of public meetings.

Complete public discussion of freeway routings has for many years been a firm policy of the Legislature, the Highway Commission and the division.

Last year this policy was re-emphasized with respect to consultations with local planning bodies and governmental agencies at the time the division first begins specific route studies.

Later, when sufficient engineering and economic data have been developed concerning possible alternate routes, the division conducts public meetings, map displays and hearings. A booklet entitled "Freeway Facts," distributed at these meetings, explains the route selection procedure. (Copies available on request.)

During the 1957-58 Fiscal Year, 49 formal public meetings regarding freeway routings were held by the Division of Highways. In addition there were several hundred preliminary informational meetings and map displays.

Also, the Highway Commission itself may hold official public hearings on proposed freeways in the areas where new routes are being considered. These hearings are scheduled either at the request of local authorities or on the commission's own initiative. Four such public hearings were held during the fiscal year ending June 30, 1958, one at the request of local agencies, and the other three on initiative of the commission. Eight more were held in the latter part of 1958, three of them on successive days in different areas.

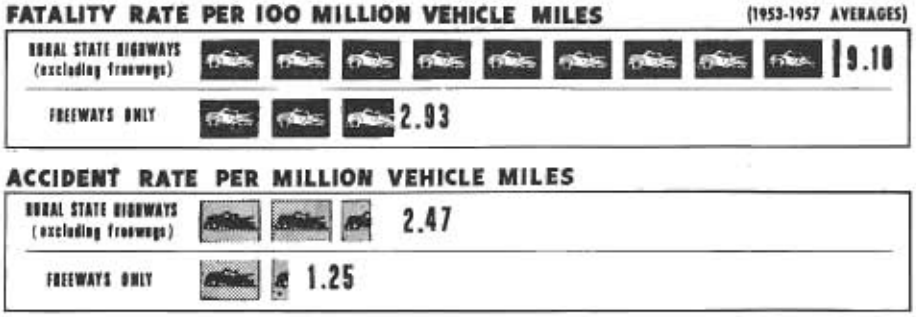
Freeway routes covering 486 miles were adopted during the past year, bringing to 4,691 the total mileage of declared freeways on the State Highway System at the end of 1958.

Improved Methods

New or improved methods and equipment have enabled the Division of Highways to meet the demands of the accelerated program of highway construction.

The increased use of electronic computers, aerial photography, and new surveying and map checking devices, plus other administrative and technical improvements, have in recent years saved thousands of engineering man hours which would have been required under former methods.

During the 1957-58 Fiscal Year alone, the use of electronic computers in calculating traverses in surveying increased about 50 percent. Earthwork quantity caculations by electronic means increased 40 percent to almost 3,500 miles. Electronic computers are also used in tabulating traffic data and statistics and in making structural calculations for bridge design.



Aerial photography or "photogrammetry" methods are now used in the design of nearly all projects which involve changes in alignment and grade. As a result, much of the time-consuming field surveying work of the past is no longer necessary.

Two other devices, the stereoplotter and the geodetic distance meter, have aided California highway designers in handling bigger workloads without proportionate staff increases.

Through the use of the stereoplotter, it is possible to make complete evaluations of design maps as soon as they are prepared. About 40 percent of all design mapping was checked for accuracy by stereoplotter during the 1957-58 Fiscal Year. Former field check methods were more expensive and less dependable.

The geodetic distance meter is an electronic instrument used in surveying to measure long distances for the purpose of establishing reference points for aerial mapping, construction staking and right-of-way surveys.

Traffic and Accidents

The fact that freeways save life and limb and effectively carry tremendous traffic volumes is once again demonstrated by recent traffic and accident figures.

In the five-year period from 1953 through 1957 the fatality rate on conventional California highways was 9.10 for every 100 million miles of travel. In the same period the fatality rate on full freeways was 2.93 for every 100 million vehicle-miles.

Thus, the life of a motorist on a modern freeway in the midst of dense and fast-moving traffic continued to be more than three times as safe per mile of vehicle travel as on conventional highways with lower traffic volumes.

The overall accident rate totals for the five years also show the safety built into modern freeways. During the five-year period there were 1.25 accidents in every million vehicle miles on freeways as compared to nearly twice as many, 2.47, on conventional routes. (See accompanying chart.)

An indication of the progress which highway engineers, safety groups and enforcement agencies have made is provided by the fact that the fatality rate on state highways has been reduced from a high of 17.2 deaths per 100 million vehicle-miles in 1945 to 8.64 fatalities per 100 million vehicle-miles in 1957.

As in previous years, freeways in the central Los Angeles area handled amazing daily traffic volumes again in 1958. Average daily traffic on downtown sections of the Hollywood and Harbor Freeways was 192,000 on each route. The four-level interchange, the world's busiest intersection, carried an average daily volume of 321,000 vehicles.

Another striking example of the safety benefits inherent in freeways was provided last year in a before-and-after study of accidents on a 10-mile section of U. S. Highway 40-99E northeast of Sacramento.

The study covered accidents during a 44-month period—22 months before the freeway was in operation, and 22 months after it was opened to traffic.

In the 22 months following completion of the freeway the accident rate decreased 86 percent, even though traffic volumes went up. The number of accidents also decreased on the superseded highway route due to reduced congestion.

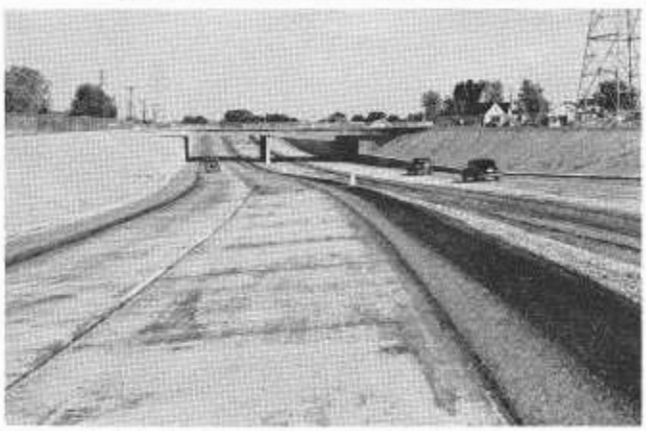
Directional Signs

Many advances have been made in the last few years in the design and placement of directional signs on California's freeways. These improvements provide for safer, more efficient freeway operation and make it easier for motorists to get to their destinations.

In addition to more and bigger signs on the recently completed freeways, several new features are being included in the sign systems. Among these are the following:

- Greater use of overhead illuminated signs which are more readily seen by motorists in heavy traffic.
- More advance notice of off-ramps to permit ample time for necessary lane changes. On some sections signs which give the distance in miles to each of the

Freeway landscaping adds greatly to roadside beauty and also serves functional purposes such as reducing headlight glare and traffic noise. Trees, shrubs and ground cover provide an attractive setting for the section of US 40-99E near Sacramento in the photo at left. The same section, as it appeared in 1949, is shown below.



This huge landslide along the Pacific Palisades closed US Highway 101 Alternate near Santa Monica and took the life of a Division of Highways maintenance superintendent. A temporary detour was constructed to reopen the highway, and at the end of the year work was being pushed on rerouting the highway around the slide.

next three turnoffs are being used.

- Down-arrows which give a positive advance indication of the proper lane or ramp which the motorist should use for a specific destination.
- Route numbers on directional signs to reassure motorists that they are on the right road and to give advance notice of impending highway junctions.
- Improved sign illumination to assist drivers at night.
- Walkways on overhead sign structures to permit servicing without disruption of traffic. This makes possible more frequent cleaning and aids in the replacement of burned out light fixtures, thus insuring a higher standard of legibility.

Roadside Planting

California's highways are the scene of an increasing number of planting and landscaping projects in accord with a Highway Commission policy adopted in 1957 at the request of the Legislature.

The 1959-60 State Highway Budget contains nearly $4,000,000 for 36 landscaping or planting projects as compared to approximately $3,000,000 for 32 such projects in the current 1958-59 budget.

In addition to these separately budgeted projects, the division's roadside development unit also plans the basic erosion control plantings or the planting preparation work included in a large number of construction contracts.

It is usually cheaper to include in the construction contract certain types of erosion control and such planting preparations as the spreading of topsoil and the installation of water lines under roadways.

The Division of Highways Nursery at Davis often supplies plants, shrubs and trees which are not available in quantity from commercial sources for highway planting projects.

Maintenance

Widespread damage to highways and several temporary road closures resulted from the severe storms which struck California last winter and spring.

To the division's maintenance crews, whose job it is to keep the highways open or to provide detours when possible in such emergencies, the storms meant long hours of difficult work in uncomfortable and sometimes dangerous circumstances.

A huge slide which occurred on the Pacific Coast Highway near Santa Monica on March 31 took the life of Maintenance Superintendent Vaughn O. Sheff of the division's Los Angeles office. Sheff was directing efforts to clear an earlier slide.

Total damage to highways as a result of the storms was estimated at about $11,000,000, some $4,000,000 of which is subject to reimbursement from federal sources. Most of the storm-damaged highways have now been repaired.

The maintenance of the State's highways is an important and continuing part of the work of the division. California's varied climate and topography dictate a broad maintenance program requiring equipment and personnel for a wide range of tasks.

In addition to such annual duties as snow removal and repairs after winter storms, the maintenance department also is responsible for such things as the care of roadside trees and landscaped highway sections, the posting of warning and directional signs, adjustment of electronic traffic signals, and a constant program of resurfacing, patching, sealing, painting, spraying and shoulder maintenance.

No small job for maintenance crews is picking up after highway litterbugs. In an effort to curb the expense of roadside cleanup, which cost about $650,000 in 1957-58, the division has installed 1,000 litter disposal cans along the State's highways. Signs indicating the locations of litter cans have also been installed.

The continuing statewide campaign by various groups to reduce roadside litter is believed to be producing generally beneficial results. In some locations, however, litter cans have been used for the disposal of household garbage and junk.

During the 1957-58 Fiscal Year, the division took over the maintenance of

146 miles of former county roads—sections on State Sign Route 1 in Sonoma and Mendocino Counties, on Sign Route 20 in Mendocino County, on Sign Route 49 in Sierra and Plumas Counties and on Legislative Route 232 in Sacramento, Sutter and Yuba Counties.

To better co-ordinate its broad, statewide activities and to provide up-to-the-minute reports of road conditions, the maintenance department has developed a radio network which at the end of 1958 included 175 radio stations, 23 microwave stations, and 850 mobile radio units.

During the winter, accurate road condition reports are received by radio from the field and supplied to newspapers, automobile clubs, radio and television stations, and other interested agencies through division-operated teletype facilities.

Equipment

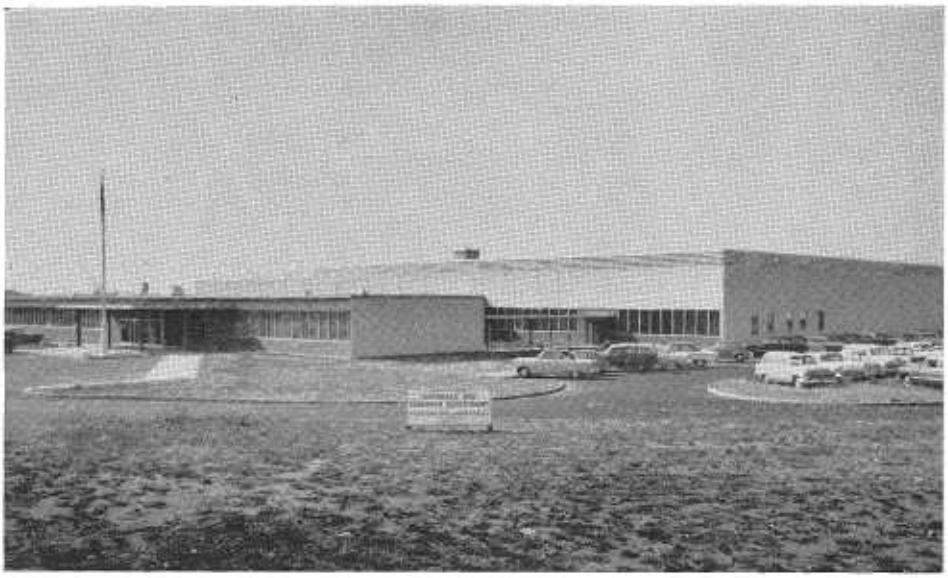
The operation and maintenance of California's highways requires considerable automotive and maintenance equipment including various trucks, automobiles, graders, snowplows, power shovels, tractors, and miscellaneous items such as rollers, mixers, trailers, pumps, drills and mowers.

The division's automotive and maintenance equipment inventory at the end of the 1957-58 Fiscal Year amounted to $23,500,000.

In the past five years, the number of equipment units under the jurisdiction of the division's equipment department has increased nearly 30 percent. At the same time the number of employees in this department has risen by only four, from 616 to 620. This favorable comparison is due largely to effective on-the-job training, increased operational efficiency, and improved equipment and tools.

During the 1957-58 Fiscal Year, the division acquired 1,360 pieces of equipment with a total value of some $4,500,000. A large part of this equipment was designed, assembled or constructed in department shops.

Among the recently designed or developed equipment items are a rotary snowplow mounted on a heavy-duty four-wheel-drive motor grader and a pushbutton highway striping machine which will eliminate the need for a man to ride in the striping buggy during the painting of lines on the pavement.



Personnel of the Division's Materials and Research Department moved into this new headquarters laboratory in May, 1958. The building provides 65,000 square feet of space and was constructed at a cost of $1,377,000.

Materials and Research

The highlight of the past year for personnel of the division's materials and research department was the move to the new headquarters laboratory building in Sacramento.

The new $1,377,000 structure was formally dedicated by members of the Highway Commission and other officials May 21, 1958.

Staffed by about 200 employees, the new building provides 65,000 square feet of modern laboratory and utility space for various kinds of research and testing equipment.

The new Sacramento laboratory is headquarters for a statewide research and testing organization which includes specialized branch laboratories in Los Angeles, Berkeley, Santa Maria, and Bakersfield. The department also co-ordinates the technical work of laboratories in each of the 11 state highway districts.

The work of the materials and research department may be divided into two main categories—testing to make sure the State gets its money's worth from every highway construction dollar, and research to develop better methods and materials.

In addition to making sure the State's high standards for materials are being met, the department also conducts research into such subjects as the durability of paints, the stability of soils, the effectiveness of highway lighting, the effect of temperature changes on pavements, the skid resistance of pavements, and the durability of roadways under heavy traffic.

One unusual problem which is being actively investigated by the materials and research department is that of damage to vehicles from blowing sand on a section of freeway in Riverside County. Extensive data are now being accumulated in an attempt to find a permanent solution to this problem.

As part of the division's continuing studies of the effect on freeway safety of dividing strip barriers, the Materials and Research Department last year began conducting full-scale impact tests on various guard rails using remote control automobiles and special cameras and other technical equipment to record results.

Bridges

A significant addition was made November 25, 1958, to the list of great bridges in the San Francisco Bay area when the parallel Carquinez Bridge at Crockett was opened to traffic.

The bridge and its impressive freeway approaches in Contra Costa and Solano Counties had been under construction since December, 1955, with

financing provided by $46,000,000 in Toll Bridge Authority revenue bonds.

The huge Carquinez project was one of the most spectacular of the recent bridge and highway construction jobs in California.

It included not only the new bridge, but also extensive viaduct, interchange facilities and 2.9 miles of freeway in Contra Costa County; 1.2 miles of freeway in Solano County; widening and new south connections on the old bridge (now under construction); and other related work. Twelve separate construction contracts were involved.

When the current work on the old bridge is completed this summer, the new bridge will carry northbound traffic and the old structure will handle southbound vehicles.

The freeway approach south of the bridges extends through a manmade canyon believed to be the largest cut in the history of roadbuilding. More than a quarter-mile wide at the top and as much as 350 feet deep, this "big cut" required the removal of nearly 9,000,000 cubic yards of earth.

Construction is scheduled to start this year on another major crossing of the Carquinez Strait, the long-planned bridge which will replace the present division-operated ferry service between Benicia and Martinez. This project will also be financed by Toll Bridge Authority revenue bonds.

The Division of Highways Bridge Department, with its own facilities for design, construction, operation and maintenance, is responsible for all structures on state highways.

These include elevated freeways, traffic interchanges, overcrossings and undercrossings, highway-railroad separations, and bridges over rivers, streams and other bodies of water.

The bridge department also supervises the operation and maintenance of the state-owned toll bridges—the San Francisco–Oakland Bay Bridge, Richmond–San Rafael Bridge, the San Mateo–Hayward Bridge, the Dumbarton Bridge, and the Carquinez Bridges.

Largest of the toll bridges is the San Francisco–Oakland Bay Bridge, which carried a total of 35,253,643 vehicles during the 1957-58 Fiscal Year, a gain of 4.5 percent over the previous year.

New laws pertaining to the financing of railroad grade separation structures on county roads and city streets, which were passed by the 1957 Legislature, went into effect during the past year.

These statutes provide that beginning with the 1958-59 Fiscal Year, $5,000,000 is to be set aside each year in the State Highway budget to help finance local railroad grade separation projects included on a priority list established annually by the State Public Utilities Commission.

The cost of such projects, after deduction of any contribution by the railroad involved, is shared equally by the local agency and the State.

At the end of the year, the Highway Commission had made allocations from this special fund to help pay the cost of nine local railroad grade separation projects on the 1958 P. U. C. priority list.

Motorists on the new US Highway 40 freeway approaches to the Carquinez Bridges in Contra Costa County travel through a manmade canyon believed to be the largest cut in the history of road building. The "Big Cut" is a quarter-mile wide at the top and up to 350 feet deep.

Right-of-Way

A total of 7,955 right-of-way transactions were concluded in the 1957-58 Fiscal Year. Of these, 95.6 percent were negotiated settlements with property owners. Only 4.4 percent of the cases were court proceedings in eminent domain.

The total amount spent for rights of way, including administration, was $121,235,749.

One big reason for the success in concluding amicable right-of-way negotiations is the division's policy of paying fair market value for required property. In dealings with right-of-way personnel, owners can expect to receive the same amount for their holdings as they would from any other buyer under normal market conditions.

The methods and policies of the Right-of-Way Department are outlined and explained in the booklet "More Than 14 Million People Want

My Property," which is mailed to affected property owners before their property is appraised. (Copies available on request.)

Acquisition of rights of way in California is expedited in some cases by a special fund which has been authorized by the Legislature.

This $30,000,000 revolving fund has been set up for the advance purchase of rights of way on which costly improvements are slated. Expenditures from the fund are repaid from regular highway funds when the construction period is reached for each project.

The effect of this procedure is to provide funds to purchase property before improvements are made, even though actual highway construction may be some years in the future.

It is estimated that a $170,000,000 saving in right-of-way acquisition costs has been made in the six years since the fund was established.

F. A. S. Roads

Out of the 69,000 miles of county roads in California, a total of 6,844 miles and included in the Federal-aid Secondary System. For the most part these roads are next in importance to state highways in terms of traffic volume and economic service. They are often referred to as "feeder roads" or "farm-to-market roads."

Projects on federal aid secondary routes are planned and in most instances constructed under the direct supervision of the county involved. The Division of Highways, under federal regulations, has the responsibility for reviewing and approving these county projects. The division also assists in other phases when requested to do so by the counties.

Working in close co-operation with the division, California's counties compiled a commendable record in the planning and construction of FAS county roads during the past year.

This was particularly true in connection with the use of "crash program" funds made available under the antirecession provisions of the 1958 Federal Highway Act.

Additional funds were apportioned to California under the 1958 federal act in April with the requirement that projects financed with the added

California highway construction is performed under contracts awarded on the basis of competitive bidding. The longest freeway ever built in California under one contract was opened in December, 1958. A portion of this 29-mile stretch of freeway on US Highway 91-66 between Victorville and Barstow is shown above during construction.

money had to be under contract before December 1st.

With only a few months in which to take care of the countless details of planning, financing and administration, the participating counties and the division succeeded in obligating all the additional federal funds and state matching money by the specified deadline.

Under this program, 69 county road projects with an estimated cost of $6,666,017 were placed under contract before December 1st. These projects were financed by $4,405,040 in FAS funds, $1,093,299 in state matching money, and $1,167,678 in county funds.

There were other important accomplishments which also indicate the progress made by the counties in developing strengthened engineering organizations.

For the first time in more than 10 years of operation under the FAS program, surveys and plans for all FAS county road contracts awarded during a fiscal year were handled exclusively by the counties. Some state assistance had been required in previous years.

In addition, the counties supplied all or part of the construction engineers required on 90 percent of the FAS county road jobs.

The regular 1958-59 federal apportionment to the counties for use in improving roads on the FAS System amounted to $9,615,571. State highway funds made available to the counties for use in matching this regular allocation totaled $5,965,903. These

totals do not include the special crash program funds.

The largest source of revenue for all county road purposes is the one and three-eighths cent share of the State's six-cent-a-gallon gasoline tax. These funds are distributed directly to the counties by the State Controller, and are administered by local boards of supervisors.

Apportionments are made according to law on the basis of proportionate motor vehicle registration and mileages of county maintained roads. For 1957-58 the counties received as their share of the gas tax, along with a portion of the vehicle registration fees, a total of $75,656,519.

City Streets

The Division of Highways administers the apportionment on a population basis of the five-eighths-cent gasoline tax revenue which goes to incorporated cities and reviews and approves city street improvements financed with these funds.

In addition, the division apportions state highway funds set aside for city street engineering and administration purposes. According to law, this apportionment ranges from $1,000 a year for cities with population of less than 5,000 to $20,000 for cities of more than 500,000 population.

During the 1957-58 Fiscal Year, a total of $30,427,652 was apportioned to cities in gas tax money and engineering funds. This is an increase of more than $1,000,000 over the $29,219,480 paid in the previous year. City street projects approved by the division during the fiscal year numbered 543.

Rising Costs

A constant problem in planning and financing highway improvements is the upward trend of construction costs. Even though more efficient methods and better construction machinery are now in use, these gains have not entirely offset the rising cost of labor and materials.

At the end of 1958, average construction costs were approximately 140 percent higher than in 1940, even though the cost index maintained by the division showed that construction cost averages have declined from an earlier high.

The average cost per parcel in right-of-way transactions is also climbing. In 1945 this average was $2,370. The 1957 average was $14,128 while in 1958 the figure had risen to $15,014.

Construction Contracts

California highway construction is performed under contracts awarded on the basis of competitive bidding. This insures that the public receives the greatest value for its highway dollar.

Contractors who desire to bid on state highway projects estimated to cost more than $15,000 are required to be prequalified by the division. Each contractor's financial capabilities, experience and resources are studied in determining the type and size jobs he is qualified to undertake.

At the end of the 1957-58 Fiscal Year, there were 1,018 contractors, with varying prequalification ratings, eligible for bidding on state highway projects, compared with 992 at the end of the previous year. Total bidding capacity of these contractors was $1,920,000,000, an increase of $141,000,000 over the year before.

Construction projects are advertised for bids by the Division of Highways after the Director of Public Works, on the division's recommendation, has approved plans, specifications and estimates. Contracts are awarded by the Director of Public Works, also on recommendation from the division.

Of the 438 contracts awarded during the 1957-58 Fiscal Year, more than 82 percent were for projects costing less than $250,000. Thus, contractors with limited resources were capable of bidding on the great majority of state highway jobs.

About 10 percent of the contracts were in the $250,000 to $1,000,000 class, and approximately 8 percent went above the $1,000,000 mark.

California Highway Commission

As noted earlier, responsibility for highway route adoptions rests not with the Division of Highways, but

. . . Continued on page 64

California's 11 state highway districts. The black dots represent cities in which district offices are located.

Longest Freeway Contract Completed

A crowd representing more than 20 Southern California communities celebrated the opening of the new freeway between Victorville and Barstow. The freeway eliminates the old two-lane highway and shortens the distance between the two cities by nearly five miles. Constructed at a cost of $5,750,000, it was the longest stretch of freeway ever built in the State under a single contract. Among those taking part in the opening ceremony were (left to right) Everett Poncho, Indian runner; Bernard W. Keller, President of the Barstow Chamber of Commerce; George W. Oakes, Mayor of Barstow; Magda Lawson, county supervisor from Needles; T. F. Bagshaw, then State Director of Public Works; Edward A. Rodeman, President of the Victorville Chamber of Commerce; Clyde V. Kane, District Engineer of the State Division of Highways; Irene Pearson, Construction Queen; Zelpha Wallace, Miss Victorville; and James A. Guthrie, State Highway Commissioner from San Bernardino.

NEW OFFICIALS

Continued from page 13 . . .

For six years before that, he was with the U. S. Bureau of the Budget, most of the time as principal examiner for all military personnel budgets.

During World War II, Wright served as a Navy officer in subchasers on convoy escort duty in North African waters. He is now a Commander in the Naval Reserve.

Wright's earlier career was in personnel work with the New York State and Federal Governments. He graduated from Syracuse University in 1937 and did two years graduate work in public administration at Syracuse. He was born in Auburn, New York, in 1915. The Wrights' children are: David, 17; Nancy, 15, and Jimmy, 8.

Chambers was appointed Secretary of the Highway Commission to succeed Ben D. Martin, who has been in the position since last August.

Since 1940, Chambers has held civil service posts with various Federal Government agencies in San Francisco. For the seven years before January, 1958, when he began management of Brown's Northern California campaign, he was Director of Business Service Centers for the western region of General Services Administration.

During the 1940's, Chambers was with the U. S. Department of Labor, War Production Board, War Labor Board, War Manpower Commission, Small War Plants Corporation and War Assets Administration.

Chambers was born in San Francisco in 1910. He studied at St. Joseph's College in Mountain View. He has made his home in Alameda with his wife and twin sons, 11, Robert and Stephen.

The State Department of Public Works awarded 41 contracts amounting to $16,233,200 during December. Fifty-five contracts amounting to $23,488,100 were completed. On December 31, the Division of Highways had under way 324 contracts with a value of $377,746,700.

L. B. Reynolds Retires; Joined State in 1928

LLOYD B. REYNOLDS, Assistant Office Engineer of the California Division of Highways, retired on November 28, 1958, after more than 30 years of state service.

For the last 10 years Reynolds was concerned with engineering reports and statistics for the Division of Highways, and had been in charge of that function since April, 1956. His work included the preparation of the quarterly index of California highway construction costs and related data as well as assisting in the processing of bids and construction contracts. His duties have also included preparation of the division's annual report.

LLOYD B. REYNOLDS

Reynolds was born in Ophir, Placer County, and attended high school in Auburn. He also attended the University of California. His engineering career began in 1920, when he participated in various studies being made of the California Highway System by the U. S. Bureau of Public Roads and others. Subsequently he worked for the Nevada Highway Department in Carson City; the Western Pacific and Southern Pacific Railroads and the Port of Oakland before joining the Division of Highways in Sacramento in April, 1928, as a draftsman.

He transferred to the Stockton district in 1936 as assistant chief draftsman, and returned to the Headquarters Office in Sacramento in 1945 to work on plans, specifications and estimates and subsequently on reports and statistics.

Reynolds and his wife, Marjorie, live at 3707 T Street, Sacramento. He is a member of Union Lodge No. 58, F. and A. M.

Half a billion cars have crossed the San Francisco-Oakland Bay Bridge since it was completed in 1936. This is enough to fill a six-lane freeway bumper to bumper from here to the moon.

Index of California Highways and Public Works

January to December, 1958

SUBJECT INDEX

INDEX OF AUTHORS

CARQUINEZ

Continued from page 12 . . .

Bridge Division of U. S. Steel Corporation, chose to use shop bolted joints because of the heavy gusset plates and heavy members which required a considerable force to draw up to a tight fit.

The high-strength bolts was one of the big factors contributing to the very fast rate of erection attained on the job. As Slim Edmonds, the erection superintendent for American Bridge said: "This job has gone together faster and easier than any truss of this size that I have ever erected."

Bolting Method Speeded

On most heavy trusswork of this size, it is frequently necesary to completely bolt up a joint prior to riveting. This is necessary in order to have the joint drawn up tight ahead of any riveting. As a result it is estimated that one bolting crew of two men can more than equal the work of a four-man riveting crew. For this reason, the bolting crews were easily able to keep pace with erection which it is believed would not have been possible with riveted joints.

Bolts were tightened by pneumatic impact wrenches. These impact wrenches were actually designed for ⅞-inch diameter bolts but were used for the one-inch and 1¼-inch bolts as well. On the joints with one-inch bolts it was necessary for the bolting crews to go over the joint twice with the impact wrench open to maximum capacity before each bolt was sufficiently tight. On the few joints with 1¼-inch bolts it was necessary to go

over the joint three times to insure tightness.

Testing was done by inspectors using a torque wrench. Only about every third bolt was tested unless several bolts in a joint were found below minimum torque requirements, and then all the bolts in that joint would be tested.

Bolts were not checked to see if they exceeded any maximum torque because the nut will nearly always strip before the bolt reaches an unsafe tensile stress.

Both impact wrenches and torque wrenches were occasionally checked by the Skidmore-Wilhelm Bolt Tension Test Device which is designed for the calibration of impact wrenches.

The high-strength steel bolts proved to be completely satisfactory in every respect. While the bolts cost more to furnish than the rivets, a great deal of erection time and cost were saved by bolted joints.

The work in connection with this $46,000,000 Carquinez Toll Bridge Project was administered by the State Division of Highways under G. T. McCoy, State Highway Engineer, and his engineering staff. These engineers along with the contractors who have provided their skills and "know-how" can well be proud of the Carquinez Bridge and its freeway approaches.

DISTRICT VII

Continued from page 44 . . .

the Downtown Business Men's Association, reproduced on page 29.

The map shows that the distance which can be driven in 30 minutes from downtown in offpeak traffic hours has been extended in the past five years at least five miles in every direction except westerly, where there are no freeways. The radius which can be driven is between 10 and 15 miles in nearly all cases, and as much as 20 miles in some cases. Extensions of the 30-minute driving point shown on the map, as compared with a similar study five years ago, clearly indicate the role of the freeways in providing easier access to downtown Los Angeles and throughout the Los Angeles metropolitan area. Driving times indicated on the map are from the core area of downtown and include time driven on downtown streets to reach freeways or major surface streets to outlying areas.

The Downtown Business Men's Association emphasizes the fact that during the greater part of the day and night, traffic moves freely and rapidly on the freeways, as indicated by the map. Also, that the traffic congestion we hear so much about exists only for a very limited time during the morning and evening peak hours.

CALIFORNIA HIGHWAYS

Continued from page 60 . . .

with the California Highway Commission, which is a nontechnical, nonsalaried board of business and professional men representing the people of the State at large.

Commissioners are appointed by the Governor, and the appointments are confirmed by the State Senate.

The commission is a seven-man body with the State Director of Public Works, as ex officio chairman, serving at the pleasure of the Governor. The other six members serve four-year staggered terms.

Members of the commission at the end of 1958 were: Chairman, T. F. Bagshaw, Director of Public Works (succeeding C. M. Gilliss, who resigned in November); Robert L. Bishop of Santa Rosa; John O. Bronson of Sacramento (succeeding H. Stephen Chase of San Francisco, who resigned in February); James A. Guthrie of San Bernardino; Robert E. McClure of Santa Monica; Fred W. Speers of Escondido; and Chester H. Warlow of Fresno.

In addition to budgeting highway funds and adopting freeway and highway routes, the commission also approves county primary road systems and authorizes the execution of deeds, condemnation proceedings, and right-of-way abandonments and relinquishments.

Division of Highways

Chief of the Division of Highways is the State Highway Engineer. He is assisted by a headquarters staff in Sacramento composed of two deputy state highway engineers, four assistant state highway engineers, a chief right-of-way agent and a comptroller. Each of the assistant state highway engineers is in charge of a group of specialized units.

The State is divided into 11 state highway districts to provide for localized administration of the highway program. These districts have approximately equivalent state highway mileage. A district engineer is in charge of each district except in the San Francisco and Los Angeles areas where an assistant state highway engineer is in command.

The district engineer is responsible for all phases of the highway program in his district. Information concerning local highway matters is most readily obtained at his office.

District offices are in these cities:

District I
Eureka
430 West Wabash Avenue
Sam Helwer, District Engineer

District II
Redding
1657 Riverside Drive
H. S. Miles, District Engineer

District III
Marysville
703 B Street
Alan S. Hart, District Engineer

District IV
San Francisco
150 Oak Street
B. W. Booker, Assistant State Highway Engineer

District V
San Luis Obispo
50 Higuera Street
A. M. Nash, District Engineer

District VI
Fresno
1352 West Olive Avenue
W. L. Welch, District Engineer

District VII
Los Angeles
120 South Spring Street
E. T. Telford, Assistant State Highway Engineer

District IX
Bishop
South Main Street
E. R. Foley, District Engineer

District X
Stockton
1976 East Charter Way
J. G. Meyer, District Engineer

District XI
San Diego
4075 Taylor Street
J. Dekema, District Engineer

EDMUND G. BROWN
Governor of California

CALIFORNIA HIGHWAY COMMISSION

ROBERT B. BRADFORD . Chairman and Director of Public Works
CHESTER H. WARLOW, Vice Chairman . Fresno
JAMES A. GUTHRIE . . . . San Bernardino
ROBERT E. McCLURE . . . . Santa Monica
FRED W. SPEERS . . . . . Escondido
ROBERT L. BISHOP . . . . . Santa Rosa
ARTHUR T. LUDDY . . . . . Sacramento
FRANK A. CHAMBERS, Secretary . . . . Alameda

EPARTMENT OF PUBLIC WORKS

B. BRADFORD . . . . . Director
. WRIGHT . . . . . Deputy Director
SHAW . . . . . Assistant Director
TANFORD . . . . . Management Analyst
WHITE . . . Departmental Personnel Officer
WINN . . Departmental Information Officer

DIVISION OF HIGHWAYS

McCOY
tate Highway Engineer, Chief of Division
KREY . . . Deputy State Highway Engineer
WAITE . . Deputy State Highway Engineer
SK . . . Assistant State Highway Engineer
HORST . . Assistant State Highway Engineer
ACK . . Assistant State Highway Engineer
PHY . . . Assistant State Highway Engineer
EM . . . Materials and Research Engineer
BAXTER . . . . Maintenance Engineer
GSNER . . . . . Engineer of Design
B . . . . . Traffic Engineer
ARRIS . . . . . Construction Engineer
H B. LA FORGE . Engineer of Federal Secondary Roads
M. H. WEST . Engineer of City and Co-operative Projects
EARL E. SORENSON . . . . Equipment Engineer
H. C. McCARTY . . . . . Office Engineer
J. A. LEGARRA . . . . . Planning Engineer
F M. REYNOLDS . . . . Planning Survey Engineer
L. L. FUNK . . . . . Photogrammetric Engineer
SCOTT H. LATHROP . Personnel and Public Information
E. J. L. PETERSON . . Program and Budget Engineer
A. L. ELLIOTT . . . . Bridge Engineer—Planning
I. O. JAHLSTROM . . . Bridge Engineer—Operations
R. R. ROWE . . . Bridge Engineer—Special Studies
J. E. McMAHON . . Bridge Engineer—Southern Area
L. C. HOLLISTER . . . Projects Engineer—Carquinez
E. R. HIGGINS . . . . . Comptroller

Right-of-Way

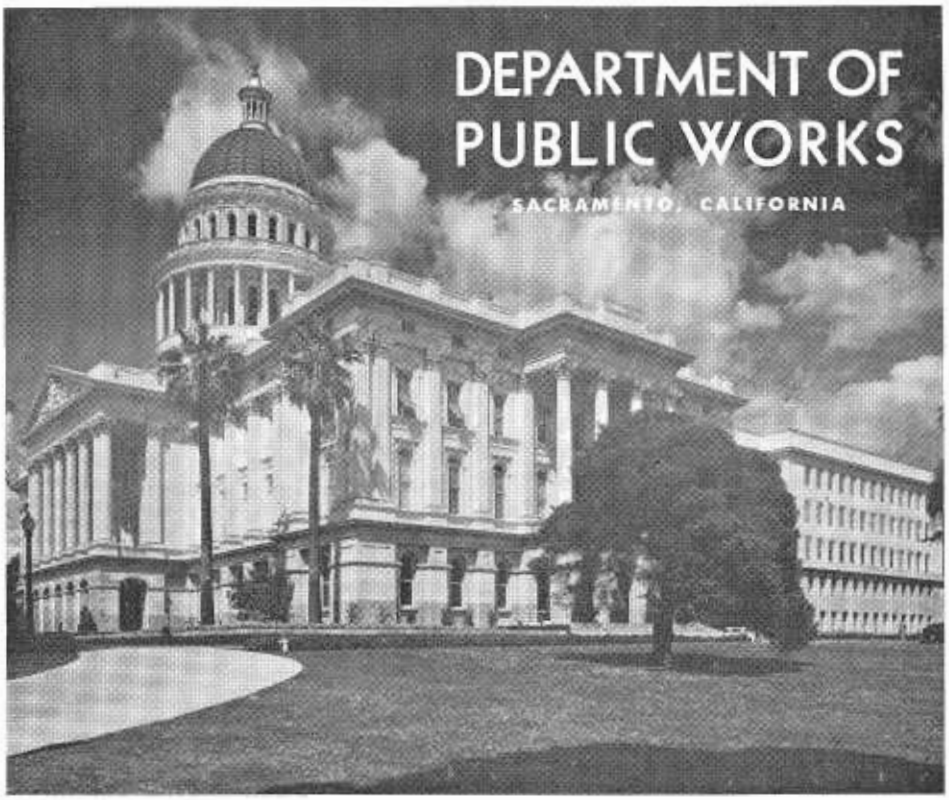
FRANK C. BALFOUR . Chief Right-of-Way Agent
E. F. WAGNER . . . Deputy Chief Right-of-Way Agent
RUDOLPH HESS . . . . . Assistant Chief
R. S. J. PIANEZZI . . . . . Assistant Chief
E. M. MacDONALD . . . . . Assistant Chief

District IV

B. W. BOOKER . . . Assistant State Highway Engineer

District VII

E. T. TELFORD . . . Assistant State Highway Engineer



District Engineers

SAM HELWER . . . . . District I, Eureka
H. S. MILES . . . . . District II, Redding
ALAN S. HART . . . . . District III, Marysville
J. P. SINCLAIR . . . . . District IV, San Francisco
L. A. WEYMOUTH . . . . District IV, San Francisco
R. A. HAYLER . . . . . District IV, San Francisco
A. M. NASH . . . . . District V, San Luis Obispo
W. L. WELCH . . . . . District VI, Fresno
A. L. HIMELHOCH . . . . District VII, Los Angeles
LYMAN R. GILLIS . . . . District VII, Los Angeles
C. V. KANE . . . . . District VIII, San Bernardino
E. R. FOLEY . . . . . District IX, Bishop
JOHN G. MEYER . . . . . District X, Stockton
J. DEKEMA . . . . . District XI, San Diego
HOWARD C. WOOD . . . . . Bridge Engineer
State-owned Toll Bridges

DIVISION OF CONTRACTS AND RIGHTS-OF-WAY

Legal

ROBERT E. REED . . . . . Chief Counsel
GEORGE C. HADLEY . . . . . Assistant Chief
HOLLOWAY JONES . . . . . Assistant Chief
HARRY S. FENTON . . . . . Assistant Chief

DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

NORMAN C. RAAB . . . . Chief of Division
BEN BALALA . . . . . Principal Bridge Engineer

DIVISION OF ARCHITECTURE

ANSON BOYD . State Architect, Chief of Division
HUBERT S. HUNTER . . . . Deputy Chief of Division
ROBERT W. FORMHALS
Administrative Assistant to State Architect
FRANK B. DURKEE, JR. . . . . Information Officer

Budget and Fiscal Service

EARL W. HAMPTON . . . . Assistant State Architect
HENRY R. CROWLE . . . . . Fiscal Officer
(VACANCY) . . . . . Contract Administrator
WILLIAM R. VICK . . Construction Budgets Architect
WADE O. HALSTEAD . . . . Principal Estimator
STANTON WILLARD . . Principal Architect, Standards
WILLARD E. STRATTON
Supervisor of Professional Services
LEAVITT M. POWERS . . . . Accounting Officer
W. F. PARKS . . . . Supervisor of Office Services

Design and Planning Service

(VACANCY) . . . . . Assistant State Architect
ROBERT M. LANDRUM . Chief Architectural Co-ordinator
ARTHUR F. DUDMAN . . . . Principal Architect
JAMES A. GILLEM
Principal Architect and Area Supervisor, Los Angeles
CHARLES PETERSON
Principal Structural Engineer, Los Angeles
(VACANCY) Principal Mechanical and Electrical Engineer
CLIFFORD L. IVERSON . Chief Architectural Draftsman
GUSTAV B. VEHN . . . . Chief Specification Writer

Construction Service

CHARLES M. HERD . . . Chief Construction Engineer
CHARLES H. BOCKMAN
Assistant to Chief Construction Engineer
RICHARD T. CASEY . . General Construction Supervisor

AREA CONSTRUCTION SUPERVISORS

THOMAS M. CURRAN . . . . . Area I, Oakland
J. WILLIAM COOK . . . . . Area II, Sacramento
CLARENCE T. TROOP . . . . Area III, Los Angeles

AREA STRUCTURAL ENGINEERS SCHOOLHOUSE SECTION

MANLEY W. SAHLBERG . . . . Area I, San Francisco
M. A. EWING . . . . . Area II, Sacramento
ERNEST MAAG . . . . . Area III, Los Angeles

printed in CALIFORNIA STATE PRINTING OFFICE 86600 1-58 50M

California Highways and Public Works
DIVISION OF HIGHWAYS
P. O. Box 1499
SACRAMENTO, CALIFORNIA

RETURN POSTAGE GUARANTEED

2