JANUARY-FEBRUARY
1955

California Highways and Public Works

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

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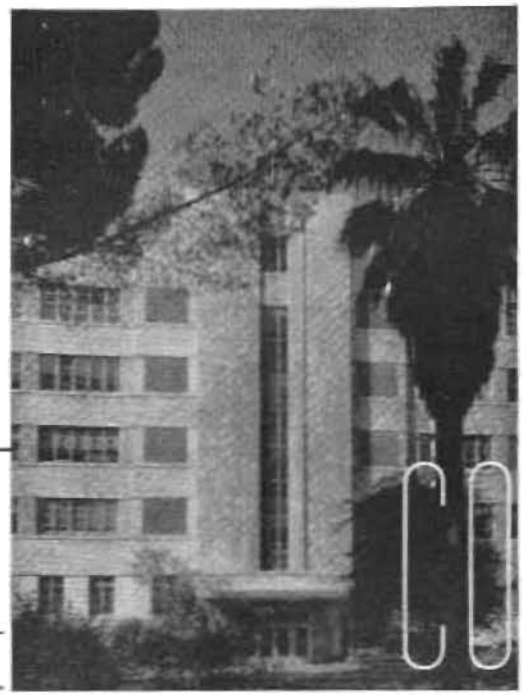
Vol. 34 January-February Nos. 1-2



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Excellent Record of School Patrols

State Prepares Free Booklet

By GEORGE M. WEBB, Traffic Engineer, and
J. J. SPOTTISWOOD, Assistant Traffic Engineer

A RECENT ruling by Attorney General Edmund G. Brown regarding responsibility for the protection of children crossing streets on their way to and from school has attracted considerable interest throughout the State, particularly among school authorities and law enforcement agencies.

The opinion was rendered in response to the request of District Attorney W. O. Weissich of Marin County, who asked specifically whether it was the duty of the City of San Anselmo or the San Anselmo School District to provide policemen or guards at school sites.

Attorney General's Opinion

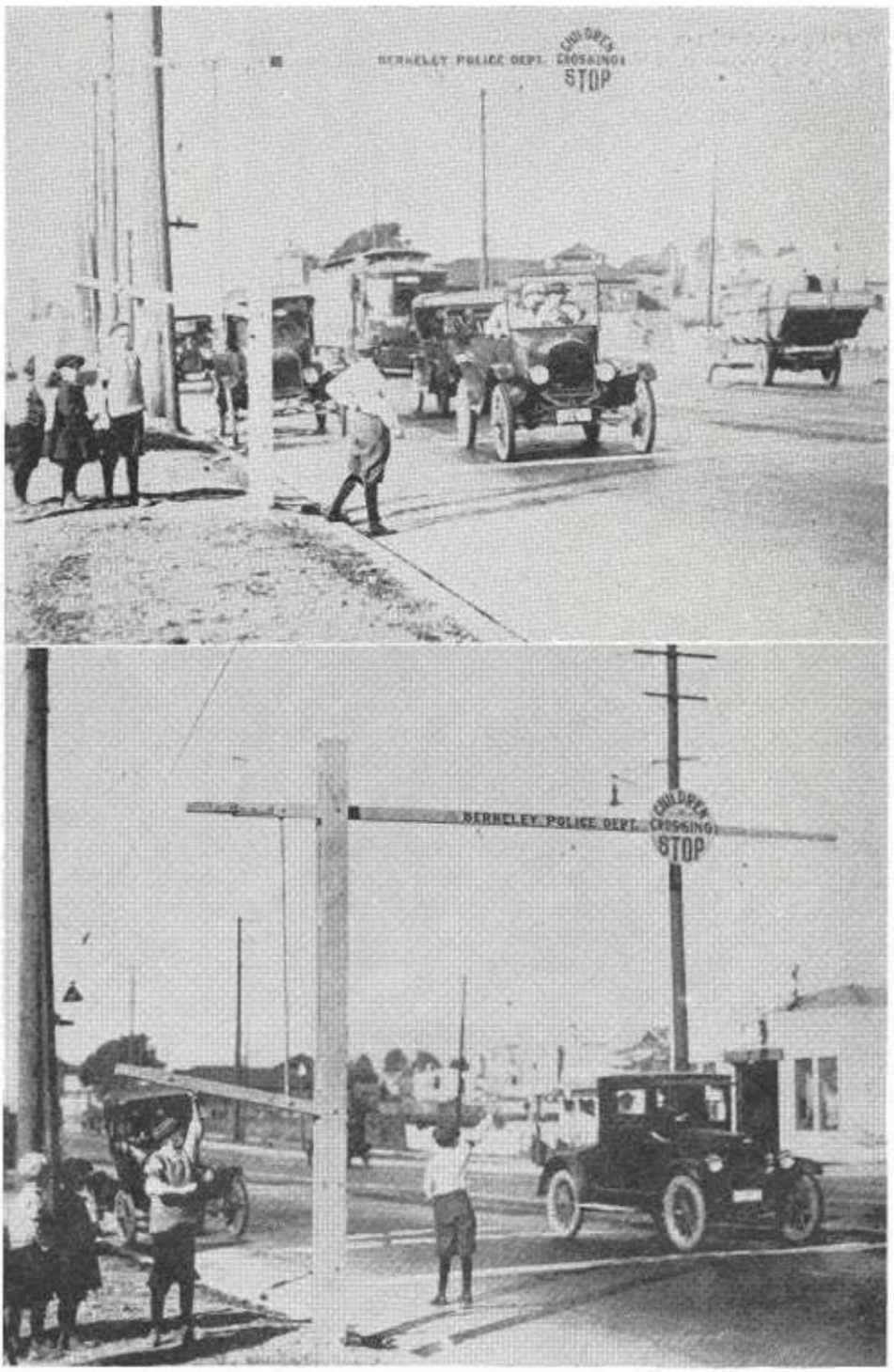
The Attorney General's opinion, dated October 19, 1954, is summarized as follows:

"1. The City of San Anselmo has a duty to provide protection to school children crossing streets as they go to and return from school, but whether such protection is required at the school depends upon the conditions existing at each particular site.

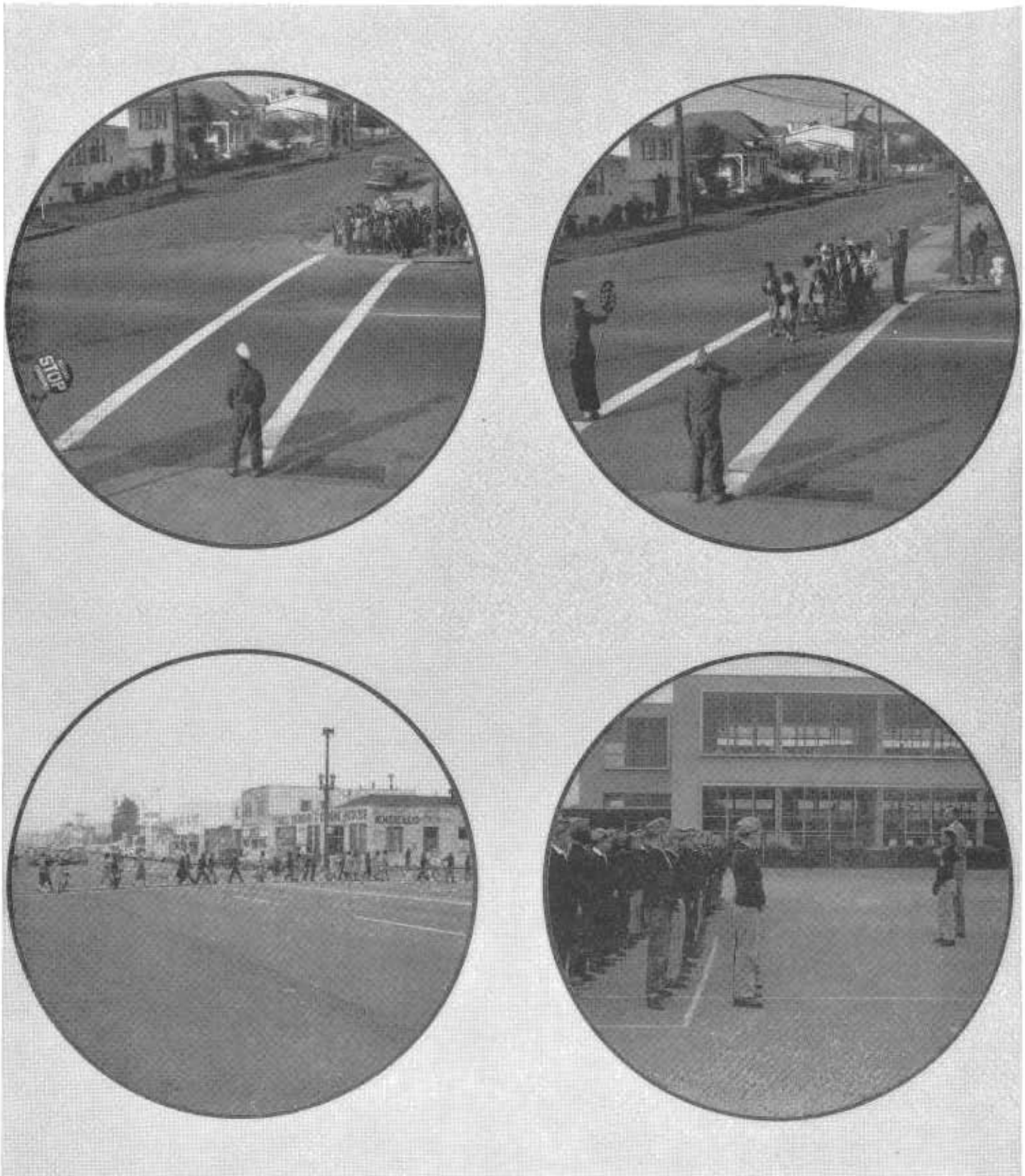
"2. The San Anselmo School District does not have a duty to control traffic so as to provide protection for school children crossing streets as they go to and return from school, but at the school site

EDITOR'S NOTE: The Division of Highways has prepared a handy illustrated booklet on signs, signals and devices used for school crossing protection on state highways.

Persons interested in obtaining a copy of the booklet should address their request to Traffic Engineer, Division of Highways, Public Works Building, P. O. Box 1499, Sacramento 7, California; or to this magazine.



First school safety patrol in Berkeley in 1923. These photos taken at intersection of San Pablo Ave. and Virginia St. See photo, lower left, on page 2 taken at same intersection in December, 1954.



UPPER LEFT—At Ashby and King Sts. in Berkeley, Lincoln School patrol members and students wait for the patrol leader's signal. UPPER RIGHT—All clear, the patrol leader blows his whistle, the sign operators take their positions, and the children are allowed to proceed. In Berkeley, the crossing sign operators stand at the edge of the parking lane for better visibility. LOWER LEFT—On busy arterials in Berkeley, traffic is stopped simultaneously on all legs of an intersection. The stopped vehicles themselves provide a protective barrier. This is San Pablo Ave. and Virginia St., location of the first Berkeley school safety patrol on January 16, 1923. LOWER RIGHT—Weekly drill is regular procedure for Berkeley school safety patrols. Mr. Herman Nyland is the teacher-sponsor at Columbus School (pictured).

and the streets immediately adjacent thereto conditions may warrant some form of supervision of the students depending on the risks involved."

The problem of protecting the school child is older than the automobile itself, but its magnitude has grown through the years with increase in the State's population and motor vehicle registration.

Problem One of Scope

There is not now and never has been any doubt that the protection of the children is a community problem which must be shared by parents, community agencies, police, and schools. The question rather is one of scope. Some California authorities have believed that the responsibility of the school is and should be limited to the education of the children in safe and proper traffic behavior, and that their physical protection on streets and highways off the school grounds is the responsibility of the law enforcement agency.

Other authorities, realizing the practical limitations of actual police protection, have for years exercised some form of supervision of the students on the streets immediately adjacent to the schools.

Patrols Successful

One of the most successful methods for elementary and intermediate schools has been the use, in cooperation with the police departments in cities and with the California Highway Patrol in rural areas, of school safety patrols. These patrols are made up of boys, and sometimes girls, in and above the fifth grade.

California's law authorizing school safety patrols in the public schools was enacted in 1947, but the idea is much older. Nationally, the earliest experiments with school safety patrols go back some 35 years. In this State the first cities to organize patrols were Berkeley and San Francisco. Both did so in 1923 through the joint efforts of the city school departments, the police departments, and the California State Automobile Association. The American Automobile Association was one of the earliest sponsors of the school safety patrol idea, and through the years has continued to be one of its most active and enthusiastic supporters.

It doesn't rain very often in San Diego, but the school safety patrol is well prepared

Authorized by Law

Legal authority for school safety patrols in California is contained in the State Education Code, which authorizes any school district to establish and maintain patrols, subject to rules and regulations adopted by the State Board of Education.

Police departments in cities, and the California Highway Patrol in unincorporated areas, are authorized by the law to cooperate in the establishment of school safety patrols upon request of the governing board of any school district. The law is specific that the patrols are for the purpose of assisting pupils in safely crossing streets and highways adjacent to schools, and that patrol members are authorized and required to give signals and directions only for that purpose. Attorney General Brown says that the school safety patrol is not to be deemed protection in lieu of actual police protection, but rather supplementary, and that police officers should be present when conditions warrant.

Operating Procedure

Rules and Regulations of the State Board of Education relating to School Safety Patrols are set forth in the California Administrative Code. They cover in detail the establishment, general duties, and operating procedure of the patrols; and they specify the type of crossing sign, uniforms, and insignia.

Briefly, the prescribed operating procedure for school safety patrols is as follows:

(a) At crossing controlled by a police officer or crossing guard, the patrol members direct the crossing of the students in conformity with the signal of the police officer or guard.

(b) At crossing controlled by automatic traffic signals, the patrol members hold the students off the street or roadway until the signal allows them to cross safely, and require latecomers to wait for the next green light.

(c) At crossings with neither automatic nor pedestrian signals, the patrol members are so posted that they are clearly visible to approaching traffic. They stay out of the roadway unless their view is obstructed by parked cars, in which case they are posted no farther into the roadway than the outer edge of the

San Diego doubles the number of patrol crossing signs on more heavily traveled streets for greater safety. On four-lane streets with center curbed islands, one of the sign holders stands in the island for better visibility of drivers in the inside lane.

parked cars. They do not permit students to enter the roadway until it appears safe, and then direct them to cross in groups. Not until the children are safely across do the patrol members change the crossing signs to permit traffic to proceed.

(d) At crossings where there are pedestrian-operated signals, patrol members operate the signals. They are careful to activate the signals when there is a break in the traffic stream, and they control the students as in the case of automatic signals.

Patrol members also see that pedestrian overcrossings and undercrossings are used, when there are such facilities, and they supervise the loading of buses and streetcars.

Standard Uniform

The basic standard uniform is a federal yellow overseas cap to which optional colored piping may be added. It must be worn by patrol members at all times while on duty. White Sam Browne belts and red jackets or sweaters are optional; some school districts provide the belt, some the jacket, some both. The City of San Diego also requires white pants and white shirts. Insignia or special badges identifying the organization are also permitted by the code.

Rainy-day uniforms consist of federal yellow raincoats and rainhats, with or without the Sam Browne belt. Some cities also provide rubber boots.

Most schools furnish the rain clothes, but many provide only the yellow cap for regular wear. The full uniform, however, appears to have several advantages. It is much more discernible to the motorists, and therefore safer; it inspires a higher morale among the patrols; and, like grownups, the children seem to react more readily to the authority of a badge and uniform.

Service Voluntary

The official school safety patrol crossing sign is a red disc 18 inches in diameter with the words "Stop, School Crossing" in white letters. The sign is fastened to a six-foot pole at such an angle that the lettering is horizontal when the sign is extended diagonally toward the street.

Service on the school safety patrol is voluntary, but there is never a dearth of applicants. Appointment to the patrol is considered to be a privilege by the great majority of students. Most small boys look forward to the day when they will be big enough to serve, and older boys are honored to be chosen for the responsibility. Parental objection is rare; the usual reaction is pride that their boy has been found to have the qualities necessary for such a responsibility.

Members of the safety patrols are selected by the school principals upon the recommendation of the teachers with, of course, the consent of the pupil and his parents or guardians. Squad leaders and other officers are ap-

pointed by the supervising police officer from the upper-class veterans, guided by the recommendation of the teachers and, in some cases, by vote of the patrol members themselves.

Police Officers Help

The key to a successful school safety patrol is the police officer or patrolmen assigned to supervision of the program. In unincorporated areas California Highway Patrol personnel assist in this service as part of their regularly assigned duties. In some of the larger cities details of police officers are assigned full time. Without exception the officers interviewed in the preparation of this article were enthusiastic about their assignment, and were wholehearted believers in the value of the school safety patrol idea. Their attitude and efforts are directly reflected in the behavior and performance of the boys and girls under their charge.

Most California cities allow school safety patrols to operate alone only on streets of light to moderate traffic, limiting their activities on heavily traveled streets to assisting police or adult guards. Berkeley is a notable exception. There, on busy streets, without the aid of policemen or adult guards, the patrols stop traffic simultaneously on all legs of an intersection before permitting the children to cross, thus making the vehicles themselves provide a protective shield. One such location at San Pablo Avenue and Virginia Street is illustrated.

San Francisco System

San Francisco does not use the prescribed stop sign in connection with its patrols, but does require the presence of a regular uniformed policeman where the volume of traffic is such that the children cannot cross in safety without having the traffic controlled. At these locations the school safety patrols assist the police officer by monitoring the children on the sidewalks. At intersections with light to moderate traffic, the patrols do not stop the vehicles but hold back the children on the sidewalk until the street is clear.

On rural roads and highways, if there is the slightest doubt as to safety, the California Highway Patrol does not encourage the use of school safety patrols. However, the patrols have been operating successfully on some heavily traveled highways. One example is at Davis School on US Highway 50-99 a few miles north of Stockton (illustrated). At this location, a four-lane divided highway, there are yellow flashing lights on standard school signs on both sides of each roadway 500 feet in advance of the school crossing. The lights are put in operation only when children are entering or leaving the school grounds.

With traffic safety stopped in both directions, a Washington School patrol squad leader in San Diego is about to release the children

UPPER—Children are held in the dividing strip at Davis School on US 50-99 until the safety patrol squad leader on the second roadway determines it is safe to cross. LOWER—On US 50-99 north of Stockton, a divided highway, Davis School safety patrols operate independently of each other, one on either roadway.

Squads of Three

Two three-member squads operate independently of each other at this location, one on the northbound and the other on the southbound roadway. They conduct the children across the highway in two steps. A boy with a stop sign is stationed on each side of both roadways 50 feet in advance of the crosswalk, and they operate their signs at the whistled commands of the squad leaders. The squad leaders' positions are at the crosswalk on the side of the approaching children, and they do not permit the children to enter the roadways until it is safe to do so.

And what about the accident record of school safety patrols? San Francisco, one of the two California cities with the longest record, reports not a single fatality at a patrolled intersection in the 30 years they have been operating. Berkeley, the other veteran city, reports not only no fatalities, but only five accidents in 30 years at intersections controlled by the school safety patrol. All of the five accidents recorded were due to drivers' negligence, and not the fault of the patrol. Other cities and counties claim similarly excellent results.

More Uniform Procedure

Successful as the school safety patrol system has proved, some authorities believe that it could be improved by more uniform procedure. Some cities, for instance, do not post patrols at intersections where there are traffic signals, or they remove the patrol after signals are installed.

A traffic signal does not mean that a school patrol or a crossing guard is not needed. Traffic authorities know that there is a general tendency to place too much reliance on the protection of a traffic light and too much faith that the motorist will never miss or violate the red signal. This belief is especially prevalent among non-drivers, which of course include the elementary and intermediate school child. Also, there is a particular hazard for the small child to start across the intersection too late to reach the other

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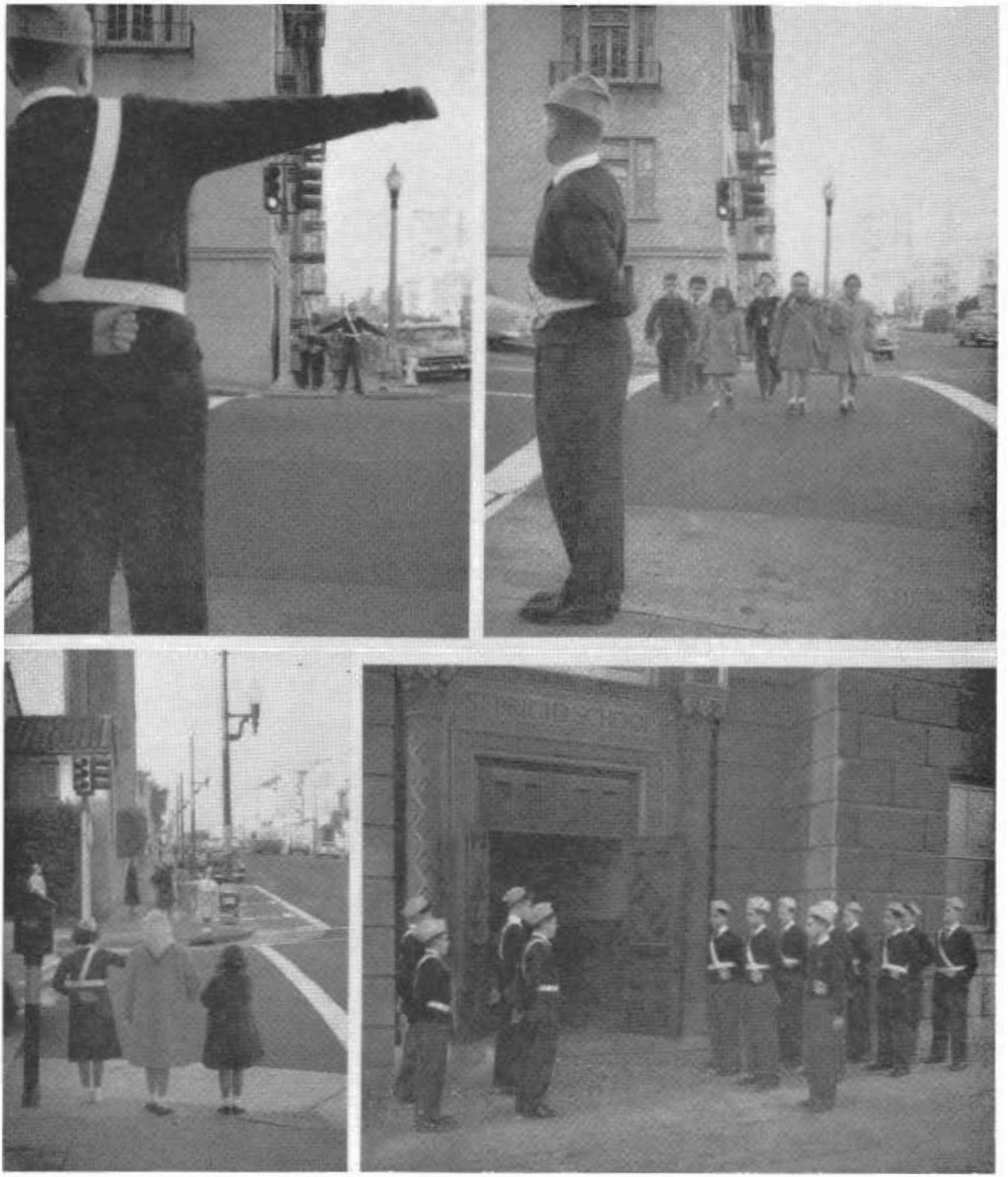


UPPER LEFT—At Broadway and Franklin St. in San Francisco, school safety patrol members are holding the children for the traffic signal, which has just flashed green. UPPER RIGHT—The same intersection a few seconds later. LOWER LEFT—Girl patrol members are no less efficient and effective than boys. This is at Union and Franklin Sts. in San Francisco. LOWER RIGHT—The school safety patrol at Saint Brigid's parochial school in San Francisco prepare to march to their posts.

Truck Loads

Division of Highways Reports to Legislature on Effect of Weight Limitations on Axles

Senate Resolution No. 28

Relative to Axle Weight Limitations

WHEREAS, This house has before it from time to time legislation with respect to the maximum weight limitations on each axle of commercial vehicles; and

WHEREAS, This house needs to be advised with respect to the effect of such limitations and any change therein on state highway construction and maintenance; now, therefore, be it

Resolved by the Senate of the State of California, That the Director of Public Works is requested to report to the Senate of the State of California at its January, 1955, Session with respect to the effect of maximum weight limitations on single axles of commercial vehicles and the effect thereof on highway construction and maintenance; and be it further

Resolved, That the Secretary of the Senate transmit a copy of this resolution to the Director of Public Works.

The following report by the Division of Highways is in compliance with this resolution.

This report has been submitted by the Division of Highways to the Legislature in accordance with California State Senate Resolution No. 28, 1954 First Extraordinary Session.

I. CONCLUSIONS

The following conclusions are the essence of this report. They represent, to the best of the ability of those charged with the construction and maintenance of state highways in California, the effect of axle loads and vehicle loads on the State Highway System.

(1) In the postwar period of 1947 to 1953, the average gross weight of commercial vehicles (including loads) on state highways has increased 18 percent and the percentage of axles carrying the heavier loads between 12,000 and 18,000 pounds has increased from 14 percent to 25 percent. In the same period, the average volume of commercial traffic has increased 40 percent. These increases in axle loading within the present law are rendering obsolete the thousands of miles of older highway not designed for such heavy loading.

(2) At the present time, the annual cost of reinforcement and maintenance of the travel lanes on state highways has risen to approximately $24,000,000. Any increase in axle loading would substantially increase this annual cost.

Construction Cost Increase

(3) If axle loadings were increased 25 percent, strengthening of the pavement would be required on 8,260 miles of older highways. The total cost of this strengthening is estimated to be $96,000,000.

(4) It is estimated that a 25 percent increase in present axle loading would increase new road construction cost by 10 percent. To construct annually the mileage of road work let to contract in the Fiscal Year 1953-54, the increase in cost would amount to approximately $14,000,000 per year.

(5) Without considering the increased future cost of maintenance, it is estimated that the increase in new road construction cost and the strengthening of the older roads would require over $298,000,000 within the deficiency period ending in 1967 if a 25 percent increase in axle loads should be enacted into law.

II. EFFECTS OF PRESENT RESTRICTIONS ON AXLE LOADS ON EXISTING STATE HIGHWAYS

Like any other engineering structure, the life of a road pavement structure and its cost of operation depend largely upon the weight of loads that it must carry and upon the number of times that these loads must be carried. The vast increases in the number of commercial vehicles on the State Highway System, together with the increases in weights within the present statutory limitations, have placed a great strain on the existing pavement structures.

Past reports on highway needs and highway deficiencies have said much about traffic gains and increases in truck weights during the war years of 1942 to 1945. What is transpiring in the current postwar period? Consider *Plate A*, which depicts graphically the average daily volumes of commercial traffic on state highways for the period of 1947 to 1953, inclusive. For every 1,000 commercial vehicles using the highways in 1947, over 1,400 are using the highways today.

Weights Increasing

Weights, too, are increasing. The State Division of Highways has carried on a truck weighing program over a period of years, beginning in 1936. Comparison of 1936 and 1944 data indicates an increase in the average weight of trucks and truck combinations from 11,556 to 19,281 pounds. It is interesting to note that from 1944 to 1953, during the postwar period, the average weight has increased to 25,114 pounds. *Plate B* presents the weight trends graphically.

Of greater significance than gross weights of vehicles is the weight per wheel or per axle of each vehicle, since it is these loadings or pressure points on the road surfacing that affect its service life. Each year, weighing stations are operated at key locations on the State Highway System and at these locations the individual axle loadings of trucks are measured.

Upward Trends

Examination of weight data indicates substantial upward trends in the weights being carried on each axle of commercial vehicles. These upward trends are of utmost importance. In

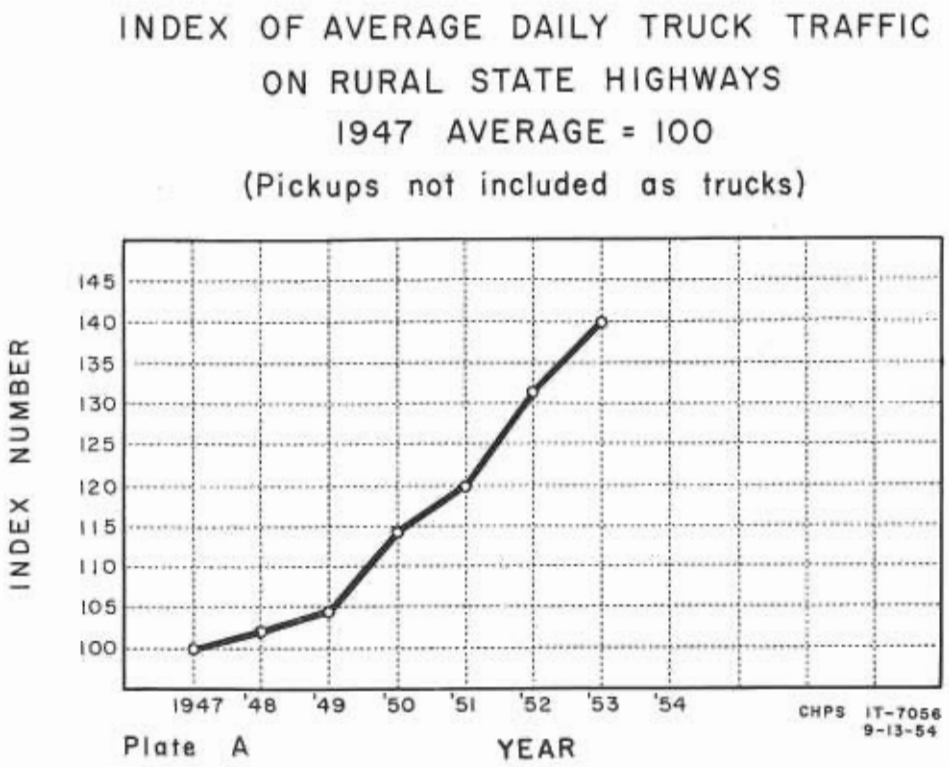


Plate A

1947, after the war, only 32 percent of all truck axles were loaded to more than 8,000 pounds. In 1953, over 44 percent of truck axles were loaded to more than 8,000 pounds. Eighteen percent of all axles were loaded to weights between 8,000 pounds and 12,000 pounds in 1947. This weight group had increased to 19 percent by 1953. The greatest damage to road pavement is caused by the heavier loads. These heavier axle loads, between 12,000 pounds and the legal maximum of 18,000 pounds, had increased from 14 percent in 1947 to 25 percent in 1953.

Summarizing

In summarizing the effects of increases in commercial vehicles and the increases in weights of commercial vehicles, the following points may be offered:

1. In numbers, commercial vehicles have increased by 40 percent in the six years from 1947 to 1953.
2. The average weight of all commercial vehicles has increased over 18 percent in the same period.
3. Because of the increase in the weight per axle of commercial vehicles, the effect on the service life of pavements is far greater than might be expected from the increases in gross vehicle weights and numbers.
4. The greater weights and numbers of commercial vehicles mean greater costs of road repair, greater costs of road construction, and shorter service life of existing road pavements. These greater costs are being caused by present traffic conforming to present law.

III. WHAT WOULD BE EFFECT OF INCREASE IN PRESENT STATUTORY LOAD LIMITS?

The approach to the problems of what would occur if load limits were increased need not be based on the hypothetical. The exigencies of the war effort and the call for rapid development of the military plant led to the hauling of many excessively heavy or illegal loads over the State Highway System. In many instances serious damage was inflicted to pavements that otherwise would have served satisfactorily for many years. This damage by war-caused traffic was recognized by the Federal Gov-

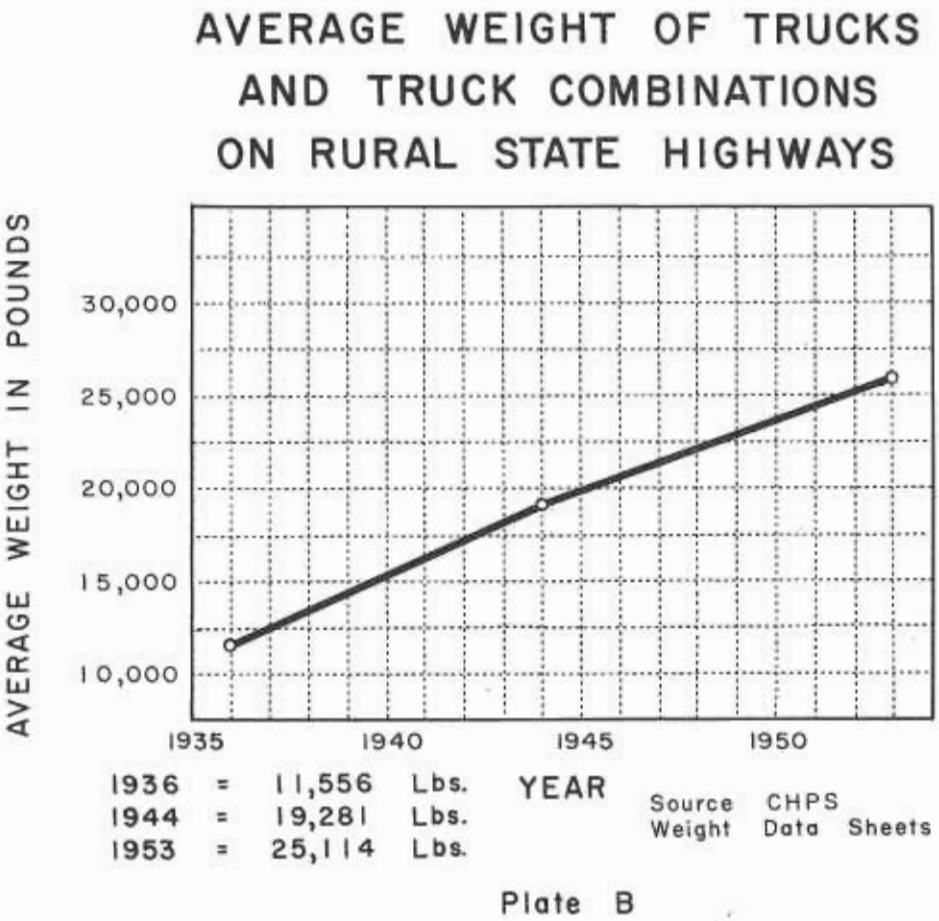


Plate B

PAVEMENT ON STATE ROUTE 5 DAMAGED BY OVERWEIGHT LOADS

PLATE C

ernment and, as a result, $1,787,359.95 was paid to California by the Federal Government toward the cost of repair.

Plates C and D present evidence of some of the failures that occurred when these heavy loads were applied. Note the damaged condition of the lane that carried the loaded vehicles as compared to the lane that carried the returning empty vehicles.

The pictures presented represent pavement designs that are substantial and which would carry present legal loadings on main line highways for many years. There are many miles of such pavements in service now. With an increase in load limits such road failures could be expected to be general.

Another realistic approach to the effect of heavier vehicle loading is the test tracks. These test tracks yield invaluable data to the highway engineer when, under controlled conditions, direct comparisons of the effect of various axle loads may be made. One of the most notable of these tests was Road Test One-Md., conducted in 1950 in Charles County, Maryland. This test was conducted under the auspices of the highway departments of 11 states, the District of Columbia, and the U. S. Bureau of Public Roads. The actual testing was under the direction of the Highway Research Board, a subdivision of the National Academy of Sciences.

California Law

California law now restricts the loading on single axles to 18,000 pounds and on closely spaced tandem axles to 32,000 pounds. Many miles of pavement in California are similar to the pavement subjected to the Maryland road test. With these thoughts in mind, attention is drawn to the following conclusions from that test:

(a) The 44,800-pound tandem axle loads caused approximately 11 times as much cracking (lineal feet) as the 32,000 pound tandem axle loads. This relationship held true over a period of almost four months, that is from 20,000 to 92,000 truck passes in each lane.

(b) The 22,400-pound single axle loads caused approximately six times as much cracking (lineal feet) as the 18,000 pound single axle loads. This relationship held true over a period of almost five months, that is from 35,000 to 238,000 truck passes in each lane.

(c) After 84,000 truck passes, 80 percent of the joints in the section carrying 44,800-pound tandem axle loads were depressed, whereas, with the same number of truck passes, only 10 percent of the joints in the section carrying 32,000-pound tandem axle loads were depressed. (Depressed joints are defined as those joints at which a marked localized settlement of the pavement has occurred, accompanied by cracking of the pavement in the vicinity of the joint.)

(d) After 137,000 truck passes, 22 percent of the joints in the section carrying 22,400-pound single axle loads were depressed, whereas, with the same number of truck passes, only 2 percent of the joints in the section carrying 18,000-pound single axle loads were depressed.

Maryland Experience

The facts developed in Maryland confirm experiences with earlier test tracks in California at Stockton and Brighton. Experiences with California State Highways bear out the fact that repetitions of heavier axle loads lead

to rapid destruction of pavements that are not designed for these heavier loads.

Of the 13,769 miles of constructed road in the California Highway System, 5,149 miles have been constructed or reconstructed to modern standards within the last few years. The remaining 8,620 miles of older roads were constructed to lighter structural standards. If heavier axle load limits were adopted, it would be necessary to strengthen these older pavements as rapidly as possible to prevent complete destruction of the riding surface.

The need for this strengthening would vary in proportion to the increases in axle weights on each individual road section and the noticeable effect of the loads on the particular pavement. It is estimated that the cost of a minimum strengthening of the riding surface on these older highways would total $96,000,000.

IV. WHAT WOULD IT COST TO DESIGN FOR HEAVIER LOADS?

It is well within the ability of the Highway Engineer to design and construct roads capable of withstanding loads of any reasonable magnitude. The controlling factor is cost.

In some states, a 25 percent greater loading is permitted on single axles than that permitted under California law. In those states, for "thruway" or "turnpike" construction, which is the counterpart of California's freeways, a pavement design for the heavier loading costs about 30 percent more per square yard than the cost of road pavements in California. This difference is due to the greater structural strength required to support the loads.

What effect does this have on the total cost of road construction? On the average, the cost of the structural elements in the upper 24 inches of the roadbed amounts to about 32 percent of the total cost of road construction. If loadings are increased 25 percent, the cost of these structural elements will be increased, and present over-all construction costs will be increased about 10 percent. Where funds today will build 100 miles of new high standard road, tomorrow, if load limits were increased, these same funds would build only 91 miles of road.

PAVEMENT ON STATE ROUTE 60 DAMAGED BY OVERWEIGHT LOADS

PLATE D

V. HOW MUCH WOULD MAINTENANCE COSTS INCREASE IF HEAVIER AXLE LOADS WERE LEGALIZED?

Like the service life of a pavement, the cost of maintaining or operating a road pavement depends largely upon the weights of loads that it must carry and the number of times that these loads must be carried.

On a lightly traveled road or on a road where heavy loads are infrequent, the operation cost is low. On a heavily traveled road where both the number and weights of loads are high, the operation cost is high. On a road where the weights and number of loads are beyond that for which the pavement was designed, total failure may occur and the costs of repair may approach new construction costs.

Consider the examples of road life on *Plate E*. Note that similar four-inch pavements were constructed in Tulare County on Route 4-A (U. S. Route 99) in 1918, and on Route 131-B two years later in 1920. Route 4-A is one of the principal north-south highways and carried an average of 1,840 commercial vehicles per day in 1953. On the other hand, Route 131-B is a local service road with an average of only 140 commercial vehicles in 1953.

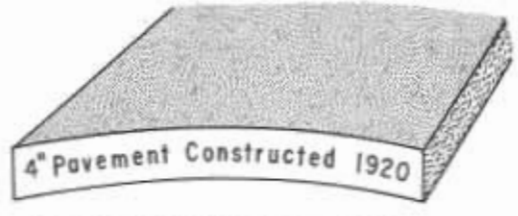
Note the frequency of repair work necessary on Route 4-A. Also note that the original pavement on Route 131-B is still serving without repair. The annual per mile cost of maintenance of the road surfacing or traveled way amounts to approximately $137 for Route 131-B and $360 for Route 4-A. This is in addition to the major repair work shown on *Plate E*, which was done with construction funds. The principal difference between these two roads from the beginning insofar as service life is concerned has been in the weight and number of vehicles.

Would Mean Road Failure

These two roads are not isolated examples. In varying degree they represent the bulk of the 14,000 miles of State Highway System today. With little doubt, if Route 4-A traffic, conforming to all present legal load restrictions, were diverted onto the old road pavement on Route 131-B, a complete failure of the road pavement would occur almost immediately. Referring to the effect of loading over the present legal limits, as shown on *Plates C and D*, also leaves little doubt that if those now illegal loadings were legalized, rapid failures in the massive pavement section on Route 4-A could be expected.

Returning to *Plate E*, it must be restated that the several increments of resurfacing required on the Route 4-A section were financed by construction funds since such repair is beyond the scope of routine maintenance. In the year 1953, about 11 percent of funds available to the Division of Highways for major improvements, minor improvements, and betterments were required for this type of construction repair. In money, this amounted to approximately $15,000,000 in 1953. This does not include the annual cost of routine maintenance. For perspective, it may be observed that in addition to the cost of construction repair, approximately $8,800,000 is expended now each year for routine maintenance of the traveled way or pavement lanes. As weights and numbers of heavy vehicles or axle loads increase, these costs may be expected to increase correspondingly.

STRUCTURAL ELEMENTS OF ROAD PAVEMENTS ON STATE ROUTES 4-A AND 131-B IN TULARE COUNTY



STATE ROAD VI-TUL-131 B
with average of 140 commercial vehicles per day in 1953

STATE ROAD VI-TUL-4-A U.S. ROUTE 99
with average of 1840 commercial vehicles per day in 1953

Plate E

Maintenance Costs

In estimating the increase in maintenance and construction repair cost, if load limits are increased, it could be said that traveled way maintenance cost plus construction repair of the traveled way have increased to approximately $24,000,000 annually with the increases in loadings and traffic that have occurred within present legal limitations, and this increase is continuing.

This $24,000,000 in 1953 is the cost of wear and tear on the pavement. It indicates that now the cost of operation of the pavement alone on state highways has risen to almost $2,000 per mile per year. It indicates that more and more of the construction dollar is being required to repair and keep in service the existing road system. It indicates that less and less of the construction dollar is going into high standard freeway construction.

How much would maintenance and operation cost be increased if load limits were increased? This cannot be precisely estimated. In a previous section, it was shown that in the Maryland test a 25 percent increase from 18,000 pounds per axle to 22,400 pounds per axle increased the rate of cracking in the pavement by 600 percent. Also recall that at present approximately $9,000,000 are being expended annually for routine maintenance of the traveled lanes and approximately $15,000,000 are being expended from construction funds for construction repair of the traveled lanes. Most certainly an increase in load limits would increase these costs substantially.

VI. WHAT EFFECT WOULD INCREASE IN PRESENT LOAD LIMITS HAVE ON BRIDGES?

Like a road pavement, the life of a bridge depends largely upon the weights of loads that it must carry and the number of times these loads must be carried. Application of loadings beyond the supporting ability of either a road pavement or a bridge will produce an overstress in the structure and damage will result. In a road pavement, the visual evidence of damage may amount to cracking of the surfacing. In a bridge, it may result in total collapse such as shown in *Plate F*.

A road pavement failure may result in a rough distorted roadbed where travel speed must be reduced to a crawl while repair is undertaken. A bridge failure may result in road closure for long periods of time and involve costs amounting to bridge replacement. For these reasons, the design of bridges must include a greater factor of safety than that required for a road pavement. For these same reasons, great caution must be used in permitting vehicle loadings that overstress a bridge.

In the study of any proposal to increase axle weights or vehicle loading, the primary consideration must be the probable effect on the bridges now in use on state highways. At present, the design of bridges is based on the H 20-S16 * loading. This loading conforms to the recommendation of the American Association of State Highway Officials, and is at present the national standard for bridge design. Of the 4,875 existing bridges on state highways, about 975, or 20 percent, have been constructed to this modern standard. It is believed that moderate

* H 20-S16 designation represents a truck and trailer having a gross weight of 36 tons, with an 8,000-pound loading on the front axle and with 32,000-pound loadings on each of two pair of rear tandem axles.

. . . Continued on page 34

PLATE F

District VII Freeways

Developments in the Los Angeles Area

By PAUL O. HARDING, Assistant State Highway Engineer

IN THREE previous issues spaced about one year apart of *California Highways and Public Works*, I have discussed the role of the State Division of Highways in the development of freeways for the Los Angeles area. In these prior writeups details were given concerning the historical background, the setup for financing state highway projects and the splendid cooperation on the part of all governmental units, civic organizations and public-minded citizens that has prevailed so that plans on the boards could be converted into usable freeways. This present story is confined largely to the important developments that occurred during the year 1954 in the furtherance of freeways in the District VII area with a forecast of what can be anticipated for the year 1955.

Freeway Mileage

The year 1954 was one of considerable accomplishment from the standpoint of getting important units of the District VII freeways completed, putting additional freeway mileage under active construction, and acquiring freeway rights of way for future construction. In the Los Angeles metropolitan area during 1954 we completed an additional 20 miles of full freeway. This brings the length of completed full freeways in the Los Angeles area to a total of 66 miles.

The accompanying map indicates the extent of accomplishment and shows how the main freeway trunk lines are radiating out from the Los Angeles downtown area to serve outlying communities, and are now coming much closer to making connections with completed expressways and multiple-lane highways in those less built-up and undeveloped areas of Los Angeles, Ventura and Orange Counties, which three counties comprise District VII of the State Division of Highways.

The Engineering Department of the Automobile Club of Southern California, which is headed by Ernest East, Chief Engineer, and Hal Holley, Assistant Chief Engineer, in a report released August, 1954, entitled, "An Appraisal of Freeways vs. Surface Streets in the Los Angeles Metropolitan Area," describes practical test runs made by this organization on freeways and on surface streets. From data accumulated on these test runs it has been determined that the average cost of automobile operation on the freeways is 4.021 cents per mile whereas the average cost on surface streets is 8.215 cents per mile.

Economic Justification

In the Automobile Club report on page 12 is developed an economic justification for the Los Angeles Metropolitan Freeways, which appears in some detail in the article "Safer Highways," elsewhere in this issue of *California Highways and Public Works*. The Automobile Club report states:

"At the indicated saving of 4.194 cents per vehicle mile, the annual saving to freeway users amounts to nearly $50,000,000, an amount equal to more than one-third the total cost of the completed freeways. If it were possible, by a wave of a magic wand, to superimpose the completed 600-mile freeway system onto the street and road network of the coastal plain of Los Angeles County, we could conservatively expect the 600-mile freeway system to carry with a minimum of congestion and with maximum safety a weighted average daily traffic of some 30,000 vehicles. These vehicles would generate about 6.6 billion vehicle miles of the total of 21.6 billion vehicle miles now traveled annually in Los Angeles County, and the saving to drivers using the completed system would exceed $275,000,000 per year. The present 45-mile freeway system now in use is actually saving motorists $50,000,000. Thus, the drivers of Los Angeles County are paying $225,000,000 per year because our freeway system is not complete."

Direct Benefits

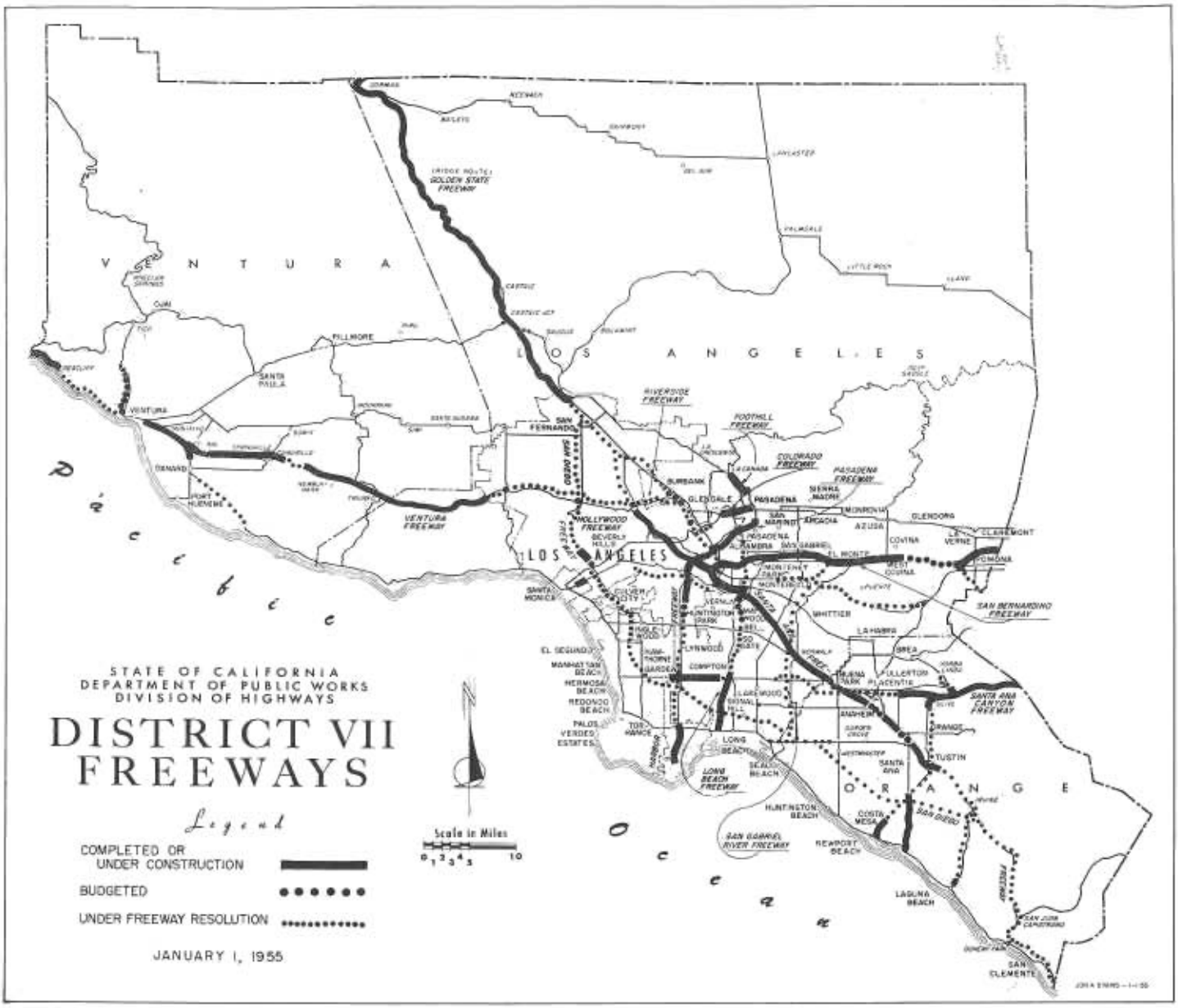
This analysis demonstrates very forcibly the truth of the saying: "We pay for good roads whether we have them or not, but we pay more if we don't have them."

In addition to the direct benefits that can be evaluated as money savings for motorists using freeways there are many indirect benefits that should not be overlooked. These are well covered in the quotation that follows from the City of Los Angeles June, 1953, report entitled, "The Economy of Freeways," by Lloyd Aldrich, City Engineer, and by Hugo Winter and Lamar W. Gardner of the Street and Parkway Design Division:

"* * * there are of course many other direct and indirect benefits to the motorist and general citizenry which cannot be easily evaluated in monetary terms, though none the less real. Among these are stabilization or enhancement of property values, relief of existing overburdened surface arteries, doubling of the practical radius of real estate development on a travel time basis, increased access to recreational or cultural facilities, increased mobility in times of disaster emergencies, increased tourist travel, reduction of strain of driving, and all of the other well known advantages in betterment of transportation. The benefits to the large amounts of traffic continuing to use formerly heavily congested surface arteries after the freeway system is built are not usually visualized. Before and after surveys have shown that removal of through traffic from surface arteries to the freeway benefits community business, property values, surface travel time, and safety on the surface system. In addition, the intended use of the freeways by express busses will greatly increase the economic value of the freeways to the general public, of which the motorists comprise a large part. The monetary value of these benefits could very well amount to huge sums, since they are all so vitally integrated with the general financial health and progress of the region. It should be borne in mind that conversely to the benefits accruing from having good transportation, *if there were no freeways there would be the losses that the region would suffer without having them.*"

More and More Freeways

As of January 1, 1955, we had a total of 60 construction contracts under way for which the construction allotments total $61,770,000. Of these contracts 34 are for construction jobs on full freeways and the



total of these allotments is $43,754,300. This is an indication of the continuing recognition given to freeway needs in District VII. An additional 14 miles of full freeways are anticipated for completion during the year 1955.

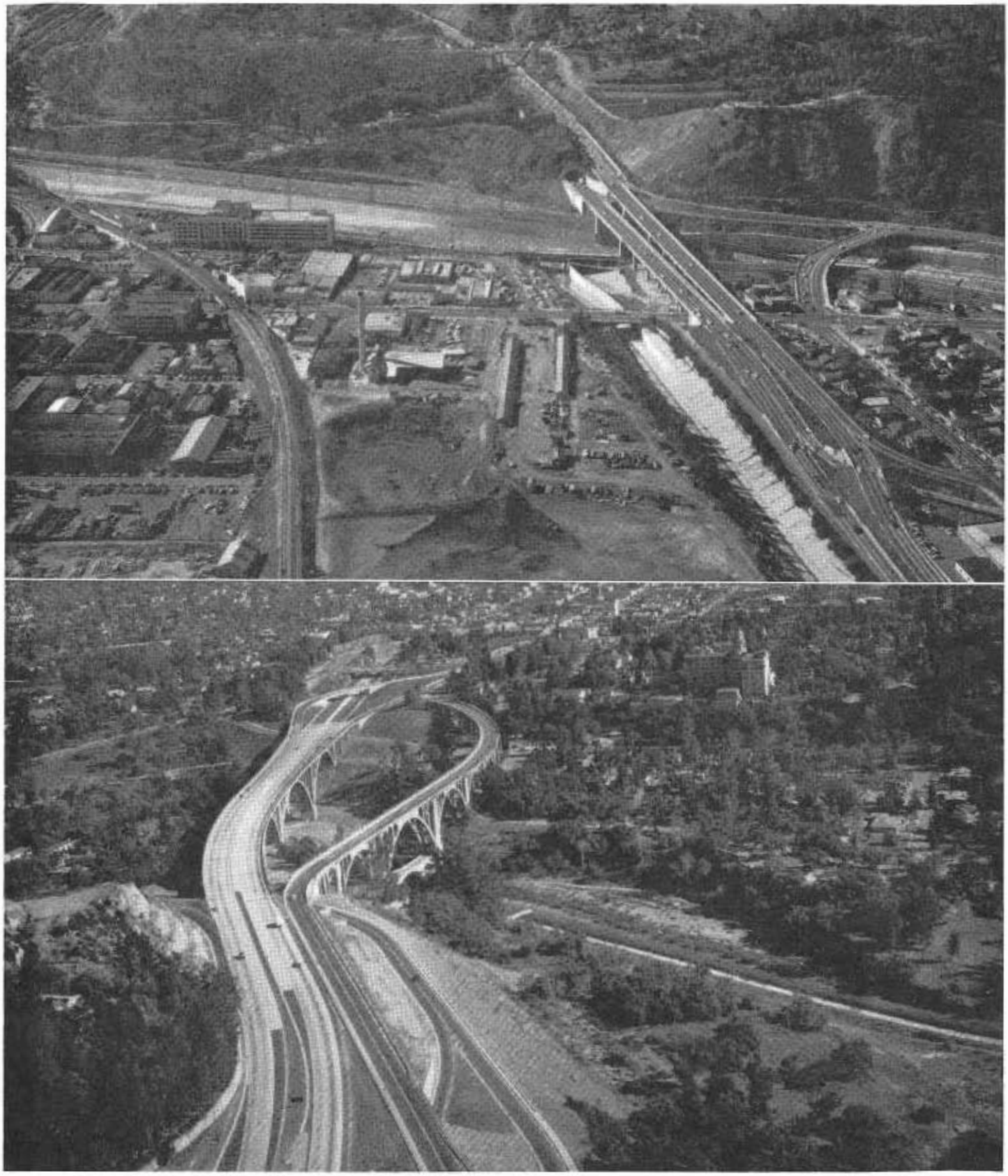
Good use was made during 1954 of the funds totaling $14,098,000 allocated to District VII for advance protective right-of-way acquisition. The money spent from this fund, in acquiring 747 parcels of property, that is often referred to as "Chapter 20 money"; for acquiring vacant, unimproved properties in the path of freeways to forestall expensive developments has now reached the total of $6,800,000. Big dividends will accrue to the State in later years to come because of these judicious expenditures, for if land now vacant is allowed to be subdivided and homes and industries built thereon the later costs of right of way acquisition may be increased many times over.

Progress Made

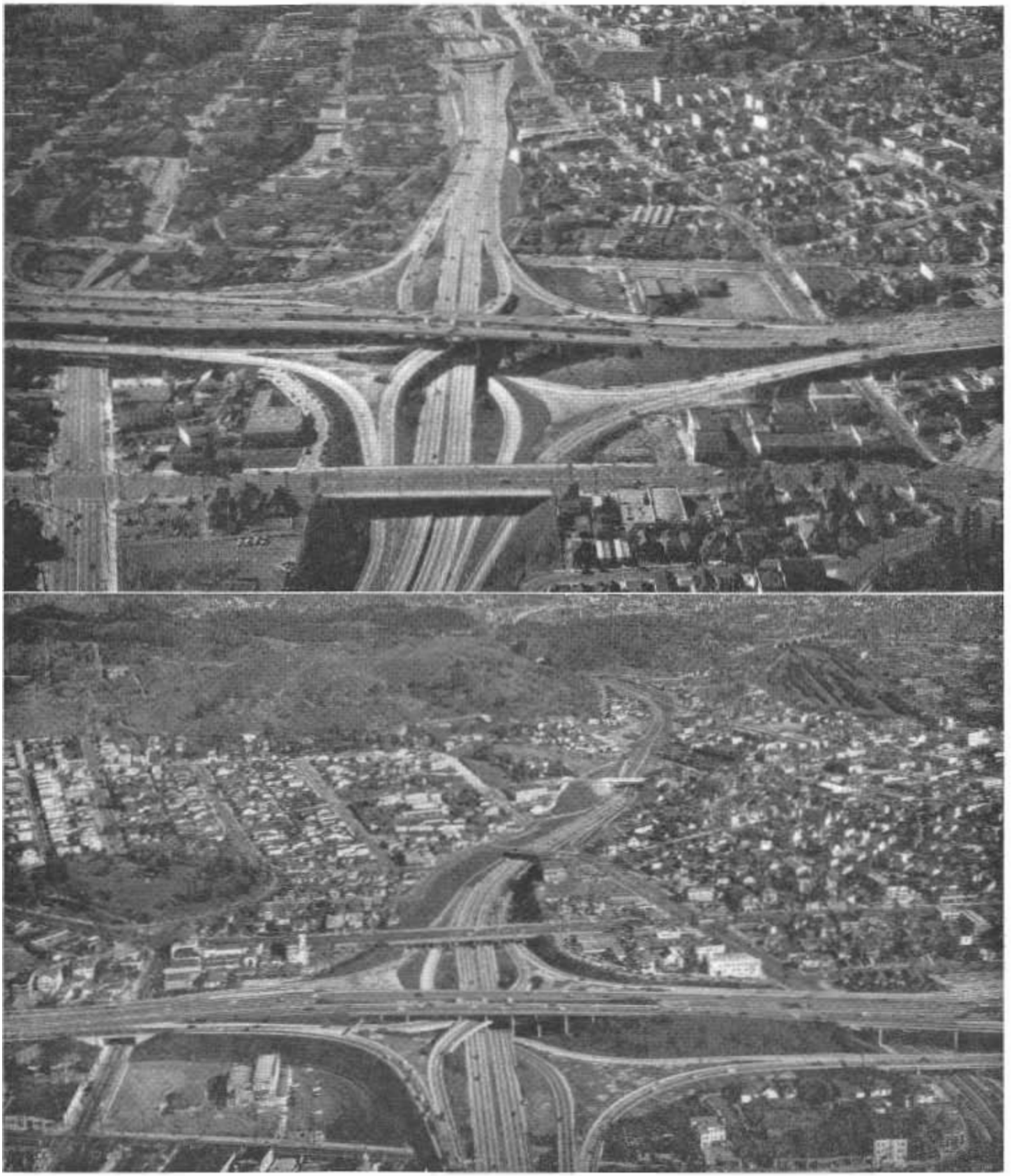
The accompanying map and tabulation showing status of District VII freeway projects indicate in a general way the progress that has been made. To date of January 1, 1955, a total of 166 miles of freeways and expressways have been completed in District VII and 50 miles are under construction. The total sum to date that has been expended for completed freeways, freeways in progress and right-of-way acquisition therefor is $336,973,000. The budget for the 1955-56 Fiscal Year recently adopted by the California Highway Commission allocates a total of $70,915,000 for expenditure upon District VII freeways. Thus, the total expended and obligated for District VII freeways is now $407,888,000, including Federal Aid funds.

PASADENA FREEWAY

With the completion of construction on the last one-half-mile link at the south end this freeway, formerly called the "Arroyo Seco Freeway,"



UPPER—Looking southerly along Pasadena Freeway, showing Arroyo Seco storm drain channel foreground right, bridges crossing Los Angeles River in center. In center background is Bishops Road disposal area where state contractors, at considerable saving to the State, have hauled in some 5,000,000 cubic yards of excess excavation encountered on nearby freeway projects. In the foreground is shown area that will be traversed by future Golden State Freeway that crosses the Pasadena Freeway at approximately right angles. LOWER—Looking easterly along Colorado Freeway showing "Pasadena Pioneers Bridge" over Arroyo Seco on left and Old Colorado Street Bridge on right, with Pasadena Civic Center and business district in background.



UPPER—Looking southerly from above Los Angeles along Pasadena-Harbor Freeway. Sunset Boulevard over Pasadena Freeway shown in foreground center. Four-level traffic interchange structure shown in foreground, with Hollywood Freeway extending from left to right. Portion of downtown Los Angeles business district shown above center left. LOWER—Looking northerly from above Los Angeles along Pasadena Freeway. Hollywood Freeway and four-level traffic interchange structure shown foreground, with City of Pasadena in background.

Looking easterly along Hollywood Freeway with four-level traffic interchange structure in center background and Los Angeles Civic Center buildings left background. This photograph shows late afternoon peak traffic flow.

on September 22, 1953, was fully completed and opened to traffic throughout its entire length of 8.2 miles, from the four-level traffic interchange structure in Los Angeles to Glenarm Street in Pasadena. On that date, for the first time, all levels of this unique traffic interchange structure and all connecting roadways were put into full operation. Recent traffic counts indicate that the average daily traffic on the southern portion of this freeway through the Elysian Park area is 110,000 vehicles per day. The northerly six miles of the Pasadena Freeway, from Avenue 26 to Glenarm Street, was completed and opened to public traffic on December 30, 1940.

HOLLYWOOD FREEWAY

Of particular interest is the final completion of the 10-mile Hollywood Freeway from Vineland Avenue in the San Fernando Valley to Spring Street in the Los Angeles Civic Center. The last major construction contract on the Hollywood Freeway was completed and accepted by Director of Public Works Frank B. Durkee on August 5, 1954. With the completion of construction throughout its entire length, public traffic has been quick to recognize the advantages which this freeway offers in safe and rapid transportation. We have found that the section between the four-level structure and Silver Lake Boulevard is carrying some 168,000 vehicles per day. This makes the Hollywood Freeway the world's most heavily traveled traffic arterial. The total cost of the Hollywood Freeway when all costs are in is expected to be $55,000,000 for the 10-mile total length.

The Hollywood Freeway extension joins the main Hollywood Freeway near the intersection with Lankershim Boulevard and extends northerly 6.8

miles to the proposed Golden State Freeway near Wentworth Avenue. District VII right of way agents have acquired 18 parcels on this unit with an expenditure in excess of $500,000, Chapter 20 money. The 1955-56 Fiscal Year budget has items totaling $4,200,000 for further right of way acquisition and structures.

SANTA ANA FREEWAY

The Santa Ana Freeway, an important traffic arterial on the Interstate Federal Aid System, completed and proposed, is 42.8 miles in length extending from Spring Street in the Los Angeles Civic Center to the junction with the San Diego Freeway near El Toro in Orange County. Through the East Los Angeles area this freeway is carrying 90,000 vehicles per day.

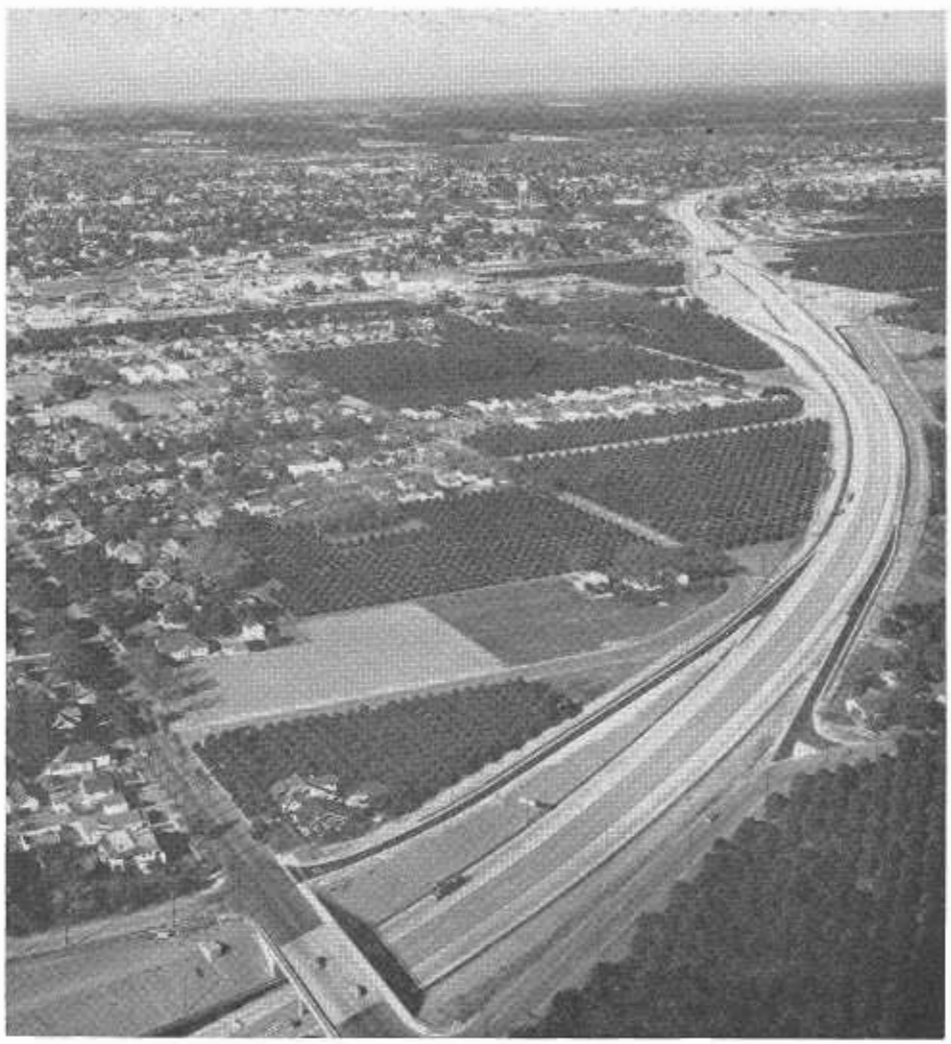
During the month of November, 1954, a two-mile section of the Santa Ana Freeway from Pioneer Boulevard to Rosecrans Avenue in the Norwalk area was completed and opened to traffic. Adding this mileage to the previously completed section of the Santa Ana Freeway and the adjoining Hollywood Freeway, we now have a continuous full freeway with no stopping for traffic signals or cross traffic from Vineland Avenue in the San Fernando Valley through the Los Angeles Civic Center to Rosecrans Boulevard in Norwalk for a total length of 26 miles.

On July 6, 1954, a $2,400,000 contract for widening the existing bridge on the Santa Ana Freeway on Aliso Street over the Los Angeles River an additional 42 feet and more, as necessary, to provide for an eight-lane freeway with central dividing strip was awarded to Oberg Bros., construction contractors, and active construction is now in progress. A $1,050,000 contract on July 11, 1954, to build grade separation structures at the signalized intersections between Rosecrans Avenue and the Orange county line, was awarded to Ukropina, Polich, Kral & Ukropina, and work on these bridge structures is now under way. Construction is in progress under a state contract about 60 percent completed with Winston Bros. Company for extending the Santa Ana Freeway in Orange County a distance of 2.5 miles southerly from First Street, Santa Ana, to Browning Avenue, just beyond the south city limits of Tustin.

The 1954-55 Fiscal Year budget provided $3,828,000 for construction of portions of the Santa Ana Freeway between Broadway in Santa Ana and the Orange County-Los Angeles County line. A construction contract is now advertised for work to be financed from this item from Broadway to Lewis Street, and bids were opened January 20, 1955. The State Highway Commission on August 26, 1954, allocated an additional $450,000 for the construction during the 1954-55 Fiscal Year of an overcrossing bridge to carry Harbor Boulevard in Orange County over the Santa Ana Freeway. Contract for this work was awarded to J. A. Thompson & Son of Inglewood on November 26, 1954, and construction is now in progress.

Much of the Santa Ana Freeway in Orange County is now on an expressway basis with the grade intersections of cross-traffic arterials channelized and signalized. In the budget for the 1955-56 Fiscal Year, sufficient additional funds have been set up, the total amount being $5,942,000, to convert substantially all these remaining sections of expressway to full freeway status. During 1955, freeway construction will be put under contract to achieve this through the City of Buena Park and the City of Anaheim. All this freeway construction should be completed in 1957, at which time motorists will have the use of 35 miles of full freeway from the Los

Looking northwesterly along completed Santa Ana Freeway bypassing the main business and residential areas of the City of Santa Ana. In the foreground is Fourth Street Bridge over the freeway and in background bridge carrying Santa Fe railroad mainline between Los Angeles and San Diego. Extensive replacement of orange groves with housing projects will be noted.



Looking easterly along San Bernardino Freeway from above City of Pomona with Ganesha Park in foreground left and Garey Ave., State Sign Route 71, in center.

in the East Los Angeles area are two railroad grade separation bridges to carry the Long Beach Freeway over the Santa Fe Railroad freight yards and the Union Pacific Railroad freight yards. Both of these structures are about one-fourth mile long and the construction cost of these two is $2,660,000.

On July 22, 1954, a contract was awarded to Ukropina, Polich, Kral and Ukropina for freeway construction and eight bridges between Sheila Street and Verona Street where junction is made with the Santa Ana Freeway. The contract allotment for this construction is $2,692,000. The work is 35 percent completed.

The Webb & White contract for the superstructure of the Long Beach Freeway bridge over the Los Angeles River that carries an allotment of $733,600 is about 26 percent complete.

Financed from a 1954-55 Fiscal Year budget item of $345,000, bids were received on January 27, 1955, for a railroad underpass bridge for the Los Angeles Junction Railway and appurtenant construction near Slauson Avenue.

For continuing construction and right-of-way acquisition on the Long Beach Freeway items in the 1955-56 Fiscal Year budget total $8,888,000.

GOLDEN STATE FREEWAY

On the portion of the Golden State Freeway, U. S. Highway 99, locally known as the "Ridge Route" between Tunnel Station and the Kern county line, 45.2 miles in District VII has been converted to a four-lane expressway. The total cost of this reconstruction, completed February, 1953, was $13,500,000.

Combined with adjoining completed reconstruction in District VI, the motoring public of California now has the use of 115 miles of completed continuous four-lane divided highway from Tunnel Station at the north city limits of Los Angeles to the Delano Underpass in Kern County near the Tulare county line. Under construction on the Golden State Freeway southerly of Tunnel Station to provide junction with State Highway Routes 23, 157 and 158, is the construction by Griffith Company, contractors, of 3.0 miles of freeway with a contract allotment of $4,400,000. This is scheduled for completion June, 1955.

The route adoption and freeway resolution for the last remaining unit of the Golden State Freeway to connect it with the Santa Ana Freeway was passed by the California Highway Commission June 24, 1954. The overall length of the Golden State Freeway in District VII extending from the Santa Ana Freeway northerly to the Kern county line is 72.7 miles.

Chapter 20, advance right-of-way money, in the amount of $360,000 has been utilized in acquiring six parcels of land for future construction on this freeway.

The budget for the 1955-56 Fiscal Year contains items for right-of-way acquisition and construction totaling $20,650,000.

VENTURA FREEWAY

The Ventura Freeway extends from the Hollywood Freeway near Vineland Avenue in the San Fernando Valley to the Santa Barbara county line, a distance of 65.1 miles. Of this mileage, 32.7 miles have been completed at a construction cost of $8,000,000 to four-lane divided highway or expressway standards. This completed construction is all westerly of the west city limits of Los Angeles at Calabasas. Within the City of Los Angeles, the State Highway Commission has adopted freeway resolutions covering 16 miles of the Ventura Freeway from the westerly city limits of Los Angeles near Calabasas to the existing terminus of the Hollywood Freeway.

In acquiring rights of way for future construction between Sepulveda Boulevard and Calabasas in the City of Los Angeles, $2,740,000 has been expended from Chapter 20, advance right-of-way money.

The 1955-56 Fiscal Year budget contains items for construction and right-of-way acquisition in the total amount of $7,300,000.

The California Highway Commission announced on December 15, 1954, that it is considering the adoption of a freeway routing to carry the Coast Highway (U. S. Highway 101) through the City of Ventura. State Highway Engineer G. T. Mc-

Looking westerly along San Bernardino Freeway from above City of Pomona, showing Garey Ave., State Sign Route 71, at bottom of picture. Wooded area encircled by freeway is Ganesha Park.

UPPER—Looking northerly, showing portion of San Bernardion Freeway with combination grade separation structure spanning over Garey Ave., State Sign Route 71, McKinley Ave. and Orange Grove Ave. LOWER—Looking easterly from above Los Angeles along San Bernardino Freeway with construction activities shown in foreground of Oberg Bros. Construction Company for widening bridge over Los Angeles River and Charles MacClosky for traffic interchange structure to take westbound motorists from San Bernardino Freeway southbound on Santa Ana Freeway.

Coy has recommended a route which would extend five and one-half miles from west of Telephone Road to one mile west of Ventura.

SAN DIEGO FREEWAY

On the part of the San Diego Freeway, formerly called the Sepulveda Freeway, between the San Fernando Reservoir and the Long Beach Freeway, a distance of 33 miles, $9,000,000 has been spent to date for right-of-way acquisition at critical locations in order to acquire rights of way in advance of extensive improvements to private property where delay would have made future right-of-way acquisition costly. Of this sum about $3,400,000 was chapter 20 advance right of way money.

The first unit of construction on this freeway was for structures between Waterford Street and Casiano Road, and bids were opened on August 26, 1954. This construction includes the grade separation bridge to carry Sunset Boulevard over Sepulveda Freeway and three other bridges. It is being financed from a 1954-55 budget item of $900,000. Award of contract to George W. Peterson and Jack W. Baker of La Canada was made on September 13, 1954, on basis of their low bid amounting to $722,657.60. Ground-breaking ceremonies at which Governor Goodwin Knight officiated were held September 20, 1954.

The California Highway Commission at its November meeting in Sacramento designated the San Diego Freeway as extending from the Golden State Freeway near San Fernando to San Diego. Thus the San Diego Freeway in District VII includes all of the formerly called Sepulveda Freeway and the portion of the previously called Santa Ana Freeway from El Toro in Orange County to the San Diego county line, a distance of 96 miles. In Orange County, through and adjacent to the City of San Clemente $984,000 of Chapter 20 money has been expended in the acquisition of 358 parcels of right of way for future construction. Items for construction and rights of way in the 1955-56 Fiscal Year budget total $4,405,000 for the San Diego Freeway.

In October, 1954, the California Highway Commission made additions to the 1954-55 Fiscal Year budget totaling $3,200,000 for construction on the San Diego Freeway. From these funds it is expected, early in 1955, to advertise and award contracts for constructing 1.2 miles of eight-lane freeway in the vicinity of Sunset Boulevard, and to build miscellaneous structures.

COLORADO FREEWAY

One and six-tenths mile of the Colorado Freeway in the City of Pasadena from Holly Street to Avenue 64 has been completed and opened to public traffic. This includes the new six-lane freeway bridge over the Arroyo Seco near the Rose Bowl and just northerly of the Colorado Street Bridge. A contract was awarded on June 14, 1954, to Peter Kiewit Sons Co. for extending this freeway from Avenue 64 westerly for three-fourths mile to Wiota Street as a full freeway and for one-fourth of a mile as a divided highway to Eagle Vista Drive where it joins a previously completed divided highway on Colorado Boulevard through the Eagle Rock section of Los Angeles. The contract allotment for this construction work that is now in progress is $988,000 and the estimated date of completion is August, 1955. To date there has been spent or obligated on this freeway for rights of way and construction a total of $13,264,700. The average daily traffic on the Colorado Freeway at Linda Vista Avenue connection is 30,000.

The construction work, completed and in progress, on the Colorado Freeway is to correct serious traffic congestion conditions on State Highway Route 161 between Pasadena and Eagle Rock, and it extends over all of the freeway route that has been adopted by the California Highway Commission.

FOOTHILL FREEWAY

Construction by Contractors Peterson & Baker and Dragline Rentals Co. on the Foothill Freeway, State Sign Route 118, from Hampton Road in the Flintridge area to Montana Street in Pasadena, is now in progress and about two-thirds completed. The total of the contract allotment is $1,922,700. The total length of this contract is 1.8 miles and to date a total of $2,600,000 has been spent and obligated for right-of-way acquisition and construction.

This construction will relieve a very severe traffic congestion situation that has existed for many years where present State Highway Route 9 crosses the Arroyo Seco on the narrow curving roadway located on Devil's Gate Dam.

ALLESANDRO FREEWAY

An application has recently been filed with the State Public Utilities Commission relative to the crossing of this freeway with the Southern Pacific Railroad. This is a badly needed freeway project since the existing State Highway Sign Route 2 at this location makes a grade crossing with Southern Pacific Railroad mainline tracks. Vehicular traffic delays at this railroad grade crossing are numerous and lengthy because of the large number of passenger train and freight train movements.

Just northerly of the Southern Pacific Railroad grade crossing is the intersection with San Fernando Road, U. S. Highways 6 and 99. This proposed unit of freeway construction will also eliminate the existing acute traffic congestion at this important highway intersection.

Right-of-way acquisition on the Allesandro Freeway for the 1.2 miles lying easterly of Fletcher Drive between the Los Angeles River and Avenue 36 near Eagle Rock Boulevard has been substantially completed. The total expenditure to date for right-of-way acquisition is $2,890,000.

ARTESIA FREEWAY

The California Highway Commission has adopted as a freeway two sections of State Sign Route 14 totaling 21.7 miles. These sections cover 8.8 miles from Normandie Avenue to Santa Fe Avenue in Los Angeles County and 12.9 miles from Palo Verde Avenue to Santa Ana Canyon Freeway in Orange County. Between these two sections a six-mile length of this route has recently been completed as a divided highway.

Looking northerly along completed Harbor Freeway, showing normal traffic use. The two bridges in foreground are for Fourth Street traffic. When cooperatively financed $1,400,000 construction contract now in progress has been completed for extending Fourth St. from Flower St. to Hill St., Fourth St. and Third St. will be put into operation as a pair of one-way streets similar to the one-way operation of Fifth and Sixth Sts., and Eighth and Ninth Sts.

State Sign Route 14 is a very important traffic arterial giving direct communication between the coastal cities of the Santa Monica Bay area with inland parts of Orange County, Riverside County and easterly. Some six miles of this route at the westerly end have been completed to four-lane divided highway standards. On August 17, 1954, a double bridge at the easterly end to provide for four traffic lanes was completed over the Santa Ana River at a cost of $465,000.

Three construction contracts are now in progress on this route for carrying out construction on an expressway basis. Total cost to date including right-of-way acquisition is $5,245,500.

SANTA ANA CANYON FREEWAY

State Highway Sign Routes 18 and 55, from Newport Beach to Riverside county line, a distance of 21.7 miles, for those sections being developed on a divided highway or expressway basis and covered by freeway resolutions by the California Highway Commission, are being called the Santa Ana Canyon Freeway because approaching Riverside County this freeway for many miles is located in the Santa Ana Canyon. Of this distance a length of 11 miles in the Santa Ana Canyon has been completed as a four-lane expressway and two miles through the City of Costa Mesa on an expressway and divided highway basis. This divided highway construction has been extended easterly into Riverside County in District VIII.

The total expenditure for right of way and construction to date on this freeway route is about $5,000,000.

OTHER DISTRICT VII FREEWAYS

In addition to the freeways listed in the accompanying summary and discussed herein there are 105 miles of freeway routings that have recently been adopted by the California Highway Commission that should be mentioned.

Considerable progress has been made in preparation of plans for the Ojai Freeway in Ventura County, U. S. Route 399, from Coast Highway (US 101) to Foster Park. Considerable right of way has been obtained in anticipation of a construction project to be advertised during 1955 for a four-mile length of four-lane freeway for which the budget allocation is $2,000,000.

On May 21, 1954, the California Highway Commission adopted a routing for the portion of the Olympic Freeway, State Sign Route 26, 9.6 miles in length, from junction with the Santa Ana Freeway to La Cienega Boulevard within Los Angeles City. Since that time designing and plan preparations have been going forward and many areas have been certified for right-of-way acquisition for the part of this freeway through the industrial area easterly of the Harbor Freeway. In the budget for the 1955-56 Fiscal Year $6,250,000 was allocated by the California Highway Commission for the start of right-of-way acquisition on the Olympic Freeway.

Commission Action

On November 22, 1954, the California Highway Commission issued a statement addressed to some 2,000 interested citizens in the San Fernando Valley area of the City of Los Angeles that were on the mailing list, relative to the action taken by the commission on November 18, 1954, adopting 10.9 miles of the Riverside-Ventura Freeway, extending from junction with the Golden State Freeway, State Highway Route 4, west-

Looking northerly along completed Harbor Freeway from above Los Angeles showing downtown business buildings and Civic Center buildings in center and toward background. The grade separation bridge, foreground left, carries Pico Blvd. under the Harbor Freeway. The four-level traffic interchange structure and Hollywood Freeway are shown background left.

erly to Sepulveda Boulevard. The statements were sent out to those citizens and property owners who had previously written in to the State Highway Commission for information or who had identified themselves at the public hearing held on July 14, 1954. This statement went to considerable length to explain the various proposed routings that had been studied and the reasons behind the commission's decision in adopting the line chosen as the route for the freeway.

The California Highway Commission on December 15th adopted a routing for the proposed San Gabriel River Freeway, which will run approximately 23 miles from the vicinity of Long Beach is a junction with the San Bernardino Freeway.

Looking northeasterly from above Los Angeles showing completed portion of the Harbor Freeway extending from foreground right to center left. Downtown business district and Civic Center shown center and right. The grade separation bridge, foreground right, carries Olympic Blvd. under the Harbor Freeway. Next above Olympic Blvd. is Ninth St. that carries one-way traffic eastbound, and above it is Eighth St. which carries one-way traffic westbound.

The route adopted is that recommended to the commission by State Highway Engineer McCoy. It follows in general the easterly portion of the San Gabriel River floodplain.

Freeways in the Los Angeles Metropolitan Area Not on the State Highway System

There are three such freeway projects that should be mentioned:

The Terminal Island Freeway from Seaside Boulevard to Willow Street is 3.1 miles in length and cost approximately $12,000,000. This freeway was designed by the State Division of Highways, constructed under State and Navy contracts, and financed by Navy and U. S. federal aid funds. The State Division of Highways was reimbursed in full for all expenditures made for engineering right-of-way acquisition and construction.

The Long Beach Freeway from Pacific Coast Highway to the Long Beach Harbor area, a length of 1.6 miles being beyond the southerly terminus of State Highway Route 167, has been and is being designed, constructed, and financed by the City of Long Beach. The estimated cost of this freeway is $12,000,000.

A 2.0-mile unit of the La Cienega Freeway in the Inglewood area has been designed, constructed and financed by the Los Angeles County Road Department at a cost of approximately $2,000,000.

Freeway System for Los Angeles Metropolitan Area

The so-called Los Angeles metropolitan area has rather vague boundaries. Sometimes it is taken to embrace the entire county, including portions of adjoining Ventura County and Orange County. Usually the Los Angeles metropolitan area is considered to be the 1,233 square miles of the Los Angeles County coastal plain. Roughly speaking, the County of Los Angeles is divided approximately one-third coastal plains, one-third mountains, and one-third in land valleys.

Thus, the freeway system for the Los Angeles metropolitan area is generally considered to be that system for the coastal plain areas that was established by the Regional Planning Commission of the County of Los Angeles and incorporated in the "Interregional Regional Metropolitan Freeways in the Los Angeles Metropolitan Area" that was presented to the California Legislature March 30, 1946, by the Los Angeles Parkway Engineering Committee. This report showed 613 miles of freeway as being on this system. At that time it was considered that 165 miles of these so-called "parkways" were a responsibility of the State Division of Highways for a 10-year period of construction.

It should be pointed out that the Division of Highways in its present freeway construction program is not completing the entire freeway system that was visualized in 1946 for the Los Angeles metropolitan area. The State is now accepting ultimate responsibility for some two-thirds of the mileage of this over-all system, and of course for many miles of full freeways and expressways in Orange and Ventura Counties outside the limits of the so-called metropolitan system.

Under the present accelerated construction program it can reasonably be expected that within the next 10-year period the State will be able to complete the state highway freeway routes in District VII, either to expressway or full freeway standards. However, the Los Angeles metropolitan area needs many other freeways that are not a state responsibility.

The *Town Hall of Los Angeles* released December, 1954, a report entitled, "The Traffic and Transit Problem of the Los Angeles Metropolitan Area." This sets up the problem very clearly, explaining the tremendous growth of population in the Los Angeles metropolitan area and the corresponding increase in motor vehicle registration. The 1954 mid-year motor vehicle registration statewide was 5,716,341. Of this amount there were registered in Los Angeles County 2,363,216.

Traffic Problem

In explanation of the traffic problem in the Los Angeles area there is quoted from *Town Hall* the following:

"Travel to and from work is the principal cause of traffic congestion at peak hours. Those persons who use their cars during the day in the conduct of their business or work also contribute to the congestion at peak hours.

"Many daily trips are made for shopping purposes. The increased use of the automobile for this purpose has led to the mushroom growth of supermarkets and suburban department stores, where parking facilities often take up more space than the store buildings themselves.

"Although neighborhood communities are more nearly self-contained and offer more diverse attractions than in earlier years, many cultural and recreational activities draw people long distances from their homes. In the Los Angeles area, also, most persons tend to have friends in various parts of the community rather than concentrate in their own neighborhood.

"In short, whether for earning or spending money, or merely enjoying the opportunities of life in this large urban community, to live is to travel. To be confined, or to travel only with difficulty and expense, is to have one's life correspondingly curtailed."

Population Impact

In commenting upon Los Angeles' problems, Charles Detoy, President of the Los Angeles Chamber of Commerce for 1954, recently said:

"If the entire population of Pittsburgh and Baltimore—1,755,000—were transported westward and settled within the Los Angeles metropolitan area you would have a fair estimate of our population increase between January 1, 1945, and January 1, 1955.

"The impact of this migration, averaging nearly 500 new residents a day for 10 years, makes even seasoned statisticians sit up and take notice.

"While the city's population climbed from 1,725,000 in 1945 to its present estimated 2,150,000—a 24.6 percent increase—Los Angeles County became the most populous county in the Country, second in the world. The county jumped from 3,345,000 residents 10 years ago to 4,950,000 today, and hasn't stopped yet.

"With a 50 percent rate of increase for the metropolitan area chalked up during the past decade, a population larger than that of Albany, capital of New York, has been added to this area each year. Certainly the problems inherent in this number of increased residents stagger the imagination and resources of any community."

The problem has been well stated but satisfactory and complete solutions to this problem of adequate transportation for the Los Angeles metropolitan area have yet to be established.

A constructive step was taken when Mayor Norris Poulson of the City of Los Angeles and John Anson Ford, Chairman of the Los Angeles County Board of Supervisors, on February 18, 1954, appointed a 45-member com-

UPPER—Looking northerly along right of way that has been cleared of buildings for future construction on the Harbor Freeway. The traffic arterial on left is Figueroa St., next is Broadway and beyond is Main St. The east and west cross street, portion of which is shown foreground right, is Florence Ave. LOWER—Looking northerly along section of Harbor Freeway under construction between 23d St. shown just above center and 42d St. at right beyond limits of picture. The Los Angeles Memorial Coliseum is shown foreground left and Los Angeles downtown business district and Civic Center buildings, background right.

mittee. This committee was called "Citizens Traffic and Transportation Committee," and it was composed of representatives with widely divergent interests and from all communities in the Los Angeles metropolitan area. Robert Mitchell, the first chairman, also president of several other prominent civic organizations, heads a rock product firm with headquarters in Vernon, and Robert L. Gordon, the first vice chairman, is Vice President of the Bank of America. Upon Mr. Mitchell's recent resignation Mr. Gordon was appointed chairman.

Panel of Consultants

Early in its deliberations this committee found the need of advice, consultation and guidance from persons who by their professional knowledge and experience were qualified as experts in the field of traffic and transportation. On May 5, 1954, a panel of professional and expert consultants to the Citizens Traffic and Transit Committee was created. This panel consisted of 12 business and professional men whose field of endeavor put them in close contact with transportation needs of the Los Angeles metropolitan area. Since that time four additional members have been added to the panel of consultants. The panel chose Mr. Joseph Havenner, Manager of the Public Safety Department, Automobile Club of Southern California, as chairman.

As Mayor Poulson said recently: "The panel works hand in glove with the citizens committee to help it speed its study, and to suggest definite long-range projects and policies for consideration. The panel also will prepare a written report that will cover the metropolitan area problems being studied.

"What we are trying to do is to coordinate the best talent we can find to analyze the basic traffic and transportation situation so as to develop the most logical solution. We possess the men with the knowledge and ability to do this. As I see things, it is the responsibility of the city and county governments to provide a leadership coordinating the efforts of these citizens to crack our complex traffic and transportation problems."

Meanwhile, the State Division of Highways freeway construction program in District VII is now providing and, in the near future, will be providing in far greater measure, for the safe and expeditious movement of huge volumes of vehicles in the Los Angeles metropolitan area.

STATUS OF DISTRICT VII FREEWAY PROJECTS—JANUARY 1, 1955

	Total miles	Completed projects		Under contract		Right-of-way costs	Total costs to date
		Miles	Constr. costs	Miles	Constr. est.		
Pasadena Freeway:							
4-level structure to Glenarm St. Pasadena	8.2	8.2	$9,275,000			$1,009,100	$10,284,100
Hollywood Freeway:							
Spring St. via Cahuenga Pass to junction Golden State Freeway near Wentworth St.	16.8	10.0	28,543,500		$105,000	24,600,000	53,248,500
Santa Ana Freeway:							
Spring St. (Los Angeles) to junction of San Diego Freeway near El Toro	42.8	29.6	31,407,400	7.1	8,874,300	15,266,000	55,547,700
San Bernardino Freeway:							
Santa Ana Freeway near Los Angeles River to San Bernardino county line in Claremont	30.8	15.6	18,256,630	11.3	14,044,470	14,540,000	46,841,100
Harbor Freeway:							
4-level structure to San Pedro	22.4	3.0	10,955,500	5.7	7,696,700	43,600,000	62,252,200
Long Beach Freeway:							
Pacific Coast Highway in Long Beach to Huntington Drive in South Pasadena	21.5	7.3	8,564,600	3.3	4,963,800	14,215,000	27,763,400
Golden State Freeway:							
Junction of Olympic and Santa Ana Freeway near Soto St. to Kern county line	72.7	45.2	11,917,800	3.0	3,738,100	3,433,500	19,089,400
Ventura Freeway:							
Vineland Ave. to S. county line Ventura and N. county line Ventura to Santa Barbara county line	65.1	32.7	8,150,100	8.8	4,636,400	8,116,000	20,902,500
San Diego Freeway:							
Golden State Freeway near San Fernando Reservoir to San Diego county line	96.0			0.4	794,900	8,849,000	9,643,900
Colorado Freeway:							
Eagle Vista Dr. in Eagle Rock to Holly St. in Pasadena	2.5	1.5	5,021,100	1.0	1,102,600	7,141,000	13,264,700
Foothill Freeway:							
Hampton Rd. to Montana St. in Flintridge	1.8			1.8	2,003,400	624,000	2,627,400
Allesandro Freeway:							
Los Angeles River to Ave. 36, near Eagle Rock Blvd.	1.2					2,890,000	2,890,000
Artesia Freeway:							
Normandie Ave. to Santa Fe Ave. and Palo Verde Ave. to Santa Ana Canyon Freeway	21.7	0.4	465,200	7.6	3,415,800	1,406,800	5,245,500
Santa Ana Canyon Freeway:							
Newport Beach to Riverside county line	27.4	12.9	2,995,900			1,214,000	4,209,900
Other freeways covered by resolution of adoption by Highway Commission	104.6					3,162,700	3,162,700
Totals	535.5	166.4	$135,572,730	50.0	$51,375,470	$150,067,100	$336,973,000

Southern Crossing

Engineering Studies for Causeway-Tube Proceeding

By NORMAN C. RAAB, Projects Engineer

ENGINEERING studies for an additional crossing of the bay between San Francisco and the East Bay communities are being made by the Division of San Francisco Bay Toll Crossings in accordance with the statutes enacted by the 1953 Session of the State Legislature.

Chapter 1056 of the Statutes of 1953, now codified as Article 2, Chapter 2, Division 17, of the Streets and Highways Code, directed the California Toll Bridge Authority to issue bonds to provide for the payment of engineering studies, plans, and specifications for an additional highway crossing of San Francisco Bay to relieve congestion of traffic on the San Francisco-Oakland Bay Bridge. It also specified that the new crossing, to be known as the "Southern Crossing," should have its westerly terminus in the vicinity of Third and Army Streets in San Francisco and its easterly terminus on Bay Farm Island, Alameda County. The Statutes further delineated in detail the approach connections to be built.

Army Approval Granted

The State Department of Public Works applied to the Corps of Engineers, U. S. Army, for permission to construct the Southern Crossing in the designated location. On April 8, 1954, approval was granted to construct a causeway-tube crossing between the selected termini and on a transbay alignment bowed southward as shown on the accompanying map.

From the sale of an additional series of bonds, supported by revenues from the San Francisco-Oakland Bay Bridge, $1,500,000 was made available to the Department of Public Works for the engineering investigation. On April 1, 1954, the Director of Public Works issued a directive to the division to proceed with the work. A separate section was organized at once within the division and its full efforts have been devoted exclusively to the Southern Crossing studies.

Attorney General Approves

The Southern Crossing statutes were studied and a preliminary layout of the entire project was prepared. This layout, together with a detailed description of the proposed approaches, was submitted to the State Attorney General for a ruling as to whether the provisions of the law were correctly interpreted. On August 20, 1954, assistant attorney general E. G. Funke, in a letter to the Division of Bay Toll Crossings, stated that the project as delineated on the accompanying plan, in his view, was in accord with the statutes.

The transbay crossing will be a six-lane causeway-tube 7.7 miles in length. Starting at the San Francisco shore near Army Street, vehicular traffic will travel eastward via a trestle viaduct approximately 5,300 feet long to a sand island. At this island traffic will enter one of three 5,800-foot-long subaqueous tubes, and will emerge at another sand island. Vehicles will continue across a low concrete trestle viaduct 22,000 feet long and thence via a 6,000-foot earthen mole to the southwest shore of Bay Farm Island.

Two 12-foot Traffic Lanes

Each of the three subaqueous tubes will carry two 12-foot traffic lanes. The tubes will pass beneath the navigation channel providing a minimum of 50 feet clear depth of water for a distance of 1,500 feet. At the tube portals two large artificial sand islands will be built. On each of the sand islands will be located:

(1) A portal building to house necessary ventilation equipment;

(2) A roadway transition section, and

(3) A light transition section to provide a gradual change of illumination intensity from the viaduct to the tubes.

Before the tubes can be placed, a deep trench in the bay bottom must be dredged to remove the soft undesirable foundation materials. In places excavation will reach a depth of 120 feet below sea level. In this trench will then be constructed the large sand islands and sand bed upon which the tubes will rest.

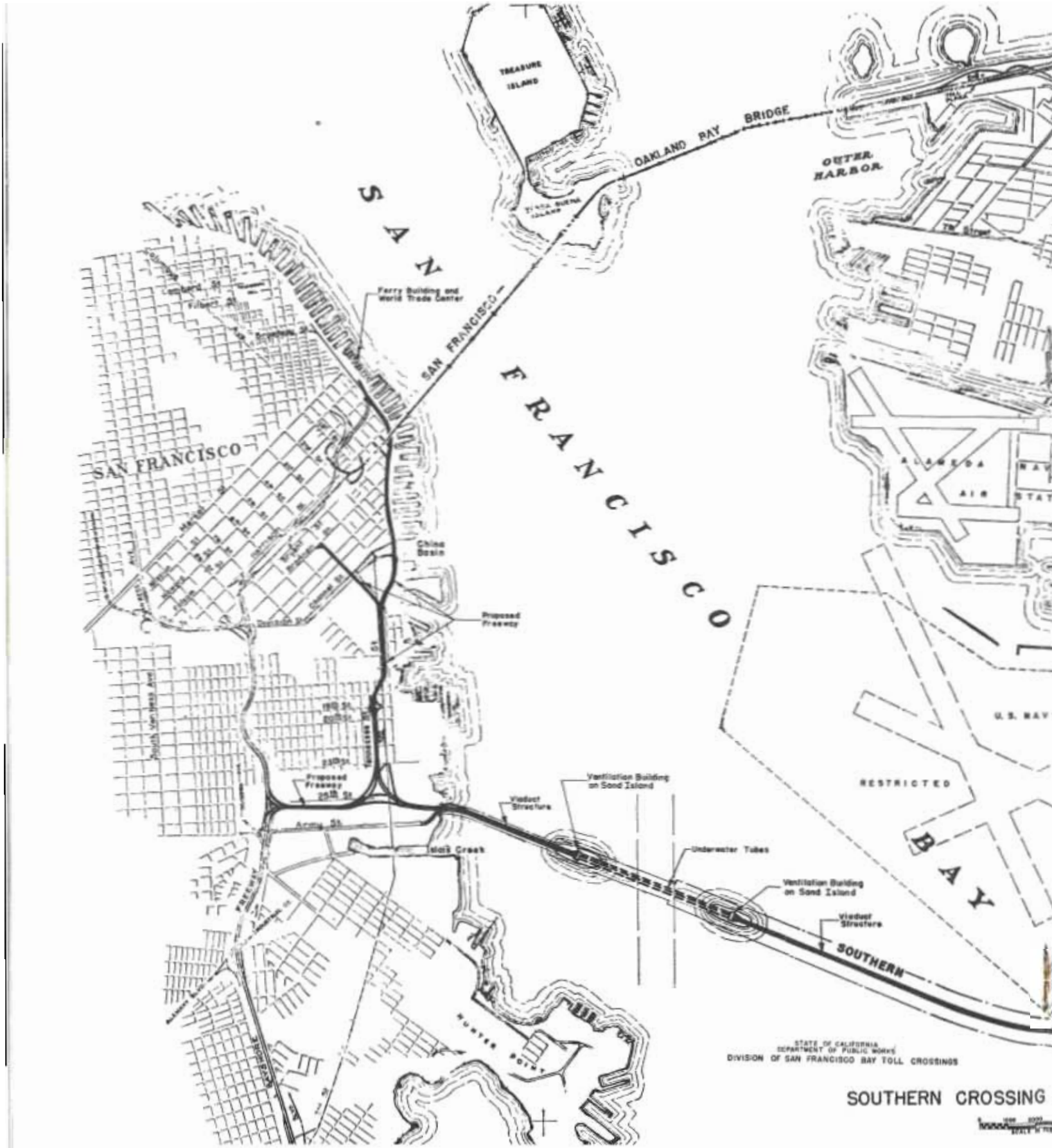
Precast Section Method

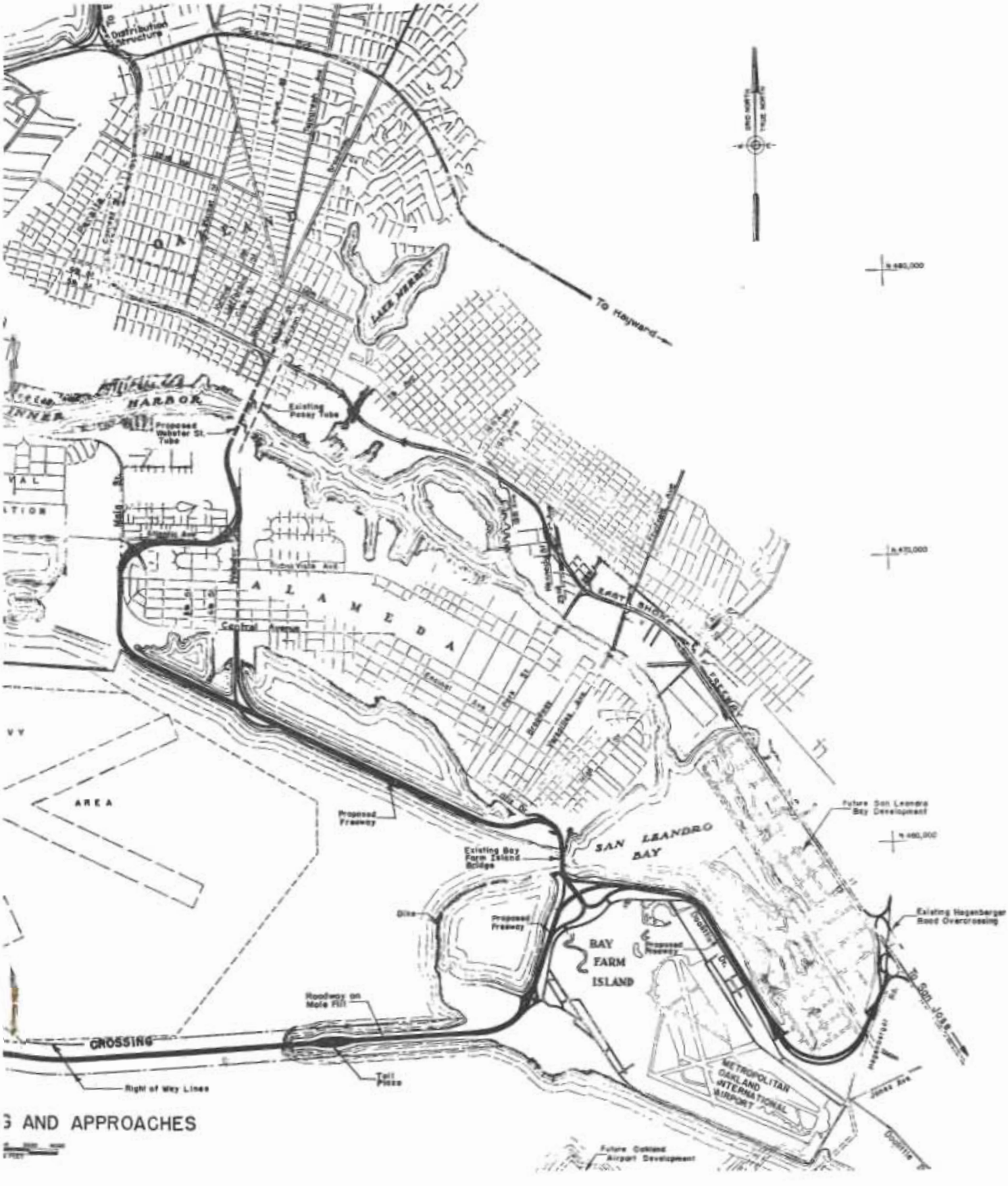
The precast section method of tube construction will be used. Each tube will consist of cylindrical precast reinforced concrete sections constructed in drydocks. After the open ends have been bulkheaded, these sections will be floated to the site. They will be sunk onto a sand blanket in the previously excavated trench and then covered with sand backfill. The individual tube segments will be connected by special joint details to insure structural continuity and watertightness. The method of construction is essentially the same as was used for the existing Posey Tube.

The viaduct structures, totaling about five miles in length, will accommodate three lanes of traffic on each of two parallel 38-foot roadways separated by a raised 6-foot median. They will be low level, reinforced concrete trestles consisting of a series of identical deck spans supported on concrete pile bents. Studies are being made of both precast and cast-in-place deck sections with span lengths ranging from 40 feet to 60 feet, and for both prestressed and nonprestressed designs.

Sand Fill Mole

The mole extending westward from Bay Farm Island will be constructed of sand fill placed by hydraulic means. Side slopes exposed to wave action will be protected by heavy riprap. Each of two parallel three-lane roadways on the mole will be 36 feet wide, separated by a 10-foot median, and with 8-foot shoulders along the outer lanes.


TREASURE ISLAND
YERBA BUENA ISLAND
OAKLAND BAY BRIDGE
OUTER HARBOR
SAN FRANCISCO BAY
Ferry Building and World Trade Center
SAN FRANCISCO
SAN FRANCISCO
China Basin
Proposed Freeway
Proposed Freeway
Army St.
Islais Creek
Ventilation Building on Sand Island
Viaduct Structure
Underwater Tubes
Ventilation Building on Sand Island
Viaduct Structure
SOUTHERN
RESTRICTED
HUNTERS POINT
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS
SOUTHERN CROSSING



3 AND APPROACHES

Projects Engineer Norman C. Raab briefs press in San Francisco on Southern Crossing.

The toll plaza will be located on the offshore end of the mole fill. The administration and maintenance buildings will be located in the center of the plaza with eight toll lanes for unidirectional traffic on each side. All collections will be made on the driver's side of the vehicle. Truck tolls will be charged on the basis of number of axles rather than by weight.

Approach Facilities

The general approach facilities are shown on the accompanying map. Freeway standards will be used for design with maximum grades limited to 3½ percent, except for the ramps where steeper grades are necessary. Each of the approach freeways will be either four- or six-lane.

The San Francisco approaches will consist of about five miles of freeway (mostly on elevated viaduct) connecting the Southern Crossing with the Bayshore Freeway, the proposed Embarcadero Freeway, and with the business and industrial areas of San Francisco.

The East Bay freeway approaches will total about 10 miles in length. The freeway crossing Bay Farm Island will branch at the northern end of the island, with one leg skirting around the south shore of San Leandro Bay and the east side of the Oakland Airport to a connection with the Eastshore Freeway at Hegenberger Road. The other leg will cross over the existing bridge between Bay Farm Island and Alameda, and thence will go northwesterly along the south shore of Alameda. This approach continues across Alameda to connections with the existing Posey Tube and with the proposed Webster Street Tube under the Oakland Estuary, and connects with Oakland city streets on the north side of the estuary.

Estimate of Materials

Present estimates indicate about 65,000 tons of reinforcing steel, one million cubic yards of concrete, 1½ million barrels of cement, 10,000 tons of structural steel, and 14 million cubic yards of sand fill will be needed to construct the project.

The division will continue with the engineering investigations and will determine cost estimates for all sections of the project. A detailed and comprehensive report covering these engineering investigations and including cost, traffic, and financing phases will be made to the Director of Public Works by the end of 1955.

TRUCK LOADS

Continued from page 13 . . .

increases in loadings of vehicles or axles would not dangerously overtax these 975 bridges.

Bridges in Two Categories

The remaining 3,900, or 80 percent, of bridges may be divided into two categories. The first category consists of the older county-built bridges which are not considered capable of carrying many repetitions of the present legal loads and are posted accordingly. On state highways, these posted bridges are being replaced as rapidly as funds will permit; however, there are many such bridges on county roads throughout the State that would be affected by any increase in axle loads.

The greater number of the 3,900 bridges are in the second category, which consists of the state-built bridges that were designed for the standards in effect prior to adoption of the heavier H 20-S16 loading. It is calculated that the present legal loading on vehicles now using these older state-built bridges overstresses some of the structures as much as 15 percent, and occasional overloads produce overstresses in excess of 15 percent. Mention of these overstresses is not intended to create alarm. Experience to date indicates that the service life of these older state-built bridges is not materially reduced, and immediate hazard is not presented by present-day legal vehicles with occasional overloads. It is intended to point up the fact that present loadings on the bulk of the bridges on state highways are now encroaching into the danger zone, and that further encroachment is unsafe.

What would occur if present loadings were increased? A moderate increase would probably have little effect on the 20 percent of bridges constructed to the H 20-S16 standard. The same increase would substantially increase the annual cost of bridge replacement, due to increased damage to the 80 percent of bridges constructed for lighter loadings. The cost of replacing structurally deficient bridges on state highways in the 1953-54 Fiscal Year amounted to $4,230,000.

Snow Poles

Driving Them by Air Hammer Saves Time and Money

By M. E. FISCHER, District Maintenance Engineer

In the November-December, 1952, issue of *California Highways and Public Works* there appeared an article written by W. L. Savage, then Assistant District Maintenance Engineer of District IX, entitled "Life Line," which dealt with the task of driving steel snow spoles along U. S. 395 in Mono County.

This article reports on a recent experiment conducted in District IX whereby the former method of driving poles by hand will be discontinued.

It is estimated that 150 miles of state highway in District IX are lined with 10-foot steel snow poles and a grand total of some 9,000 poles were driven by hand, and had to be completed all within a period of about three weeks. Such antiquated hand methods of driving and a review of accidents which had occurred, instilled in the writer's mind the idea of using a suitable air hammer to do the job.

Method of Operation

Marvin Tetrick, Safety Supervisor, was placed in charge of the project and through his perseverance and efforts, together with the cooperation of the maintenance forces and Shop 9, this project has now been sufficiently tested to draw definite conclusions.

In 1953, a pilot model driving platform was constructed of wood. This platform rests on the sidewalls of the dump body of a two-ton truck and is clamped in place to prevent any accident from occurring from slippage or overturning. The platform is provided with railings all around, a feature which interfered with hand driving.

To complete the pilot setup, a pipe boom was attached to one corner of the platform along one of the corner posts. This boom was set in pipe sleeves giving freedom for rotation and easy removal. Necessary blocks were attached to the end of the boom and the air hammer was suspended by a three part line.

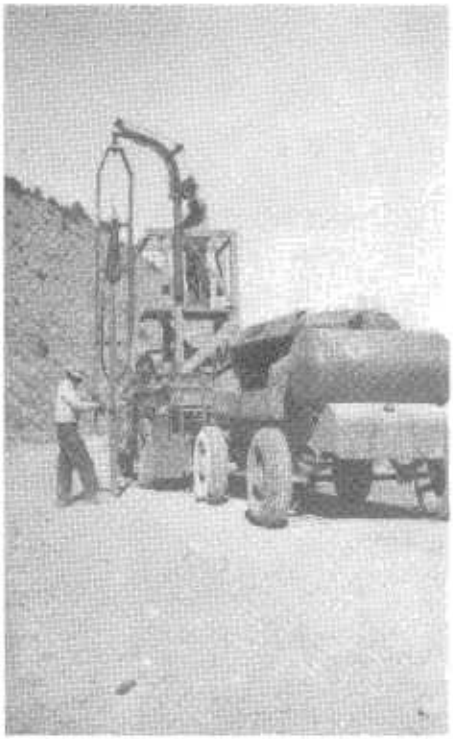


PHOTO 1

Equipment Used

The following equipment was used:

1. One 2-ton maintenance truck.
2. One 210-cubic-foot air compressor.
3. One Ingersoll Rand JB[4] air hammer, later replaced by one Thor-Cochise Model 25 pavement breaker.
4. The platforms with block and tackle.
5. A specially constructed driving head.

Driving tests were conducted in some of the hardest shoulder material known to exist along the highway where as long as 15 minutes' driving time by hand have been required. Time observations made showed that, assuming a steady rate of progress for seven hours, approximately 250 poles should be driven in one day by a three-man crew. Such production cannot possibly be maintained at 6,000- to 8,000-foot altitudes and from actual experience, 150 poles driven per day was considered tops for a normal driving crew of three men, including the truck driver.

When the air hammer was used, under the same conditions, our observations showed that at least 400 poles should be driven by the same crew.

Pilot Model Revised

Based upon the data obtained in the tests, a Thor Model 25 S pavement breaker with sheet pile driving head attached and weighing approximately 155 pounds, was purchased by the Equipment Department. The pilot model was revised in that steel swinging leads were constructed using 3-inch by 4-pound channels, and guides were placed on the hammer to fit the inside of the channels. An old crane with hand winch and cable was found at one of the maintenance stations. The complete driving setup is shown in *Photo No. 1*. A hinged clamping device with lugs to fit the shape of the pole holds the steel pole in place and the sheeting head on the hammer holds the pole in position at the top. *Photo No. 2* shows the clamp about to be closed and locked by a latch. *Photo No. 3* shows a pole under actual driving conditions. The man on the platform controls the winch with his left hand and operates the air valve with his right hand. The pole is driven approximately 18 inches and plumbing is automatic through the swivel connection at the top of the leads.

The hammer did not arrive in time to use during 1953, but when it did, tests were made on two miles of road not yet driven by hand.

Production Increase

During 1954 all poles on US 395 from the Inyo-Mono county line to the Nevada state line were driven by air hammer.

PHOTO 2

PHOTO 3

Each foreman, with one man, spotted the poles ahead of the driving operation, using an express. This was necessary because of the foreman's familiarity with snow conditions. (The pole spacing is varied according to conditions peculiar to a section.) The driving crew, consisting of three men, two-ton truck and compressor, worked the entire length.

After making a few minor improvements from the experience gained from the tests of the previous year, such as shortening the leads and cutting the height of the platform 24 inches and adding a step for the ground man to ride on between poles, instead of driving 150 poles per day by hand, over 600 poles per day were averaged increasing the production rate more than four times, using approximately 50 man-days' time instead of about 200 man-days.

In addition to an actual, tangible, monetary savings, there are other intangible savings.

1. Poles need not be pointed.
2. The driven end will not be damaged one bit. No burring on brand-new poles was noted.
3. Breakage during driving is eliminated.
4. The accident hazard of hitting another man or himself with the sledge hammer has been eliminated.
5. The physical effort has been all but eliminated.
6. The morale of the men has been increased, because their job has been made easier.
7. A valuable savings in manpower has been realized.

RIVER WITHOUT A MOUTH

The Mojave River, which runs along U. S. Highway 66, is a river without a mouth, says the National Automobile Club.

This strange river has its source in the springs and snow crevices of the San Bernardino Mountains and has no mouth since its waters are swallowed up in the sands of the desert.

COUNTIES SHARE FOREST RECEIPTS

A check amounting to $2,537,323.59 was recently turned over to the State of California as its share in the cash revenues from the national forests in California, according to Clare Hendee, Regional Forester, California Region, Forest Service.

This payment represents 25 percent of the receipts from timber sales, grazing fees, land use, and other uses of the national forests for the fiscal year ended June 30, 1954. As provided by law, the states apportion the money thus received to the counties having national forest land within their boundaries. The law further provides that the money will be used for the benefit of public schools and roads. When a national forest lies within more than one state or county, the portion of the receipts distributed to each, is proportional to the national forest area therein. Thus, many counties share in the receipts of two or more of the 21 forests in California.

Riprap Job

Highway Engineers Fight Ocean in Ventura County

By GEORGE E. DICKEY, Resident Engineer

The Coast Highway (US 101), which borders the beaches between the City of Ventura and the Santa Barbara county line, is now being developed into a modern, four-lane divided highway. This is in striking contrast to the early road through this area which required narrow two-lane timber causeways to span the numerous small embayments that even encroached upon the Southern Pacific Railroad right of way on the land side of the highway.

When the improvement to the existing three-lane roadway was carried out some years ago, steel sheet piling and concrete sea walls were constructed to replace the wooden causeways and the ocean was pushed out to the now existing beach line. Now once again because of the great increase in traffic volume and the need for modernization of this route, the State Division of Highways has found it necessary to take issue with the Pacific Ocean and force the shore line still farther out to sea.

Project Cost $2,434,900

This portion of the Coast Highway in Ventura and Santa Barbara Counties now under construction between Punta Gorda and 300 feet westerly of the Santa Barbara county line, is 2.85 miles long. The contract was awarded June 16, 1954, to McCammon-Wunderlich Company, contractor, Palo Alto. It carries a contract allotment of $2,434,900. The estimated time of completion is November, 1955.

The work consists of constructing a four-lane, divided highway, similar to adjoining completed construction easterly and westerly, with adequate drainage facilities, supported on the ocean side by approximately two miles of heavy riprap shore protection. The pavement section is to be constructed of four inches of plant-mix surfacing on eight inches of cement-treated base material placed on new roadway embankment.

The imported borrow is being excavated from a 500-foot-high hill north-

D8 dozer excavating for toe rock

Lima 803 crane with 70-foot and 2-cubic-yard Esco orange-peel bucket with rock hooks placing rock backing in riprap section

erly of the Southern Pacific Railroad at the easterly end of the project. Approximately 800,000 cubic yards of material will be stripped from the face of the hill on a 1:1 slope. This is being conveyed under the railroad tracks and under the existing state highway through a 10-foot by 6-foot box culvert, by means of a 600-foot conveyor system and elevated to hoppers from which it is being distributed with bottom-dump Euclids.

Drainage Facilities

The drainage facilities are a series of various size reinforced concrete box culverts which extend oceanward out through the riprap sea wall and extend landward to connect with existing drainage structures under the Southern Pacific Railroad tracks. The outer 45 feet of the ends of the culverts are designed as cantilevers to prevent any cracking during the anticipated settling of the riprap. These sections will be cast in place. Because of the large volume of public traffic through the contract, and in order to keep the contractors' heavy equipment off the traveled way and thus secure added safety by reducing traffic hazards, the remaining portions of the culverts are being precast in 11-foot sections and will be set in place as the roadbed is being constructed.

The riprap shore protection comprises almost one-half of the total expenditures for this project and naturally presents the most complex construction problems that occur on this contract.

Heavy Riprap

About one mile of the heavy rock riprap is to be placed along a beach area which is out of the water during low tides and can be worked fairly easy during the lower high tides. The remaining portion of the riprap work consists of placing rock 135 feet out in front of the existing sea wall where the water is from three to seven feet deep during calm seas and even deeper during storm periods.

The riprap section is made up of a 6-foot-thick blanket of rock, each of which weighs from 3 tons to 15 tons, placed on a solid foundation and carried up to 12-foot elevation. The voids are filled with chinking rock and the rock blanket is backed up with a 3-foot blanket of graded gravel which in turn prevents the embankment material from washing through the voids in the large rock.

Larger rock weighing from 5 tons to 15 tons are used as toe rock which is the base or foundation for the entire riprap structure.

To place these heavy rock on a firm foundation it is possible to work in the areas subject to surf action only at

. . . Continued on page 58

Looking oceanward showing Lima 803 crane placing 11-ton toe rock behind sand dike

Chico Project

Section of Realigned US 99E Open to Traffic

By P. C. SHERIDAN, Assistant District Engineer

THE RELOCATED portion of US 99E between Oroville Wye and Chico was officially opened to traffic on December 17th by a ribbon-cutting ceremony near the north end of the project at Chico. Chico Mayor, Ted Meriam, officially cut the ribbon and in a few brief remarks prior to the ribbon cutting, he expressed the appreciation of motorists in the region, noting that the new road is "important to this entire Northern California area."

Telegrams from Governor Goodwin Knight and State Director of Public Works Frank B. Durkee were read by Mayor Meriam. District Engineer A. M. Nash spoke briefly.

After the ribbon-cutting ceremony, the participants in the affair toured the entire length of the new route in a car caravan.

New Alignment

The nearly 19-mile length of new location traverses a route considerably removed from the old highway which involved several sharp turns on otherwise mostly tangent alignment, two main line crossings of the Southern Pacific Railroad, and went through the communities of Richvale, Nelson, and Durham. The new alignment reduced the travel distance by nearly a mile and also traverses somewhat higher ground, alleviating a bad drainage problem along the old highway. There are no communities along the new alignment to impede traffic flow.

Except at three locations, the new highway is a two-lane facility constructed on rights of way acquired for future development to expressway status. At the intersection of old Route 87, the Oroville-Chico lateral, a summit vertical has been constructed on a four-lane divided basis to decrease excavation and to provide better intersection channelization with Route 87.

Pavement Widened

At the Centerville Road intersection (Paradise Skyway) the pavement has also been widened to four lanes divided to provide better intersection facilities. Near the end of the project at the junction with the old highway, four lanes undivided have been provided to better channelize the intersection and to provide additional lanes at the crossing of the Sacramento Northern Railway. The four-lane undivided section then continues on into Chico to 20th Street, the end of the project.

Provision has been made in the location just south of Chico so that it will fit future routing adopted through the Chico area. Meantime, the portion between Centerville Road and the old highway will serve as a connecting link to the existing highway through Chico and will provide access to the future routing from the southern section of the city.

View of section of relocated portion of US 99E between Oroville Wye and Chico

Ribbon-cutting ceremony. Left to right: Capt. Ralph Walker, California Highway Patrol; Robert Pease, President, Chico Chamber of Commerce; Assemblyman Don Hobbie, Oroville; Harold W. Harrison, President, Paradise Chamber of Commerce; Robert Smith, Resident Engineer; A. M. Nash, District Highway Engineer; Supervisor L. Ray Black, Chico; Mayor Theodore Meriam, Chico; Dan Montgomery, President, Butte County Chamber of Commerce; Supervisor Gene Stokes, Chico; Marshall Jones, Butte County Director of Public Works.

Thirteen Bridges

Actual work began with the letting of a $535,300 structure contract for the construction of 13 bridges on November 15, 1951. Twelve of the bridges are of the reinforced concrete flat slab type, and the bridge across Butte Creek is a reinforced concrete T-beam type of bridge. The structures constructed under this contract are listed as follows:

Junction Draw—2 spans 26 feet 2 inches long; roadway width 40 feet.

Western Canal—4 spans 30 feet 11 inches long; roadway width 28 feet.

Cottonwood Creek—3 spans 30 feet and 2 spans 22 feet 6 inches long; roadway width 28 feet.

Shippee Creek—2 spans 16 feet long; roadway width 40 feet.

Gold Run Creek—2 spans 13 feet long; roadway width 40 feet.

Dry Creek—1 span 36 feet and 4 spans 30 feet long; roadway width 28 feet.

Ash Creek—3 spans 30 feet long; roadway width 40 feet.

East Fork Roberts Creek—2 spans 34 feet and 2 spans 25 feet 6 inches long; roadway width 28 feet.

Roberts Creek—3 spans 30 feet long; roadway width 40 feet.

Scrub Creek—2 spans 10 feet 9 inches long; roadway width 40 feet.

Butte Creek—1 span 92 feet; 3 spans 59 feet and 1 span 50 feet long; roadway width 28 feet.

Edgar Slough-Upper Crossing—1 span 30 feet and 2 spans 22 feet 6 inches long; roadway width 40 feet.

Edgar Slough-Lower Crossing—2 spans 30 feet and 2 spans 22 feet 6 inches; roadway width 40 feet and a 5-foot sidewalk.

All but the last named bridge above are on the new alignment. Edgar Slough-Lower Crossing Bridge is on a realignment of a portion of the old highway constructed to provide a proper intersection facility with the new alignment.

H. W. Ruby was the contractor on this portion of the project and F. C. Marshall represented the Bridge Department for the State.

Grading Project Under Way

The next unit in the construction of the over-all project was a grading contract between 3.8 miles north of Oroville Wye and 20th Street in Chico. Work began on this unit on May 29, 1952. Included in the contract was the complete base and surfacing of the portion on old Route US 99. Major items on this $745,700 project included 471,244 cubic yards of roadway excavation; 9,360 cubic yards of structure excavation; 10,310,000 station yards of overhaul; 23,457 tons of untreated rock base and 913 cubic yards of structure concrete. The contractor was Richter Bros. of Oroville. D. R. Hislop and T. G. Smith were Resident Engineers for the State.

In order that a portion of the realignment might be put to use, the next unit of construction consisted of surfacing from the junction of Route 87 to old Route US 99 south of Chico. Completion of this third unit enabled the Oroville-Chico lateral traffic to use a portion of the new facility. Work began on this unit on June 11, 1953, and traffic was routed over this portion of the new alignment in May, 1954. Rice Bros. of Marysville was the

. . . Continued on page 58

Minarets Summit Road

FAS Route 1195 in Mono Is Improved

By HOWARD EMRICH, Road Commissioner of Mono County

MONO COUNTY completed another link of its Federal-aid Secondary System on October 29, 1954. By surfacing 5.5 miles of FAS 1195, a large recreational area was made more easily accessible.

The route known as the Minarets Summit Road begins at State Highway No. 112 (Mammoth Lakes Road) and extends to the Mono-Madera county line. From the Madera county line a dirt road continues to the headwaters of the San Joaquin River and the Devil Postpile National Monument.

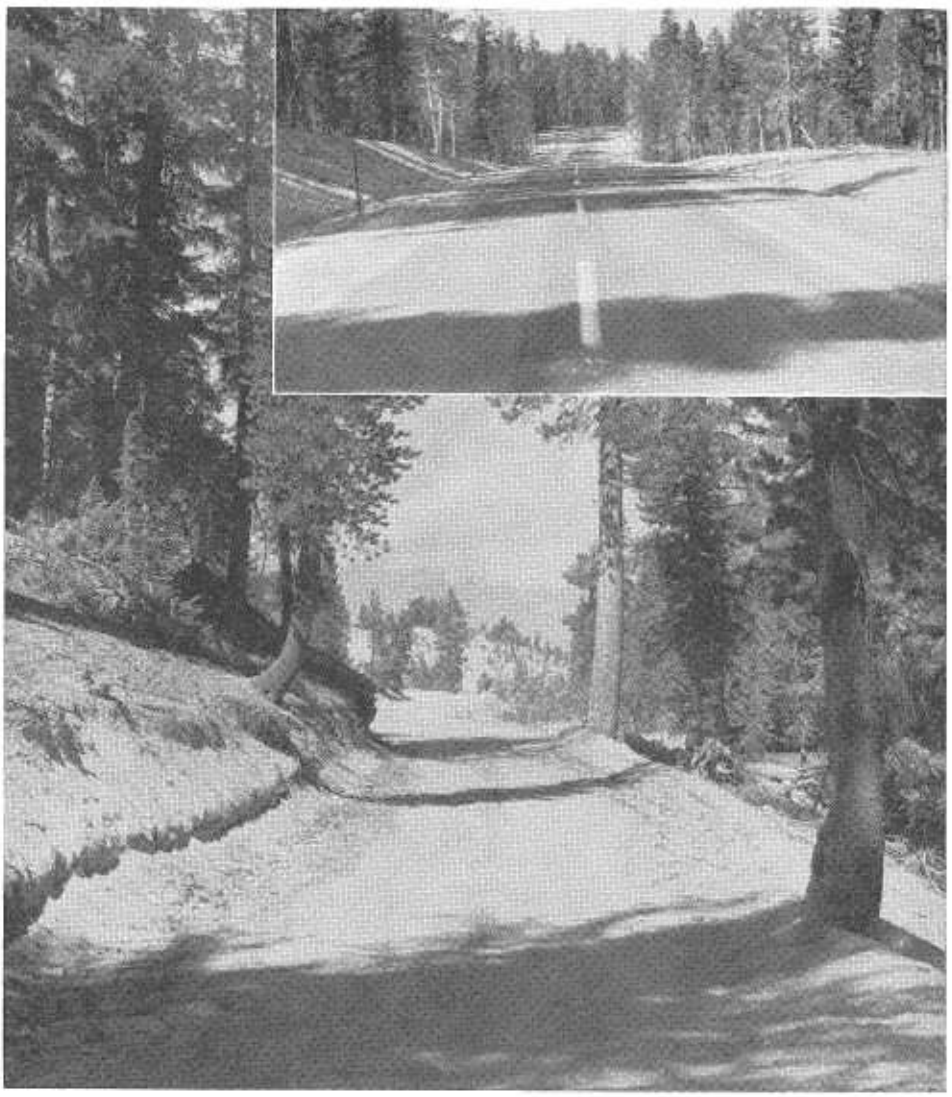
Historical Background

Back in the 1870's when the gold mining town of Mammoth (then known as Pine City) was booming, the need for a road over Mammoth Mountain was realized. While miners were seeking their fortunes there and in Bodie, Aurora, Lundy and other thriving communities, to the north and east, still bolder prospectors were pushing farther back in the rugged peaks of the Sierra. Agnew Meadows, along the headwaters of the San Joaquin River, was headquarters for one such mining group. This, too, was a stopover for the pack trains that fought their way eastward over the mountains from Fresno Flats. From here they crossed Mammoth Mountain to bring supplies to the mining camps.

About 1929 the mining companies eventually built a road from Mammoth to the San Joaquin River at the mouth of Minarets Creek. This was later extended to Reds Meadows, near the Devil Postpile National Monument. It was somewhat improved and maintained by the U. S. Forest Service.

Recreational Route

The Minarets Summit Road today is primarily a recreational route. Until about 10 years ago this area was only opened to the enjoyment of the public for a few months each summer. Some years it was late July before the snow melted on the summit.



UPPER—A view of the completed Minarets Summit Road after surfacing under Mono County's FAS program. LOWER—A typical section of Old Minarets Summit Road before reconstruction by Mono County.

With the improvement of this section of road and the inauguration of a county snow-removal program, the tourist season has been extended considerably. Numerous resorts and businesses have come into the picture as a result of this increased season and the economy of the area has greatly improved.

In addition to the magnificent scenery, there are several outstanding points of interest for the tourist. About 1.8 miles from the Mammoth Road one crosses the earthquake fault. This fault, sometimes thought to be a cooling crack, can be followed intermittently for several miles across the country. In places the crevices are 20 to 30 feet deep and snow remains the year round.

From its meager beginning when the customers were towed behind a secondhand army weasel to the ski tows, there has developed, on the slopes of Mammoth Mountain, one of the best-known ski areas in California. Here as many as 1,500 persons a day have ridden the tows to a height of over 10,000 feet and a brave few climb to the summit to see the world from a dizzy elevation of 11,035 feet. This area boasts one of the longest skiing seasons in California, from November to June or July, and is reached by this newly constructed highway.

At the Madera county line, some 9,100 feet above sea level, the Forest Service maintains an observation point where the public may enjoy the beauty of the Sierra. Such points of interest as the Devil Postpile National Monument, the San Joaquin River with its colorful Rainbow Falls, Mammoth Mountain, the Minarets, and Reds Meadows may be observed from this station. From here one descends to the valley of the headwaters of the San Joaquin, a paradise for fishermen and hunters, where the Forest Service maintains camp grounds along the river and a well-stocked pack station is provided for the more rugged sportsman.

At the end of the road the tourist may park his car and after a short hike arrive at the Devil Postpile National Monument. This freak of nature was caused by the cooling and shrinking of a flow of an igneous mass of basalt. As the formation was exposed to erosion, the columns toppled to form a jumbled mass of rock.

Earthquake fault crossed by Minarets Summit Road, Federal Aid Secondary Route 1195 in Mono County

This view of the parking area near Mammoth Mountain on the Minarets Summit Road indicates the importance of this newly completed FAS route to skiing enthusiasts

Recent Improvements

The original road when it was taken into the Mono County Road System in 1948 was little more than a good-sized stock trail. From its beginning it twisted around and turned, climbed and dropped for approximately seven weary miles. In many places the road was not much more than eight feet wide. Grades of 12 percent and a radius of 50 feet were not uncommon.

In the spring it was difficult to find the road, much less remove the snow from it.

To better this condition, the Mono County Road Department in the spring of 1950 started a survey for a complete realignment of this section. By September, 1951, with its own forces, it had completed 5.5 miles of new alignment. A 24-foot gravel roadbed was used with a minimum radius of 250 feet and a maximum grade of 6 percent for the greatest part of the construction.

In the spring of 1954, the construction forces of the Mono County Road Department widened the existing roadbed to 28 feet, increased the sight distances and decreased the grade in a number of places.

The work as let under contract consisted in general of priming the already completed roadbed and the placing of a road-mixed surfacing. The new construction provided for a 20-foot paved section of 0.21-inch thickness.

The contractor for this project was Burnett & Smith Construction Co., of Los Angeles, California. The total cost of the contract was $57,870.10 exclusive of engineering. The project was financed with Federal-aid Secondary Funds, State Highway Matching Funds and County Funds.

Construction engineering forces used on this project were employees of the California Division of Highways, District IX, at Bishop. Fred E. Thompson was resident engineer.

SAFETY AWARDS

Southern California Freight Lines of Los Angeles has announced names of its drivers who have won the National Safety Council Safe Driver Award. This award is generally conceded to be the Nation's highest award for professional safe driving of commercial vehicles. To qualify, a driver must complete 12 consecutive months without being involved in an accident.

The company states that 67 percent of all of its drivers eligible to earn the award were successful in doing so. A total of 268 awards were earned this year. The awards ranged from 1 to 17 years.

SACRAMENTO-LODI UNIT LAUNCHED BY GOVERNOR

Governor Goodwin J. Knight operates bulldozer to break ground for first unit of Sacramento-Lodi Freeway while Director of Public Works Frank B. Durkee happily participates in ceremony

Governor Goodwin J. Knight officiated at the beginning of actual construction of the first phase of the program to improve U. S. Highway 99 to freeway standards, between Sacramento and Lodi, when he manipulated a huge bulldozer into forward gear and made the earth fly at a ceremony at the junction of Highway 99 and Elk Grove Road, on December 21st. Following brief talks by Clyde A. Shurtleff and John Bronson of the Sacramento Chamber of Commerce, A. M. Nash, District Highway Engineer in charge of the project and Frank B. Durkee, State Director of Public Works, the Governor was introduced by H. Stephen Chase, Highway Commissioner from Sacramento.

Governor Knight expressed his determination to bring the State Highway System up to adequate standards with all possible haste and stated that he was particularly pleased with the start of work on this section of highway, in keeping with assurances given to the people in the area that action was forthcoming. Mrs. Knight was introduced and told of her interest in better highways and of her pleasure in participating in this first experience in ground-breaking ceremonies.

Contract for the project in the sum of $1,513,047 was awarded to Granite Construction Co.

The second phase in the program to four-lane Highway 99 on freeway standards will be on the section between Jahant Corners and the Sacramento county line. Bids for this work were opened January 19th, and the low proposal, $1,036,230, was submitted by M. J. B. Construction Co. and Lord and Bishop, Stockton. On January 27th, the contract for this project was awarded to the low bidder by the Department of Public Works.

Safer Highways

Study Shows Roles of Enforcement and Freeway Construction

By J. W. VICKREY, Assistant State Highway Engineer, and
R. J. ISRAEL, Assistant Traffic Engineer

THE CRUSADE against loss of life, limb, and property on the highway is unending. It is carried on continuously by those who refuse to accept an annual nation-wide toll of 38,000 deaths, 1,350,000 injuries and more than 4 billion dollars in accident costs as the necessary price of a motorized civilization.

The crusaders work through the newspapers, the classroom, the driver licensing bureaus, research laboratories, national and community organizations, insurance companies, and the automotive and other industries. They include in particular the enforcement officers who patrol the highways and the engineers who design and build them. Increasingly, these people make their contributions to safety as a team, recognizing that the causes of highway accidents are deep-seated and complex.

Goal Is Less Accidents

Measurement of the achievements resulting from these continuing efforts is in terms of the accidents that don't happen. A substantial reduction in the *number* of fatal and other accidents is the immediate goal, although this becomes more difficult year by year as traffic continues to increase. Safety advocates can with considerable justification claim some degree of success if the *rate* of accidents per mile of travel goes down even though the *number* of accidents goes up due to increased numbers of vehicles in operation. But the engineers, the enforcement officers, and other safety workers are primarily interested in preventing accidents and in saving lives, not in statistics.

California has had a definite decrease in the accident rate on its rural state highways since 1951 (*see Figure 1*), and an actual decrease in the *number* of fatalities state-wide from 3,562 in 1952, to 3,371 in 1953, and

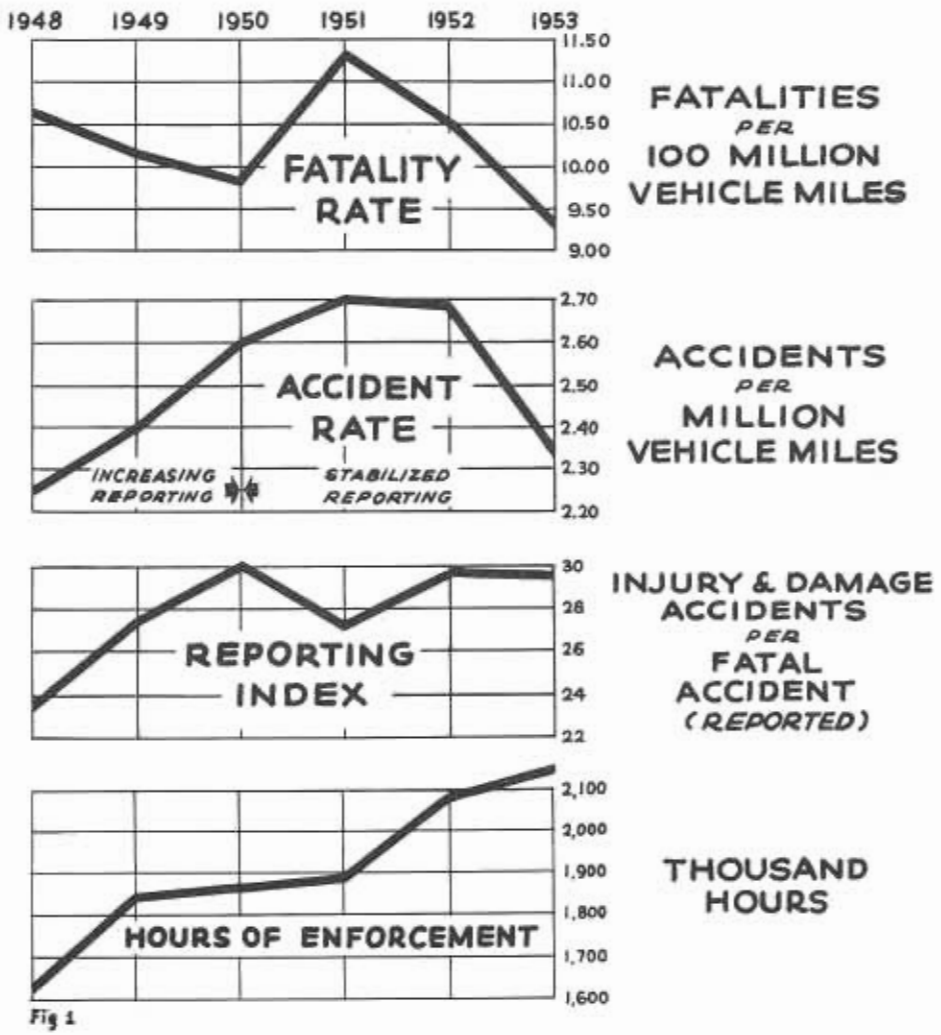


Fig 1

3,087 (preliminary figure) for 1954. If this trend can be continued, it is evident that the safety crusade is making some progress—although one traffic death in California on the average of every 170 minutes is nothing to be complacent about. There is no lack of incentive or challenge to greater efforts on the part of everyone concerned with highway safety.

Available Yardsticks

To what extent can the various factors contributing to improved highway safety be segregated and measured? Obviously, the beneficial effects of driver education are most difficult to analyze, although experts agree that the attitude of the individual driver is the keystone of any sustained safety effort.

Enforcement and engineering measures, on the other hand, do lend themselves to some degree of measurement. This study is an attempt to bring together and correlate data which have been collected for the most part in California but also in

some eastern areas. Analysis of these data has led to the following general conclusions:

1. There is evidence that increased enforcement can exert a favorable influence on the accident and fatality rates.

2. The amount of increased enforcement manpower required to effect a decrease in accidents and fatalities appears to be large in proportion to the results obtained.

3. The effect of increased enforcement on accident and fatality rates tends to diminish as further enforcement manpower is added.

4. Freeways not only move large volumes of traffic expeditiously, but also with greatly increased safety.

5. Freeways exert a beneficial safety effect on nearby roads and streets. Accident rates have been materially reduced on a city-wide basis after the opening of a freeway through or around moderate-sized California cities, and have been reduced to some extent in metropolitan areas as a reflection of an expanding freeway network.

6. Freeways, particularly in metropolitan areas, are self-liquidating in that they repay their total cost in savings to the motorist in a few years.

Enforcement in California

Figure 1 shows the accident and fatality rates on the California Rural State Highway System for the years 1948 to 1953 compared to the annual enforcement hours and the reporting index for these years.

Accident and fatality rates are from the California Division of Highways records. Enforcement hours are from the reports of enforcement activities issued by the California Department of Highway Patrol. The reporting index is a standard computation based on actual motor vehicle accident reports received, which compares the reported number of injury and property damage accidents to the reported fatal accidents.

It may be noted that the reporting index closely parallels the accident rate for the years 1948 to 1950, which indicates that increased reporting is primarily responsible for the increased accident rate during this period. The reporting index has been generally stabilized since 1950, thus the accident curve can be considered basically sound from 1950 through 1953.

Fatality Curve

Fatalities, since they have always been naturally subject to complete reporting, probably form a better basis for comparison than accidents in general. The fatality curve is generally downward since 1948, except for the high peak in 1951. In that year of war in Korea, there was an increase in traffic deaths throughout the United States, generally traced by recognized safety authorities to the increased tensions and recklessness characteristic of wartime. In California, which served as a major base for armed forces activity, it is not surprising that a disproportionately large share of the fatality reports contain the names of military personnel.

Compilation of the fatality rate on the Rural State Highway System has not yet been completed for 1954, but preliminary figures indicate a substantial drop which will extend the downward curve on the chart still farther.

In connection with *Figure 1*, it should be emphasized that the period between 1948 and 1953 was also a period of extensive highway improvements. These improvements ranged from specialized treatment of individual high accident intersections to major freeway construction, and must be considered as going hand in hand with increased enforcement. More detailed discussion of the evidence of effects of highway construction on the accident rate in California will be found later in this report.

Rural Traffic Increase

During the period covered, there was an increase of traffic on the Rural State Highway System from 11,235 million vehicle miles in 1948 to 15,884 million vehicle miles in 1953. Traffic on the Rural State Highway System may be considered indicative of and parallel to increases on all rural roads in California.

Increased traffic volume without increased road mileage does not appear to have much effect upon enforcement requirements. Pennsylvania Turnpike figures, which appear later in this report, show that accident and fatality rates have dropped materially in spite of the fact that increased traffic volumes far exceed increases in police activity. Traffic increases may bring minor roads into a classification where increased patrol activity is required, and it is recognized that divided highways may add to the enforcement problems where opportunities for an officer to cross from one road to the other are spaced far apart. However, increased volumes on a set mileage appear to add little to the enforcement load.

What effect has the increase in enforcement in California, as shown in *Figure 1*, had on the behavior of drivers? Has the reduced accident rate been attributable to fewer violations of the rules of the road? The unexpected answer, as provided by an analysis of the accident reports of the California Highway Patrol, is that violations and driver condition are factors in an increasing percentage of accidents.

Factor of Drinking

Table 1 is a tabulation showing, for the California Rural State Highway System, the percent of accidents in which driver conditions, improper speed, and other violations are involved. This information was previously obtained for the years 1948, 1949, and 1950. Data were extracted for the last two years, 1952 and 1953, as a check against the earlier data. The five separate years, which span a six-year period, are shown for each major classification.

This table shows that the percent of total accidents involving had-been-drinking drivers is the same for 1948 and for 1953, although in fatal and in injury accidents drinking has increased as a factor.

The percent of accidents involving improper speed has increased substantially since 1948, although 1953 shows a drop from the high point of 1952. The percent of total accidents involving other violations has increased very slightly, while the total percent of accidents in which driver condition, speeding, or other violations are involved, shows a substantial increase.

Pennsylvania Turnpike

Accident and fatality records for 1950 to 1953, inclusive, for the Pennsylvania Turnpike, together with miles, million vehicle miles, and rate of enforcement are shown in *Table 2*.

TABLE 1—STATE OF CALIFORNIA RURAL HIGHWAY SYSTEM
PERCENT OF ACCIDENTS IN WHICH DRIVER CONDITION, IMPROPER SPEED, AND OTHER VIOLATIONS ARE INVOLVED

	Percent total accidents by years					Percent fatal accidents by years					Percent injury accidents by years				
	48	49	50	52	53	48	49	50	52	53	48	49	50	52	53
Had been drinking	22.0	21.8	21.4	22.3	22.0	22.4	21.4	21.4	23.6	24.0	24.2	24.9	24.9	26.4	26.3
Other driver conditions	7.7	7.8	7.5	3.6	4.5	10.0	11.1	8.8	6.2	8.6	8.8	9.9	9.1	4.7	5.8
Total driver conditions	29.7	29.6	28.9	25.9	26.5	32.4	32.5	30.2	29.8	32.6	33.0	34.8	34.0	31.1	32.1
Improper speed	13.1	23.8	28.4	40.6	30.8	14.7	32.0	22.0	42.3	32.1	13.8	26.4	31.6	45.0	33.7
Violation of rules of the road	70.2	72.0	73.1	74.0	73.3	49.1	48.3	48.5	52.4	51.0	63.2	63.7	65.8	67.2	66.4
Total number of accidents in which violation or driver condition is involved	82.7	86.0	87.5	90.3	88.4	69.1	75.3	74.0	80.2	80.5	79.4	83.4	85.6	90.0	88.0

This information was furnished by the Pennsylvania Turnpike Commission. The number of patrols were not shown for 1950, but the table shows that miles per patrol decreased substantially in 1952 as compared to 1951 and then increased slightly in 1953.

Regardless of variations in enforcement, accident rates and injury accident rates decreased substantially and uniformly over the four-year period. The fatality rate decreased sharply to 1952 and leveled off at that point, showing a closer relation to enforcement.

Another factor which might be of influence, although not apparent in this table, is the establishment of reduced speed limits on the western half of the turnpike on January 15, 1953. The basic speed limit was reduced from 70 to 60 miles per hour for passenger cars, from 60 and 50 miles per hour for light and heavy trucks to 45 miles per hour for all trucks, in addition to special 45-mile-per-hour limits at major bridges and 35 miles per hour at tunnel portals.

Chicago Study

A report "Effect of Enforcement on Vehicle Speeds" by James Stannard Baker, Director of Research, Northwestern University, is printed in Highway Research Bulletin No. 91. This is a report made by the Traffic Institute at Northwestern University in cooperation with the Bureau of Public Roads to study (1) the effect of a patrol unit on nearby vehicles, and (2) the effect of increased enforcement on vehicle speeds in Chicago. Speed studies were made at the same locations one year before (1948) and the first and third years after the increased enforcement.

Figure 2 shows the relation between increased speed arrests, reduced average excess speed, and reduced death rates in the City of Chicago. The average excess speed, as used in this report, is defined as the sum of the amount by which each vehicle exceeds the speed limit divided by the total number of vehicles. This figure shows that speed arrests (which remained a fairly constant percentage of arrests for all hazardous traffic violations) were more than doubled initially during the "after" period. The resulting excess speed was reduced 35 percent. The death rate per 10,000 registered vehicles was reduced approximately 17 percent by the end of the study.

Day and Night Speeds

Figure 3 shows the effect on day and night speeds of this increased enforcement, and shows that night speeds reflected increased enforcement substantially more than day speeds. The report points out:

"With the increase in enforcement, there was a conspicuous, but not specifically recorded, improvement in selectivity of enforcement, which increased the amount of night enforcement more than the day enforcement. How important this effect is we do

TABLE 2—PENNSYLVANIA TURNPIKE
ACCIDENT DATA, 1950 THROUGH 1953

Year	Average number of patrols	Miles	Miles/ patrol	MVM	Acc.	Acc./ MVM	F. and inj. acc.	F. and inj. acc./ MVM	Fatalities	F/100 MVM
1950		160-9 mo. 260-3 mo.		476.0	949	1.99	380	0.80	59	12.4
1951	33.3	260	7.8	774.2	1,409	1.82	549	0.71	66	8.5
1952	49.7	260	5.2	1,141.8	1,832	1.60	685	0.60	83	7.3
1953	60.7	327	5.4	1,206.2	1,639	1.36	589	0.49	91	7.5

MVM—Million vehicle miles.
F. and Inj. Acc.—Fatal and injury accidents.
F/100 MVM—Fatalities per 100 million vehicle miles.

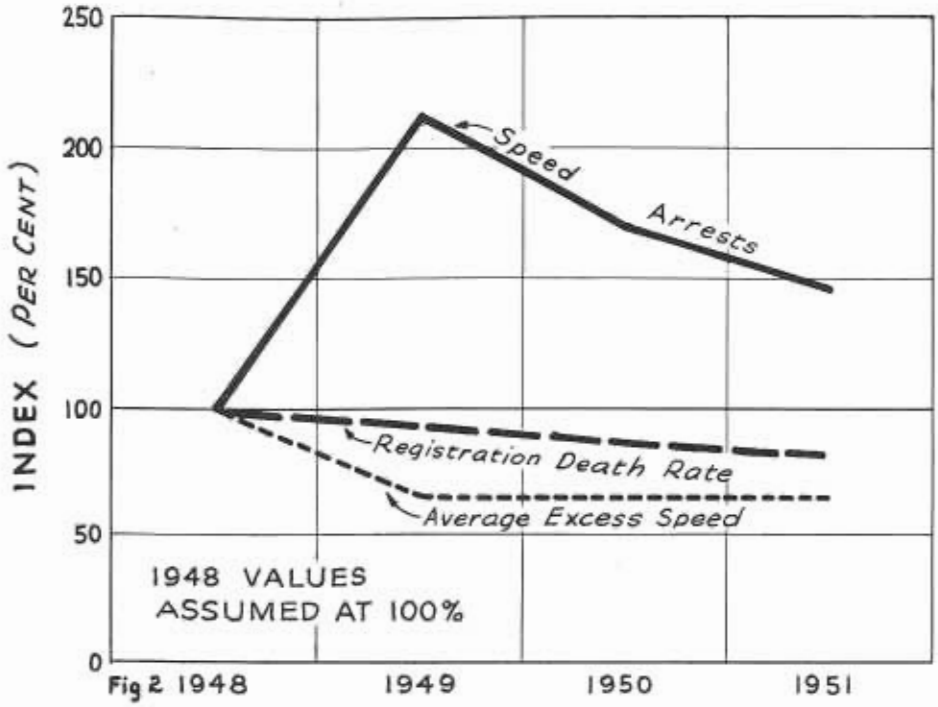


Fig 2

CHICAGO STUDY– EFFECT OF ENFORCEMENT ON VEHICLE SPEEDS

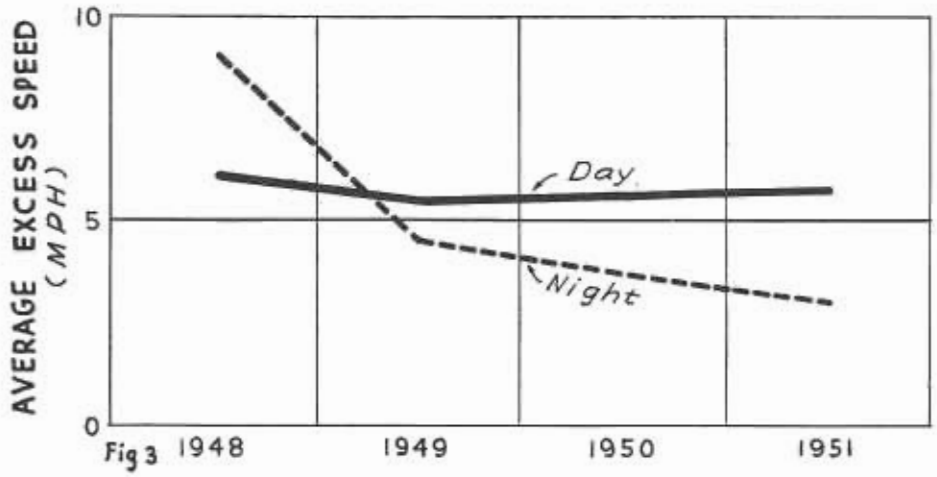


Fig 3

not know. The apparent effect on speed seemed to have no comparable effect on accidents by night and day. The percentage of total fatal accidents between 8 p.m. and 6 a.m. was 46 in 1948 and 47, 44, and 42, respectively, in the three following years."

Thus, with more than doubled arrests at the outset, a lesser but noticeable improvement was made in the city-wide fatality rate. The fact that selective (night and day) enforcement did not achieve significant results leads one to believe that other factors may have been responsible in considerable measure for the reduced fatality rate in the City of Chicago.

In a letter commenting further on his study, Mr. Baker states: "We would not be justified in assuming that corresponding increases in enforcement would achieve similar reductions in accidents in other places than Chicago. Chicago had a substantially higher death rate than other cities in its population group to begin with, and I believe we are safe in saying that it is easier to make an improvement in a bad record than in a normal record."

New Jersey Turnpike

Data received from the New Jersey Turnpike Authority shows the cumulative fatality rate as compared to turnpike police detachment (number of officers), (*see Figure 4*). They show that enforcement has been increased at various intervals and the fatality rate is being continually improved.

In addition to increased manpower, this turnpike authority is spending large sums to increase safety. One addition was the installation of large, neon-lighted signs, placed at intervals of approximately five miles in the northern portion of the turnpike where traffic conditions are dense, to inform motorists of fog, ice, snow, or other emergency conditions ahead. These signs carry a large message reading "Drive Slow" which flashes on and off to attract attention and mentions the specific condition.

The turnpike authority states: "Our present detachment strength of 76 officers and men yields a continuous patrol force of 12 to 14 cars over 118 miles of turnpike. We also have two three-man radar teams which are not usually engaged in patrol activity. However, during critical periods of heavily traveled week ends and holidays, these men are assigned to patrol car duty to supplement the usual patrol strength."

The surprising situation here is that with from 76 to 82 officers to cover 118 miles on this most modern facility, by far a higher concentration of officers per mile of road than any other known facility, the New Jersey Turnpike has yet to achieve the low fatality rate of the average of full freeways on the California State Highway System.

California—Special Enforcement

Up to now this study has dealt with enforcement on a continuing or permanent basis. Although that is the major factor to be considered, some examination should be made of the effects of special or "spot" enforcement, particularly as carried out by special units of officers, often referred to by the press as "flying squadrons."

Table 3, obtained from the records of the California Highway Patrol, shows what happened in eight areas of California where special enforce-

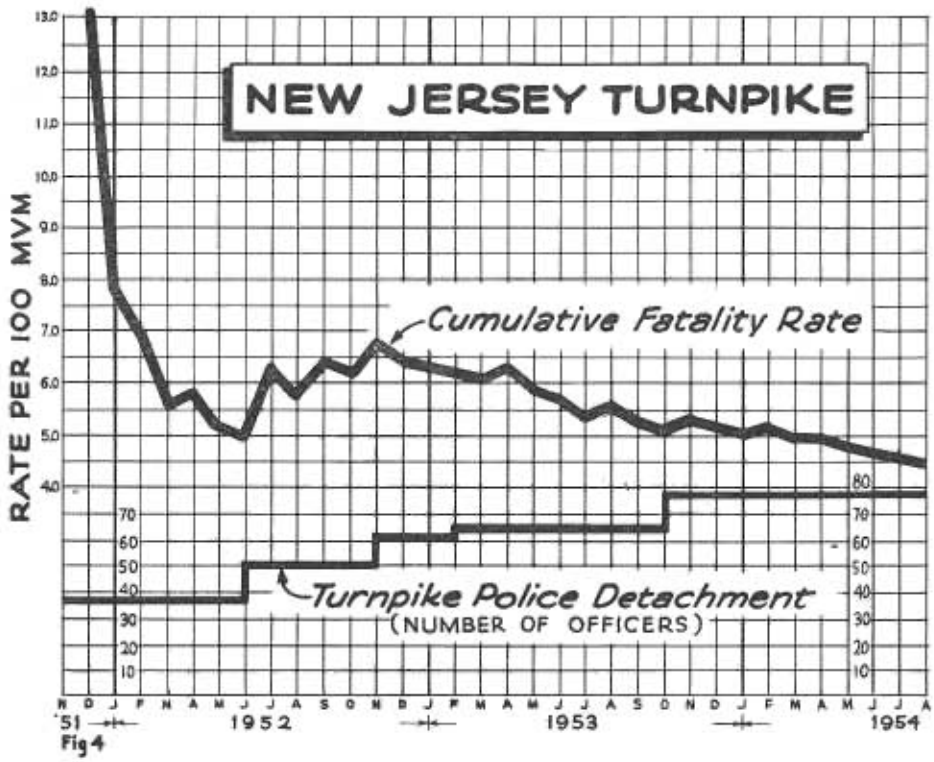


Fig 4

ment units operated for a short period of time. Comparison of hours of enforcement and of accidents is made for a corresponding month one year earlier when normal enforcement activity was under way in the area.

At first glance it might appear that this type of operation could isolate the effects of enforcement alone. It should be noted, however, that special enforcement activities in a particular locality are heralded in advance by considerable publicity emanating originally from the California Highway Patrol itself and followed up by the local newspapers throughout the campaign. There is no doubt that this publicity is an important factor in the effectiveness of such special enforcement on the accident rate, a factor which does not apply to everyday enforcement efforts.

In this connection, those special enforcement locations at which increases in enforcement manpower were small showed the greatest proportionate reduction in accidents. For example, in the Redwood City area a 7 percent increase in enforcement hours produced a 10 percent decrease in accidents. At the other end of the scale, the Bakersfield location, with a 77 percent increase in enforcement manpower, achieved only a 28 percent reduction in accidents.

Highway Improvement

Beginning with the Collier-Burns Highway Act in 1947, California has carried on an accelerated program of state highway construction and traffic improvement, which has been an important factor in reducing the accident and fatality rates, as shown in *Figure 1*.

Table 4 shows the mileage of two-lane, multilane, and multilane divided highways on which construction work was done between July 1, 1947, and June 30, 1953.

The figures on two-lane roads include those on the Federal Aid Secondary System, and cover not only miles of highway constructed on new and improved alignment but also such improvements as resurfacing or widening.

The multilane and multilane divided columns, however, show actual net miles of constructed facilities on the California State Highway System, rural and urban. Specifically, on the Rural State Highway System during the period of this study, in addition to improvements on two-lane roads, our actual status mileage has been increased by 403 miles of four-or-more-lane divided expressways or freeways, which roads have low accident rates. At the same time, status mileage has been *decreased* by 153 miles on high accident type roads, primarily three-lane highways, and two-lane mileage reduced by 331 miles.

TABLE 3—CALIFORNIA HIGHWAY PATROL
SPECIAL ENFORCEMENT UNIT ACTIVITIES—COMPARATIVE DATA

Area	Month and year compared	Without special enforcement unit		With special enforcement unit		Percent inc. patrol hours	Percent reduction, accidents
		Patrol hours	Accidents	Patrol hours	Accidents		
Bakersfield	Jan., 1953-Jan., 1954	4,705	232	8,376	167	77	28
San Leandro	Nov., 1952-Nov., 1953	3,032	227	3,384	189	12	17
Sacramento	Mar., 1953-Mar., 1954	5,228	214	8,543	142	62	33
Stockton	Apr., 1953-Apr., 1954	3,387	157	4,591	143	36	9
Redwood City	July, 1952-July, 1953	2,808	135	3,001	121	7	10
San Bernardino	July, 1952-July, 1953	3,851	204	4,507	191	17	6
San Diego	Mar., 1953-Mar., 1954	4,641	213	5,261	193	14	9
East Los Angeles	Oct., 1952-Oct., 1953	3,237	311	4,013	217	24	30
Totals		30,889	1,693	41,676	1,363	35	19

TABLE 4—CONSTRUCTION BY STATE DIVISION OF HIGHWAYS
1948 TO 1953, INCLUSIVE

Year	Construction on State and FAS Highways	Constructed miles on State Highways Rural and Urban	
	Two-lane	Multilane	Multilane divided
1947-1948	600.6	18.3	105.8
1948-1949	689.6	40.8	106.8
1949-1950	548.8	56.5	151.0
1950-1951	495.1	16.9	114.8
1951-1952	574.6	11.6	99.1
1952-1953	564.9	1.6	105.6

In addition to these major improvements, there are thousands of locations on the State Highway System where special steps have been taken to alleviate a high accident situation.

Accident Patterns

These are the locations where the California Highway Patrol, through reports of accident investigations, has enabled the Division of Highways to determine the locations and patterns of recurring accidents. Analysis of these Highway Patrol reports, supplemented by engineering field studies, has led to reconstruction or minor relocation, channelization of intersections, or increasing of sight distance. Improvements of this type have been made at an average of 332 locations a year since 1948. Nor does that figure include the hundreds of other locations where the addition of signs, striping, reflectors, and other devices have corrected or alleviated a condition which had been contributing to accidents.

Some of these simple methods of location treatment may be spectacularly effective. At one location the Division of Highways was enabled through county cooperation to prohibit left turns off a heavily traveled highway onto a county road. During the year before the "no left turn" sign was installed there had been 46 accidents at the intersection. During the year following the installation the accidents totaled four.

Effect of Freeways

The effect of freeway construction on the accident picture is definite and immediate, and particularly gratifying in that it produces an especially marked reduction in fatalities.

Since the first freeway was completed in California before World War II, both the over-all accident rate on full freeways and the injury accident rate have consistently been approximately one-half the rate for conventional rural state highways. The *fatality* rate has been from *one-fifth* to *one-fourth* the rate on conventional rural highways. The comparison with rural highways is the most appropriate since full freeways even in the congested metropolitan areas operate on the basis of the rural speed limit of 55 miles per hour.

Freeways are planned and constructed to save time, money and lives by carrying large volumes of traffic safely and expeditiously. Because of the elimination of cross traffic, freeways can and do carry far more vehicles per lane than any other type of highway facility. The design of freeways is constantly being improved on the basis of experience under actual traffic conditions. For example, the Pasadena (Arroyo Seco) Freeway, which was opened to traffic in 1940, was an example of pioneering in the freeway field. Some of its features are today considered substandard, and have been modified in the design of subsequent freeways. Nevertheless, the original section of the Pasadena Freeway is now carrying traffic volumes exceeding 50,000 vehicles per day, and its safety record compares favorably with other freeways in California.

Table 5 shows 1953 traffic and five-year accident, injury-accident and fatality rates for the various types of rural highways compared to the composite 12-year record on full freeways, rural and urban.

In addition to the increased safety to the vehicles traveling on the specific facility, the construction of a full freeway generally has a far broader influence on accident rates. That is, when a freeway removes the impatient and higher-speed traffic from the main street of a community, a very material reduction in accidents is noted not only for the freeway traffic but also for the traffic which remains on the city street. Actually, a freeway bypass on the one main route which traverses a moderate-sized community can effect a material accident reduction on a city-wide basis.

TABLE 5—TRAFFIC AND ACCIDENT DATA ON RURAL STATE HIGHWAYS

Number of lanes	1953 Data		Five-year average rates (1949-1953)		
	Miles	Average daily traffic	Accidents per MVM*	Fatal and nonfatal accidents per MVM	Fatalities per 100 MVM*
2	10,881	2,393	2.34	1.07	(10.63)
3	149	12,952	2.90	1.21	(12.65)
4 undivided	179	22,188	3.72	1.43	(8.15)
4 divided	247	16,297	3.16	1.24	(9.06)
4 divided expressways	567	11,559	2.05	0.92	(10.21)
Totals (incl. misc.)	12,543	3,469	2.56	1.11	(10.27)
Full freeways (Rural and urban)	82	47,017	†1.41	†0.61	†(2.26)

* Million vehicle miles.
† Total record — 1941-1953.

Carlsbad-Oceanside Freeway

One example of this city-wide effect has occurred in the area of Carlsbad and Oceanside following the opening of a 10-mile freeway on November 16, 1953. As evidence of this effect, reports by responsible agencies in Oceanside are shown below as they appeared in the Oceanside *Daily Blade-Tribune* and the San Diego *Union*.

(Quoted from February 26, 1954, edition of Oceanside *Daily Blade-Tribune*):

"That the Oceanside-Carlsbad Freeway has been a major contribution to traffic safety was dramatically illustrated today by statistics released to the Oceanside Chamber of Commerce by the local hospital.

"For the 90-day period prior to the freeway opening November 16th, there were 23 ambulance traffic cases handled by the hospital. Most of these cases from August 16th to November 16th, the hospital informed Chamber Manager Zac Dunlap, involved major injuries and confinement periods extending into weeks and months.

"From the freeway opening to February 16th, however, there were only 12 traffic ambulance cases—barely over half of the prefreeway rate. Of the 12, all injuries were minor in nature and required only short periods of confinement.

"The Oceanside Hospital usually receives traffic victim cases from San Clemente to Leucadia.

"In commenting on the figures released by Wilma Taylor of the hospital, Dunlap declared:

" 'The freeway's saving in human life and suffering has already become evident in a brief, 90-day period.

" 'This should be especially noted by local residents because the life which was saved or the injury which didn't happen could well have been theirs or their loved ones.' "

(Quoted from March 1, 1954, edition of Oceanside *Daily Blade-Tribune*):

"Freeways are safe ways to travel, indeed.

"Oceanside's city accident ratio which had been steadily climbing in recent years has taken a sharp dip since the opening of the O-C (Oceanside-Carlsbad) Freeway, according to figures released today by Sgt. Cliff Haver of the local police department.

"The city decline substantiated the Oceanside Hospital report (in Friday's *Blade-Tribune*) which showed a slightly less than 50 percent drop in ambulance cases during the three months since the November 16th freeway opening in comparison with the 90-day period prior to the freeway opening. The hospital also reported a dramatic decline in the seriousness of the injuries and the length of hospitalization required.

"Haver revealed that since the November freeway opening of 1953, only 85 traffic accidents have occurred within the city limits, compared with 210 during the same period last year. This is a 58 percent reduction of auto accidents, Haver pointed out.

"Although figures have not been compiled for February, data shows that 32 accidents occurred last November and December compared with 71 and 73 during those months in 1952, while 21 accidents were reported in January of this year compared with 66 during January of 1953."

(Quoted from August 8, 1954, edition of San Diego *Union*):

"A prayer for motorists' safety that state highway officials voiced at the ceremony opening the $10 million Oceanside-Carlsbad freeway nine months ago is being answered, according to local traffic safety records.

"The new superhighway skirting the business districts in both cities was opened last November.

"Previously, highway officials had considered this area a major bottleneck on the San Diego-Los Angeles coast arterial. Traffic violations and accidents were increasing annually as through traffic steadily mounted on Old Highway 101 through the center of both towns.

"At the ribbon-cutting ceremonies November 16th, Lieutenant Governor Harold Powers said he hoped the new 10-mile divided highway would improve safety conditions.

"Police Chief Patrick said yesterday that traffic accidents in Oceanside declined 59 percent the first six months of this year.

"He compared a total of 396 accidents in the first six months of 1953 with only 163 in the same period this year. The accident rate showed a similar decline in nearby Carlsbad."

Tulare Freeway

An eight-mile freeway which carried State Route 4 (US 99) around the City of Tulare exhibited a similar effect in reducing accidents over the entire City of Tulare. This freeway was opened on December 11, 1953. The following data refer to a 10½-month period since the freeway was opened compared to an identical period one year earlier. The comparative study embraces all streets within the city limits of Tulare plus both the old and new US 99 highways between the limits of the freeway at Tulare Airport on the south and Tagus Ranch on the north. Sources of accident data were from the files of the Division of Highways and the records of the Tulare Police Department.

The freeway bypass diverted approximately 70 percent of the US 99 highway traffic, which previously flowed through the city, although traffic on the old and new routes combined had increased 7 percent in the one-year period. Since the total US 99 highway flow is essentially carried on the two routes, the accident comparisons are between the old route alone in the "before" period to the sum of the old route and the freeway bypass in the "after" period. Even on this basis, there was a reduction of 63 percent in total accidents in the period since construction of the freeway. Other streets in the City of Tulare showed a drop of 23 percent in total accidents. The freeway construction effected an average reduction in accidents of 43 percent for the entire area.

Table 6 shows a comparison of accidents by type in the "before and after" periods.

On the severity basis, there was no significant change in fatal accidents, primarily due to the smallness of the sample. However, for the new freeway plus the old route, compared to the old alone in the "before" picture, there was a reduction of 44 percent in minor injuries and 47 percent in major injuries due to motor vehicle accidents.

Another interesting sidelight, following freeway construction in Tulare, was the reduced enforcement necessary because of improved traffic and accident conditions. Chief of Police Virgil Kelley of Tulare stated that after the freeway was opened the traffic and accident situation within the city was so much better that he was able to reduce his total police force from 22 to 17 officers. In addition, the Highway Patrol has been able to reduce enforcement personnel

on US 99 in Tulare County by three men a day, transferring these men to other areas in the county where they are now needed more than on the main north-south highway.

Los Angeles Freeways

As shown in the Oceanside-Carlsbad and Tulare studies, freeways can exert beneficial effects on accidents for the entire area in addition to direct accident reduction for freeway travel. This effect is, of course, less pronounced in the City of Los Angeles with its thousands of miles of city streets and 1953 travel in excess of 10 billion vehicle miles.

Figure 5 compares injury accident rates on surface streets in the City of Los Angeles to injury accident rates on full freeways within the City of Los Angeles. Basically, it may be noted that the injury accident rate for these freeways is less than one-third of that on surface streets. However, the reduction of pressures on many city arterials, due to the expanding portion of travel which is being carried on full freeways, should have an effect on the over-all accident rate. In this connection, completion of freeways at an accelerated rate beginning about 1949 appears to be reflected in a small but steady decline in the injury accident rate on surface streets.

For the two-year period, 1951 to 1953, travel on freeways increased from 4½ percent to 6 percent of the total travel within the city. The

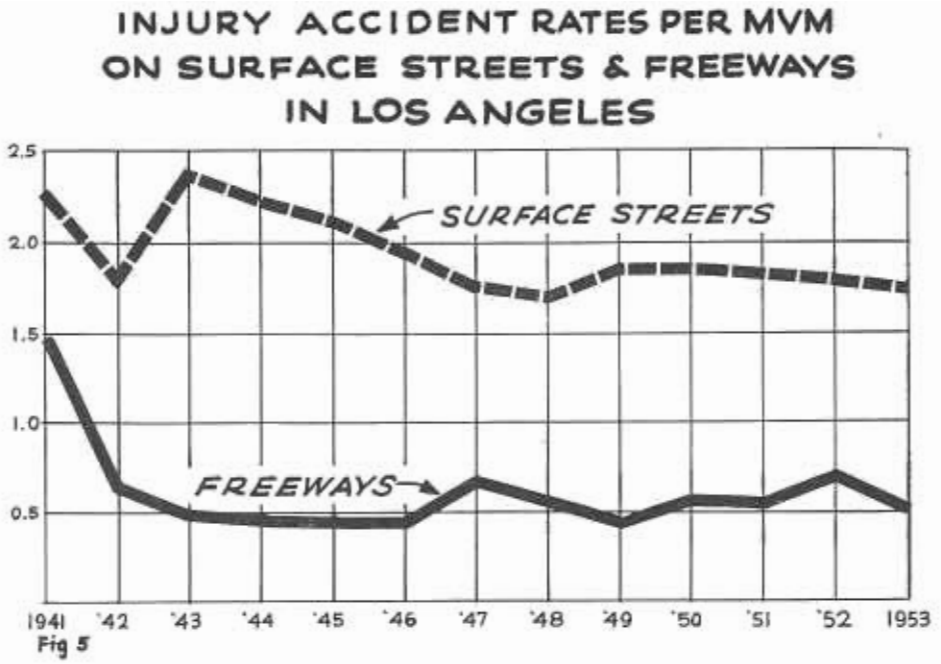


Fig 5

direct result of this additional 1½ percent of the travel on facilities with a rate one-third as high effected a reduction of 1 percent in the injury accident rate city-wide. In addition, the surface street injury accident rate, undoubtedly due to a major extent to the relief offered by the freeways, declined 2.76 percent in the same two-year period.

Economy of Freeways

Studies by highway economists both within and without the State Division of Highways have shown conclusively that freeways are self-liquidating and pay for themselves within a relatively short period of time by savings to the motoring public.

A report entitled "The Economy of Freeways" by Lloyd Aldrich, City Engineer of Los Angeles, dated June, 1953, includes the following in its introduction:

"In a previous report the capacity, time savings, and safety of freeways were compared with surface streets. Therein it was shown that a freeway on an equal number of traffic lanes basis handles three times the number of cars at twice the average speed and at an accident rate five times as favorable as a comparable surface artery."

Mr. Aldrich further states, as minimum benefits to motorists using freeways, the following average savings per vehicle mile:

(1) Gasoline savings	0.33¢
(2) Maintenance cost savings due to elimination of stop and go travel	0.24¢
(3) Accident savings	0.56¢
(4) Time savings (commercial vehicles only)	0.87¢
Total	2.00¢

In addition to the 2 cents per mile of freeway operation savings, he further lists as additional benefits to the motorist and citizen, "* * * stabilization or enhancement of property

TABLE 6—COMPARISON OF ACCIDENTS
(Number of Accidents)

Location	Fatal accidents		Injury accidents		PDO accidents*		Total	
	Before	After	Before	After	Before	After	Before	After
US 99:								
Freeway	No Rd.	2	No Rd.	8	No Rd.	13	No Rd.	23
Old route	4	2	48	8	114	29	166	39
Totals	4	4	48	16	114	42	166	62
Other streets:								
Rt. 134	0	0	12	6	49	23	61	29
City streets	1	0	13	20	79	70	93	90
Totals	1	0	25	26	128	93	154	119
Total area	5	4	73	42	242	135	320	181

* Property damage only.

values, relief of existing overburdened surface arteries, doubling of the practical radius of real estate development on a travel time basis, increased access to recreational or cultural facilities, increased mobility in times of disaster emergencies, increased tourist travel, reduction of strain of driving, and all of the other well known advantages in betterment of transportation."

From Mr. Aldrich's report we also find:

Application of Savings on Freeways Already Completed

"Applying the above listed benefits to the record of vehicle mileage on presently completed sections of freeways, we find that, on the very conservative basis used herein, in the three-year period 776,100,000 vehicle miles of travel at 2 cents per mile savings resulted in a savings of $15,522,000. The original cost of the 16.57 miles of freeways under study was $42,026,683. If the savings at the above rate could be applied to payment for the freeways, their original cost would be amortized in less than 10 years. In addition to these remarkable direct benefits to the motorist, we have also the unevaluated benefits to the region, which are of vast importance."

Auto Club Report

The most recent report on this subject is entitled *An Appraisal of Freeways* vs. *Surface Streets in the Los Angeles Metropolitan Area* as prepared by the Engineering Department of the Automobile Club of Southern California, dated August, 1954.

This report is primarily based on comparable test runs made on Los Angeles freeways and surface streets during off-peak traffic periods so as to avoid abnormal situations. The following table shows comparative data and costs of these test runs:

Test Runs on Freeways and Surface Streets

	Via freeways	Via surface streets
Date	June 2, 1954	June 3, 1954
Start	9.30 a.m.	9.30 a.m.
Car	Ford No. 8	Ford No. 8
Driver	Julius Paulson	Julius Paulson
Observer	H. F. Holley	H. F. Holley
Distance	133.3 miles	123.8 miles
Time	165 minutes	380 minutes
Gas used	6.88 gallons	8.57 gallons
Miles per gallon	19.38	14.44
Average speed	48.473 m.p.h.	19.547 m.p.h.
Number of signalized intersections	0	578
Average number of signals per mile	0	4.67
Number of stops made	0	298
Average number of stops per mile	0	2.41
Operation cost per mile		
(a) Gasoline	1.545 cents	2.076 cents
(b) Time at 2 cents per minute	2.476 cents	6.139 cents
Total cost	4.021 cents	8.215 cents

Basically, the report shows that "The 45 miles of completed freeways in the central area of metropolitan Los Angeles are saving motorists $50,000,000 a year! They cost a total of $143,000,000. If savings could be applied to amortization, total construction and right-of-way costs would be repaid in less than three years."

The basis of this surprising statement is the following economic summary developed from the test runs previously shown, which utilizes the saving of 4.194 cents per vehicle mile.

ECONOMIC SUMMARY

Miles of completed freeways under study	45.1
Weighted average daily traffic (vehicles per day)	72,400
Estimated vehicle miles per day traveled on completed freeways	3,264,200
Vehicle miles per year traveled on completed freeways	1,191,433,000
Saving in operation cost on freeways as opposed to travel on surface streets	
A. Per mile	4.194¢
B. Per year	$49,968,700
Estimated cost of 45.1 miles of completed freeways	$143,000,000
Number of years required for saving in operation cost to pay entire cost of freeways	2.86

Freeway Progress

As of January 1, 1955, California had 1,275 miles of multilane divided highway in operation, far more toll-free mileage of this type than any other state, with an additional 275 miles under construction or advertised for bids. Additional multilane divided highway projects budgeted through June 30, 1956, bring California's total of this type of highway completed, under contract, advertised or budgeted to 1,658 miles, or about 12 percent of the entire State Highway System.

Of this mileage, 170 miles consist of full freeways completed, with an additional 150 miles under contract or advertised. When these freeways plus those budgeted through June 30, 1956, are completed, California will have nearly 400 miles of this highest and safest type of highway facility.

As stated at the outset of this report, there is no room for complacency about California's traffic fatality picture even though it appears to be improving. The statistics which indicate that California's full freeways compare more than favorably with turnpikes and other modern facilities in other states must be regarded as a challenge to our engineers, our enforcement officers and other safety workers to continue at full tilt their battle against needless death on our streets, roads and highways.

HUGH CULLEN—FABULOUS FIGURE

Oil production and highway construction are akin in many ways. Hence, road engineers should be interested in a book recently off the presses of Prentice-Hall, Inc., New York. It is "Hugh Roy Cullen—A Story of American Opportunity." The authors are Ed Kilman and Theon Wright.

The book tells the life story of Hugh Cullen, fabulous Texas oil producer, an amazing figure in the contemporary American scene. One of the greatest philanthropists of our time, he has given away cash and oil properties valued at more than $175,000,000.

IT PAYS TO WAIT

If you're extra tired when you finish your day's work, it may pay you to wait until the rush is over before starting to drive home. The most dangerous hours of the day are those when people are on their way home, weary, impatient and often in a hurry.

KEEP YOUR DISTANCE

Drivers who are traveling faster than most of the traffic should never drive close to a car they intend to pass, says the California State Automobile Association. If you drive too close to the car ahead you cannot see around it and may be confronted by an oncoming vehicle just as you decide to pass.

Cost Index

Highway Construction Costs Down During Fourth Quarter 1954

By RICHARD H. WILSON, Assistant State Highway Engineer; H. C. McCARTY, Office Engineer; JOHN D. GALLAGHER, Assistant Office Engineer

ON THE BASIS of prices submitted on state highway construction projects in the last three months, the California Highway Construction Cost Index indicates a drop of 7.5 percent in construction costs during the fourth quarter of 1954. This decrease largely offsets the 9.9 percent rise in the previous quarter, bringing the Index down 15.6 points, from 207.8 to 192.2 (1940 = 100). This is within 3.2 points of the second quarter of 1954, when at 189.0 it reached the lowest point since the second quarter of 1950.

This 192.2 Index figure for the fourth quarter of 1954 is 21.7 percent below the all-time high of 245.4 in the fourth quarter of 1951 but is 20.1 percent above the 160.0 in the first quarter of 1950 which is the low point since the end of World War II.

The accompanying tabulation shows the California Highway Construction Cost Index by years from 1940 to 1949 and by quarters from 1950 through 1954.

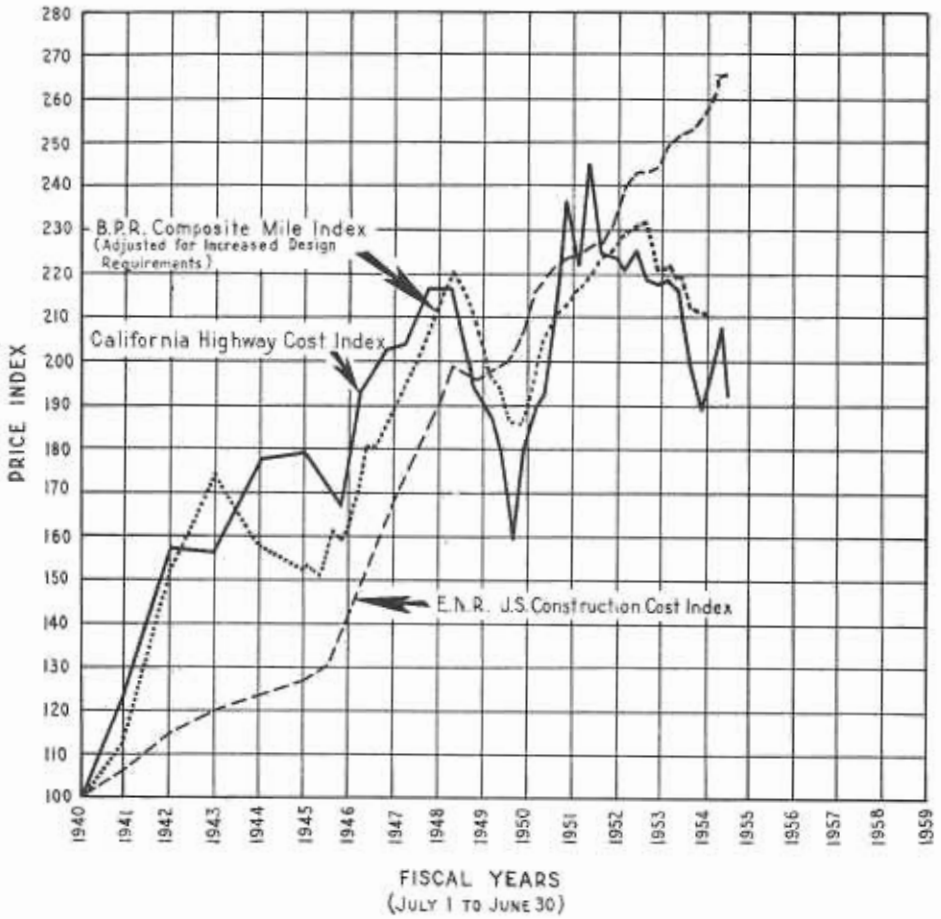
THE CALIFORNIA HIGHWAY CONSTRUCTION COST INDEX

Year	Cost Index
1940	100.0
1941	125.0
1942	157.5
1943	156.4
1944	177.8
1945	179.5
1946	179.7
1947	203.3
1948	216.6
1949	190.7
1950 (1st quarter)	160.6
1950 (2d quarter)	180.0
1950 (3d quarter)	189.2
1950 (4th quarter)	194.8
1951 (1st quarter)	215.4
1951 (2d quarter)	238.3
1951 (3d quarter)	221.9
1951 (4th quarter)	245.4
1952 (1st quarter)	224.8
1952 (2d quarter)	224.4
1952 (3d quarter)	221.2
1952 (4th quarter)	226.2
1953 (1st quarter)	218.3
1953 (2d quarter)	217.5
1953 (3d quarter)	218.0
1953 (4th quarter)	216.7
1954 (1st quarter)	199.4
1954 (2d quarter)	189.0
1954 (3d quarter)	207.8
1954 (4th quarter)	192.2

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

PRICE INDEX CONSTRUCTION COSTS

1940 = 100



It is, however, the opinion of this department that the 7.5 percent drop is not necessarily indicative of a continued downward trend in construction costs during the immediate future. This opinion still is based on the premise that the factors which offset increased labor costs in the con-

tracting industry have reached a point of balance and that the effect of such increased costs for labor must become apparent in the Index in the immediate future.

On the other hand, the currently large number of highway contracts above the million-dollar mark, involving large quantities of work and materials, together with continued keen competition among contractors have a marked effect in depressing unit prices. Nevertheless, as stated, it is thought that these factors will not remain strong enough to continue balancing the effect of increasing labor costs.

Average Unit Prices

Study of the average unit prices bid during the fourth quarter of 1954 for the eight principle items upon which the California Highway Construction Cost Index is based (see accompanying tabulation) show a drop in all but plant-mixed surfacing, which is up 3.2 percent, and portland cement concrete pavement, which rose 3.9 percent. Of the other items, roadway excavation was down 18.5 percent, untreated rock base, down 3.8 percent, structure concrete dropped 7.1 percent, bar steel down 1.0 percent and structural steel dropped 16.6 percent.

The decrease in the average unit cost of roadway excavation from $0.43 to $0.35 per cubic yard may be attributed largely to the large volume dirt moving involved in individual projects. The total volume of roadway excavation for the quarter was 6,300,000 cubic yards and of this amount, nearly 3,000,000 cubic yards were included in only three contracts. This item unquestionably was a major factor in the 7.5 percent decline in the Index.

Structural Steel

Similarly the average unit price of structural steel for highway contracts awarded during the fourth quarter of 1954 was $0.135 per pound as compared to $0.162 per pound in the third quarter. Here again the quantity in individual contracts was a factor. Of the 7,680,000 pounds required by all contracts 6,200,000 pounds were concentrated in only four contracts. Also in the case of structural steel, as was reported in the Cost Index release for the third quarter, the total quantity in the third quarter was only about 4,000,000 pounds, as compared to the 15,000,000 pounds in the second quarter and over 7,000,000 pounds in the fourth quarter; also most of the 4,000,000 pounds in the third quarter was for projects located in outlying areas, far from sources of steel. This situation alone would account for an abnormally low average unit price for structural steel in the second quarter and an abnormally high price in the third quarter, all of which was noted in the third quarter release. From the average prices for the year preceding it would appear that the $0.135 for the fourth quarter is a relatively normal average at this time.

The accompanying comparative chart, showing the California Highway Construction Cost Index, the *Engineering News-Record* Construction Cost Index and the United States Bureau of Public Roads Composite Mile Index is incomplete in this release in that figures on the bureau's Composite Mile Index are not as yet available for the last two quarters.

The *Engineering News-Record's* over-all Construction Cost Index continues to rise gradually (up 0.26 percent) and one wonders how long this will continue. It is in this Index that the effect of continuing increases in labor costs is most perceptible as the *News-Record's* Index is based upon wages and material costs and not on bid prices.

Competition Among Bidders

The U. S. Bureau of Public Roads Composite Mile Index and the California Highway Construction Cost Index are both based on actual average bid prices for highway contracts, the one on a national scale, the other limited to California.

That competition among bidders for state highway work remains keen is shown on the accompanying Sum-

CALIFORNIA DIVISION OF HIGHWAYS—AVERAGE CONTRACT PRICES

	Roadway excavation, per cu. yd.	Crusher run base, per ton	Plant mix surfacing, per ton	Asphalt concrete pavement, per ton	PCC pavement, per cu. yd.	PCC structures per cu. yd.	Bar reinforcing steel, per lb.	Structural steel, per lb.
1940	$0.22	$1.54	$2.19	$2.97	$7.68	$18.33	$0.040	$0.083
1941	0.26	2.31	2.84	3.18	7.54	23.31	0.053	0.107
1942	0.35	2.81	4.02	4.16	9.62	29.48	0.073	0.103
1943	0.42	2.26	3.71	4.76	11.48	31.76	0.059	0.080
1944	0.50	2.45	4.10	4.50	10.46	31.99	0.054	0.132
1945	0.51	2.42	4.20	4.88	10.90	37.20	0.059	0.102
1946	0.41	2.45	4.00	4.68	9.48	37.38	0.060	0.099
1947	0.46	2.42	4.32	5.38	12.38	48.44	0.080	0.138
1948	0.55	2.43	4.30	5.38	13.04	49.86	0.092	0.126
1949	0.49	2.67	4.67	4.64	12.28	48.67	0.096	0.117
1st quarter 1950	0.34	2.22	3.65	3.74	.....	40.15	0.077	0.081
2d quarter 1950	0.40	2.13	4.48	3.74	10.86	43.03	0.080	0.105
3d quarter 1950	0.41	2.32	4.25	5.50	10.91	44.34	0.093	0.131
4th quarter 1950	0.42	2.81	4.64	4.61	12.55	43.18	0.098	0.120
1st quarter 1951	0.45	3.07	4.06	5.22	11.71	46.38	0.103	0.206
2d quarter 1951	0.63	3.88	4.56	4.63	12.93	51.50	0.105	0.166
3d quarter 1951	0.56	2.88	4.59	3.90	12.41	46.14	0.107	0.165
4th quarter 1951	0.66	2.91	5.66	4.89	12.71	49.38	0.105	0.169
1st quarter 1952	0.56	3.25	4.88	4.77	14.25	47.46	0.094	0.152
2d quarter 1952	0.53	3.19	5.29	4.13	14.20	49.12	0.091	0.143
3d quarter 1952	0.55	2.61	5.49	4.60	12.80	48.21	0.094	0.132
4th quarter 1952	0.66	2.68	4.97	.....	12.53	48.45	0.094	0.128
1st quarter 1953	0.45	*2.48	5.27	4.46	12.47	53.19	0.098	0.150
2d quarter 1953	0.50	2.07	5.38	4.59	13.06	52.68	0.091	0.132
3d quarter 1953	0.54	2.15	5.30	4.82	13.78	49.23	0.092	0.129
4th quarter 1953	0.48	2.11	4.74	4.47	14.77	53.41	0.105	0.139
1st quarter 1954	0.45	2.28	4.23	4.78	14.89	47.82	0.092	0.126
2d quarter 1954	0.38	2.09	4.29	5.18	14.28	47.12	0.093	0.114
3d quarter 1954	0.43	1.85	4.68	7.00	12.63	49.59	0.095	0.162
4th quarter 1954	0.35	1.78	4.83	.....	13.13	46.08	0.094	0.135

* Untreated rock base substituted for crusher run base at this point.

NUMBER AND SIZE OF PROJECTS, TOTAL BID VALUES AND AVERAGE NUMBER OF BIDDERS

(July 1, 1954, to December 31, 1954)

	Project volume						
	Up to $50,000	$50,000 to $100,000	$100,000 to $250,000	$250,000 to $500,000	$500,000 to $1,000,000	Over $1,000,000	All projects
ROAD PROJECTS							
Number of projects	132	40	35	13	9	3	232
Total value *	$2,116,386	$2,739,564	$5,595,371	$4,496,969	$5,732,255	$4,058,682	$24,739,227
Average number of bidders	4.9	6.1	7.7	9.0	8.3	8.7	5.9
STRUCTURE PROJECTS							
Number of projects	17	4	7	4	6	2	40
Total value *	$363,054	$312,188	$1,100,136	$1,476,875	$3,792,222	$2,896,540	$9,941,015
Average number of bidders	7.9	10.0	12.3	13.0	8.7	11.5	9.7
COMBINATION							
Number of projects	———	———	———	———	1	14	15
Total value *	———	———	———	———	$817,627	$33,632,557	$34,450,284
Average number of bidders	———	———	———	———	10	10.3	10.3
SUMMARY							
Number of projects	149	44	42	17	16	19	287
Total value *	$2,479,440	$3,051,752	$6,695,507	$5,973,844	$10,342,104	$40,587,779	$69,130,526
Average number of bidders	5.2	6.4	8.5	9.9	8.6	10.2	6.7

* Bid items only.

Total Average Bidders by Months

	July	August	September	October	November	December	Average for six months
1954	6.7	6.0	6.5	7.9	7.0	6.4	6.7
1953	6.2	6.9	6.4	7.6	7.4	7.7	6.9

mary of Bidders, broken down by number and size of contracts and by road and bridge construction for the last six months of 1954. The average number of bidders was 6.9 for the fiscal year ending June 30, 1954, which compares with 5.7 for the fiscal year ending June 30, 1953.

There follows this release a summary of the number of bidders prequalified to bid on state highway work in California broken down by the several brackets of bidding limitation:

The data show that 780 contractors were prequalified to bid state highway projects as of July 1, 1954. Based on their maximum ratings, the 780 contractors are grouped as follows:

10,000,000 and over	41
5,000,000 to 10,000,000	72
2,500,000 to 5,000,000	126
1,500,000 to 2,500,000	194
1,000,000 to 1,500,000	236
500,000 to 1,000,000	355
250,000 to 500,000	498
100,000 to 250,000	639
50,000 to 100,000	747
up to 50,000	780

The combined bidding capacity on June 30, 1954, of these 780 contractors was $1,472,000,000, or in round figures one billion four hundred seventy-five million dollars.

In arriving at this combined bidding capacity figure all ratings in excess of 20 million dollars are entered at the 20-million-dollar figure.

Last year at this time there were 691 prequalified contractors with a combined bidding capacity of $1,345,000,000, using the 20-million-dollar cut-off point.

New Record Made

State highway construction in California has set a new all-time record both in value of contracts under way and in mileage of multilane divided highways in the construction stage, it was reported by the Department of Public Works.

The department reported that the construction value of the 293 Division of Highways contracts under way on the first of the year amounted to $209,215,100, surpassing the previous high of $207,693,000 on October 1, 1954. This is the seventh consecutive month on which the construction value of going contracts has exceeded $200,000,000.

At the same time the department reported construction under way on 228 miles of multilane divided highway, most of it of the freeway or expressway type, and an additional 47 miles advertised for bids. This total of 275 miles of multilane divided highway in the construction stage compares with the previous high of 271 miles last October.

Completed multilane divided highways in California now total 1,275 miles, an increase of 153 miles since January 1, 1954.

Retirements *from* Service

Nate W. Downes

In May of 1949, as the result of selection through an open national competitive civil service examination, Nate W. Downes took up the assignment of organizing and directing a section within the Division of Architecture conceived for the purpose of surveying and reporting on state institutions, their equipment and utilities to the end that authentic information would be made available as to their physical condition, embracing recommendations covering items of repair, rehabilitation and improvements required to bring these properties up to an acceptable physical and functioning standard. He was further charged with the responsibility of prescribing for the maintenance and operation of these properties at and on this same standard.

NATE W. DOWNES

In the period since May, 1949, a complete report has been made on every state institution in the Departments of Corrections, Education, Mental Hygiene, Military, and Veterans' Affairs, and Youth Authority.

Guide for Planned Program

These reports have afforded a source of information for budgeting and a guide for carrying on a planned program for accomplishing the objective, presenting items with cost estimates classified in the order of their need and importance.

With the completion of his work, Downes retired from state service.

Downes' program is presently in operation in the new Porterville State Hospital, the new Deuel Vocational

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W. K. Daniels

W. K. (Wes) Daniels, age 62 years, retired from his position with the Division of Architecture under the State Employees' Retirement System on February 1, 1955, after completing almost 40 years of state service.

WES K. DANIELS

Serving in the executive position of Assistant State Architect in charge of administrative services with headquarters in Sacramento, Daniels planned, organized and directed the state-wide activities of the division relating to fiscal affairs, contracts, estimating, construction budgets, support operating budgets, personnel, office services, accounting and contract board of review.

Born July 22, 1892, in Stockton, California, he attended the public schools there and sold newspapers during his spare time. He left home

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H. R. Kriegh

H. R. Kriegh, Associate Highway Engineer, retired from service with the California Division of Highways on December 1, 1954.

He started work for the division on April 4, 1932, as assistant resident engineer on construction for District VII, and spent a number of years in the field on construction work, later transferring to the district office, where he served in various positions until retirement. He has been in the Construction Department office for the past seven years, as assistant district construction engineer, where he has done a top-notch job of supervising and controlling engineering allotments and costs, handling contractors' requests for extensions of contract time, judging contractors' claims, securing and compiling all pertinent information, and preparing the data for presentation to the Board of Review.

H. R. KRIEGH

Born in Kansas

Kriegh was born in Kansas, and received his formal engineering education at the University of Kansas. His education did not end, however, with his last class at K. U., for he has continued to expand his knowledge along scientific lines, becoming expert in such subjects as geology, mineralogy, hydraulics, mathematics, and celestial navigation.

His first employment as an engineer was with the Santa Fe Railroad, as chairman on a survey party. He soon advanced to the position of party chief, and later to the position of resident engineer on construction. He

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NATE W. DOWNES

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Institution at Tracy, and the California State Prison at Soledad.

With a background of five and one-half years' experience in appraising the physical condition of California state institutions, it is the opinion of Downes that such a program should be installed state-wide without delay.

Born in Illinois

Born in Rock Island, Illinois, Downes moved to Nebraska with his parents at a very early age where he was educated in the public schools, graduating from the University of Nebraska in 1907 in mechanical engineering.

First employed by the Freeborn Engineering Company, Consulting Engineers, Kansas City, Missouri, moving then to the Division of Buildings and Grounds of the School District of Kansas City, Missouri, he finally landed in the U. S. Army with the 81st Engineers in 1918. On being discharged, he engaged in consulting engineering practice in Dallas, Texas, and after four years in this capacity, returned to the School District of Kansas City, Missouri, as chief engineer and superintendent of buildings and grounds, later being identified as assistant superintendent of schools in charge of buildings and grounds, which position he held for 30 years.

Downes is a life member of the American Society of Mechanical Engineers, the American Society of Heating and Ventilating Engineers, and a registered mechanical engineer with the States of California and Missouri.

SAFER, EFFICIENT HIGHWAYS

"As you know so well, the phrase 'safer, more efficient highways' actually involves a vast complex of governmental, commercial, and industrial relationships—plus the daily desires and transportation needs of a freedom-loving people with 58 million motor vehicles at their disposal."—From speech by Congressman J. H. McGregor of Ohio at 40th Annual Meeting of American Association of State Highway Officials, Seattle, November 9, 1954.

W. K. DANIELS

Continued from page 56 . . .

at the age of 17 years to earn his own living and to establish a career. He secured a job as office boy in an architect's office in Sacramento for training to become a draftsman.

Daniels entered state service as a junior architectural draftsman on May 17, 1914, with the State Board of Harbor Commissioners during a program of redevelopment of pier entrance facilities in San Francisco. He transferred to the division's Sacramento office a year later in the same capacity. During the following decade he worked his way up in the architectural drafting room through promotional civil service examinations plus home studies to the position of chief architectural draftsman. He was appointed deputy chief of division in 1926 and shortly thereafter received his certificate to practice architecture in the State of California. He served later as administrative assistant and on September 8, 1937, he was reclassified as Assistant State Architect, Administrative, which position he has held since with the exception of the period 1938-1940 when he was appointed Acting State Architect following the retirement of George B. McDougall. During World War I he served with the U. S. Navy assigned to a subchaser.

When Daniels entered state service in 1914 the organization had a total personnel of 37 employees. The construction output totaled $1,365,000 for the particular biennium (two years). During his 40 years of service the peak personnel for the division increased to a total of 1,243 employees. Construction contracts in force have amounted to $110,000,000 for a single year period which represents a project level cost of $137,000,000.

In addition the division's peak work load relating to the safety of design and construction of public school buildings in California reached a high of $232,810,000 in school building valuations for a single year.

Daniels has served under nine governors, ten public works directors and two state architects.

H. R. KRIEGH

Continued from page 56 . . .

remained with the Santa Fe for 12 years, and worked one year each for the Union Pacific Railroad and the City of Oakland before coming to the Division of Highways.

Kriegh enlisted in the Army during World War I, and earned a commission as 2d lieutenant via officers candidate school. He remained active in the Reserve, and at the start of World War II resumed active duty, serving as a captain in the U. S. A. F. in India and China.

Back to Ranch

Upon retirement, "Hobe," as he is known to his friends and associates, moved with his family back to his ranch near Palmdale which he homesteaded some years ago. He then made an extensive trip through the Middle West, where he visited one of his sons and other relatives and friends.

He has now returned, and is planning to build a new home on the ranch, with a lot of the work to be done by himself. He is also writing a work on celestial navigation, including computation of the necessary tables, which will be a considerable improvement on the methods used during World War II.

Just to insure that he has no idle time on his hands, he is considering the possibility of entering into some business enterprise in the Palmdale-Lancaster area with his youngest son when the latter returns from a tour of duty with the Army in Korea.

WATCH RAILROAD CROSSING

Fourteen hundred persons were killed in the United States during 1953 as a result of accidents in which a motor vehicle collided with a railroad train, reports the National Automobile Club.

"PROFESSIONAL CARELESSNESS"

Don't let your "professional standing" as a driver lead you into "professional carelessness," advises the National Automobile Club. No matter how long you have been driving, it always pays to be careful.

RIPRAP JOB

Continued from page 38 . . .

extreme low tides. These tides rise and fall quite abruptly and thus allow only about four hours of working time to start and to complete a given section. During this short period the contractor must excavate the toe ditch to a predetermined depth with caterpillars and draglines, place the rock for the base, sometimes from elevation −8.0 feet to elevation +3.0 feet, chink all voids, place the 3-foot blanket of gravel shore protection and place enough of the roadway embankment material to prevent the tides from washing out the work which has been completed.

Construction Problem

The working period can be extended somewhat by getting in ahead of time and pushing sand berms 8 to 12 feet high on the seaward side of the work with dozers. However, when the tide builds up as much as two feet high on the outside of this sand berm, any number of dozers cannot successfully compete with the destructive erosion of the rising tide and surf action, and then the construction area floods. When this happens the contractor's equipment must then be moved out immediately. If the cycle of work is completed in time the ocean is whipped, but if it is not, the destructive wave action will cut out the roadway embankment, move the rocks out of position and much of the work must be done all over again.

After the rock riprap is successfully placed to elevation +3.0, a frontal sand beach starts to build up and the balance of the construction work can be carried on during moderate tides and except for extreme tides and storm periods very little further trouble is encountered. From elevation +12.0 to the roadway elevation averaging +23 feet a 3-foot blanket of rocks, weighing 500 pounds to 2 tons, is placed over the 3-foot-thick blanket of graded gravel. This last item of construction completes the riprap operation, and the balance of the contract work will follow normal highway building procedure.

At present quarry operations are conducted in a limestone deposit on the Guadalasca Rancho now known as the Broome Ranch 13 miles south of Oxnard on US Alternate Route 101.

James Wilson is project manager for McCammon-Wunderlich Company, Ken Omsberg is superintendent, and Robert Nutt is in charge of riprap construction.

CHICO PROJECT

Continued from page 40 . . .

contractor and T. G. Smith and T. R. Lammers were the Resident Engineers. Major contract items on this $376,000 unit included 122,170 tons of untreated rock base; 26,000 tons of plant-mixed surfacing (dense graded); and 3,450 tons of plant-mixed surfacing (open graded).

Fourth and Last Unit

The fourth and last unit of the project was a contract for completing the grading from the Oroville Wye to 3.8 miles north and for the placing of base and surfacing from Oroville Wye to the junction of Route 87. Work began on January 4, 1954, and the road opened to traffic as mentioned above on December 17th. The major items on this $690,000 contract were: 28,000 cubic yards roadway excavation; 93,000 cubic yards imported borrow; 40,000 cubic yards imported subbase material; 55,500 tons mineral aggregate for cement treated base; 30,160 tons plant-mixed surfacing (dense graded) and 4,160 tons plant-mixed surfacing (open graded). Contractors on the project were Ukropina, Polich, Kral & Ukropina of San Gabriel. R. N. Smith was the Resident Engineer.

The total of the allotments for the four contracts described above is about $2,317,000. Right of way acquisition costs for this 18.7 mile length totaled approximately $185,000. Thus, the total cost of this new facility, exclusive of engineering, was $2,532,000, or about $135,000 per mile.

FAMILIES AND THE AUTOMOBILE

Seventy percent of all the families in the United States today own automobiles.

SCHOOL PATROLS

Continued from page 6 . . .

side on the green light and be unobserved under the hoods of waiting cars when the signal light changes. Patrols, adult guards, or policemen are still necessary for the safety of children at many signalized intersection locations, particularly on heavily traveled multilane streets.

Safety at school crossings is a problem that requires cooperation and acceptance of responsibility by all concerned. The school patrols and those responsible for them are making a very substantial contribution to safety, and deserve credit for their fine work. They are doing their part of a job which should be shared with parents, school districts, enforcement officers, other officials, and motorists.

SOURCE OF INFORMATION

CENTRAL CALIFORNIA CONFERENCE OF SEVENTH-DAY ADVENTISTS

MR. KENNETH C. ADAMS, *Editor*

DEAR MR. ADAMS: Early this week one of our denominational auditors laid a copy of your fine magazine *California Highways and Public Works* on my desk. I found this magazine to be a real dispenser of information which I have desired to have as I have driven over our highways and observed the work being done and corrective measures being taken to make our highways safer and more enjoyable to use.

ROBERT E. OSBORN
Secretary-Treasurer

MAGAZINE HELPFUL

CITY OF MODESTO
Traffic Engineering Department
Modesto, California

MR. KENNETH C. ADAMS, *Editor*

DEAR MR. ADAMS: Your November-December issue was outstanding. The articles on "Financing of Grade Separations," "Guard Railing Reduces Severity of Accidents," "Traffic Signals," "Road Bond Issue," "Cost Index," and "Traffic Count," were all interesting and extremely valuable to me.

(Signed) DOUGLAS J. CARMODY
Traffic Engineer

Rod Richardson Gives Up State Post for New Job

Rodney C. Richardson, since September, 1950, assistant to the Director of Public Works, resigned on January 4th to assume the duties of vice president of the Benmatt Organization of Los Angeles and Chicago.

ROD RICHARDSON

Richardson was a Sacramento resident for the past 10 years, and during that time served in various executive positions in State Government. Originally he came to the Capitol to act as Secretary of the Governor's Veterans Committee under Earl Warren in November, 1944. Thereafter he was appointed Assistant Chief, State Airport Master Planning Staff; Coordinator of Centennial Affairs; and Deputy Director, Governor's Office of Planning and Research. Along with his other duties in the State Department of Public Works, he served as Secretary of the Engineering Division, Governor's Traffic Safety Conference, for the past four years.

Educated in Southern California, he attended U. C. L. A., U. S. C., and the American Institute of Banking. Orig-

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Johnson Assumes Post Vacated by Hal H. Hale

On January 1, 1955, Alfred E. Johnson, immediate past president of the American Association of State Highway Officials, became executive secretary of the association, succeeding Hal H. Hale, who has resigned to accept a position with the Association of American Railroads.

ALFRED E. JOHNSON

Johnson had been Chief Engineer of the Highway Department of the State of Arkansas since 1947, a post which he attained through successive promotions after entering the department as rodman and instrument man in 1927.

He was born in Harrison, Arkansas, July 10, 1907, and studied engineering at the University of Arkansas. During his professional career he has been active in numerous engineering organizations, served as president of the Southeastern Association of State Highway Officials, and concluded his term as president of A. A. S. H. O. in November, 1954.

Johnson is well known nationally, particularly in Washington, D. C., where he has often represented A. A. S. H. O. before many important meetings and before the Congress.

C. A. Maghetti New Secretary Highway Body

C. A. Maghetti, of Davis, editor of the Davis *Enterprise* for the past 20 years, was appointed secretary of the California Highway Commission January 1, 1955, succeeding R. C. Kennedy, resigned.

C. A. MAGHETTI

Maghetti has held several posts in the past years and is at present chairman of the Davis Housing Authority. He served as postmaster in Davis for two terms, during which time he was president of the California Postmasters Association. He is a past president of the Davis Rotary Club and a charter member of 28 years' standing. He served a term as director of the Yolo County Fair Board, for two terms as chairman of the Yolo County Republican Central Committee and for the past 10 years as chairman of the Salvation Army Relief in Davis.

Until his appointment he was a director of the California Newspaper Publishers Association. He is a member of the San Francisco Press Club, the Faculty Club of the University of California at Davis, and the Chamber of Commerce.

State Highway Contracts Awarded

NOVEMBER, 1954

Alameda County—Across the Eastshore Freeway, 0.1 mile north of south city limit of Emeryville. Furnish and install one sign bridge with sign lighting. Contract awarded to Ets-Hokin & Galvan, $8,694.

Contra Costa County—US 40—At the intersection of US 40 with Giant Road in and adjacent to the City of Richmond. Install highway lighting system and span-wire mounted three-way flashing beacon. Contract awarded to Hall Sloat Electric Co., Inc., $1,967.

Contra Costa County—US 40—Between 0.2 mile south of Jefferson Avenue and south of County Road 24. Grade and pave with portland cement concrete on cement treated subgrade; ramps interchange lanes, frontage roads and city streets graded and surfaced with plant-mixed surfacing, and construction of nine reinforced concrete bridges, all to provide a six-lane divided freeway. Contract awarded to M & K Corp. and Fredrickson & Watson Const. Co., $5,107,822.

Contra Costa County—SR 24—On Mount Diablo Boulevard at Oakland Street-Thomson Avenue and at Moraga Road, in the Town of Lafayette. Modify two independently operating two-phase full traffic actuated signal systems into an interconnected, coordinated system. Contract awarded to Ets-Hokin & Galvan, $8,976.

Fresno County—At the new district office at the corner of West and Olive Avenues. Construct an irrigation pipe line and a reinforced concrete diversion box. Contract awarded to Thomas Construction Co., $8,013.94.

Fresno County—FAS 808—Between State Route 138 and Sacramento Avenue, from Coalinga easterly. Construct a graded roadbed, place imported base material, plant-mixed surfacing on cement treated base, apply seal coat and construct a reinforced concrete bridge across Jacalitos Creek, 5.0 miles. Contract awarded to Granite Const. Co., $185,651.

Humboldt County—US 299—Between 3.5 miles east of Blue Lake and 1.0 mile west of Willow Creek. Install drainage facilities. Contract awarded to Mercer Fraser Co. and Mercer Fraser Gas Co., Inc., $13,882.

Humboldt County—SR 36—About 15.5 miles east of US 101. Place selected rock as embankment protection on existing roadway slopes, 0.1 mile. Contract awarded to Mercer Fraser Co. and Mercer Fraser Gas Co., Inc., $3,950.

Inyo County—At Shoshone Maintenance Station. Construct a cottage. Contract awarded to M. G. Swingrover, $12,750.

Los Angeles County—In the City of West Covina, on the Ramona Freeway between the west city limits and 0.3 mile east of Citrus Avenue. Grade and pave with portland cement concrete and seven bridges to be constructed, 4.2 miles. Contract awarded to Winston Bros. Co., $2,812,322.

Los Angeles County—US 101 Alt.—Between 0.1 mile east of Corral Canyon and 0.1 mile west of Malibu Creek, about 11 miles northwest of the City of Santa Monica. Construct a graded roadbed; surfacing with plant-mixed surfacing on untreated rock base; construct a right and left turn lanes; perform erosion control and preparatory landscaping and install traffic signal and highway lighting system, 0.7 mile. Contract awarded to Schroeder & Company, $85,999.90.

Marin County—FAS 608—On Sir Francis Drake Boulevard at Devil's Gulch about 2 miles south of Tecaloma. Extend the existing concrete arch culvert and grade; place plant-mixed surfacing on a portion of the roadbed. Contract awarded to E. A. Forde Co., $14,772.75.

Merced County—SR 33—Across Arroyo Canal near Dos Palos. Construct a reinforced concrete curbing and metal beam bridge railing on the existing bridge. Contract awarded to Thomas Construction Co., $4,843.20.

Orange County—On Harbor Boulevard, about 0.5 mile east of Anaheim. Grading ramps, frontage roads and connections and surfacing them with plant-mixed surfacing on untreated rock base and construction of a welded plate girder bridge of four spans supported on reinforced concrete piers and abutments on concrete pile foundations, completion of which provides a new overcrossing with ramps, frontage roads and connections. Contract awarded to J. A. Thompson & Son, $374,511.20.

Riverside County—At Indio Maintenance Station. Grade and surface a portion of the maintenance yard, construct new fence and relocate existing fence. Contract awarded to Meredith & Simpson, $7,121.55.

Sacramento County—US 99—Between 0.5 mile south of Elk Grove Road and 1.8 miles south of Florin Road. Construct a graded roadbed for northbound traffic lanes and pave with portland cement concrete on cement treated subgrade, widen and surface the existing highway for the southbound traffic lanes with plant-mixed surfacing and grade and surface frontage roads with plant-mixed surfacing and construct six bridges, completion of which provides a four-lane divided highway with reinforced concrete overcrossings at Elk Grove Road and Sheldon Road and reinforced concrete bridges at Elk Grove Creek, Laguna Creek, Whitehouse Creek and at Strawberry Creek, 5.1 miles. Contract awarded to Granite Construction Co., $1,513,047.

Sacramento County—US 50—At the intersections of Folsom Boulevard with 43d Street and with 60th Street. Install fixed-time, interconnected traffic signal and highway lighting systems at two locations. Contract awarded to Grason Electric Co., $8,207.

San Benito County—FAS 1193—Across Tres Pinos Creek about 18 miles southeast of Hollister. Construct a reinforced concrete bridge across Tres Pinos Creek and one across Tres Pinos Creek (Stoddart Bridge). Contract awarded to G. C. Renz Construction Co., $29,723.

San Bernardino County—At the intersection of Central Avenue with Texas Street. Install in place a semi-traffic-actuated signal system and highway lighting. Contract awarded to F. Eggers Company, $7,390.

San Bernardino County—SR 190 and 207—Between Route 207 and Baseline Avenue about 2 miles north of Redlands. 1.6 miles. Construct a graded roadbed and place plant mixed surfacing on imported base material and on existing surfacing, completion of which provides a four-lane divided highway. Contract awarded to Matich Bros., $183,894.30.

San Diego County—At the intersection of Main Street and El Cajon Boulevard. Surface the existing intersection with plant-mixed surfacing on imported base material. Contract awarded to Sim J. Harris, $3,003.50.

San Francisco County—Bayshore Freeway, at the Vermont Street Off-Ramp at Mariposa Street. 0.2 mile. Grade the Off-Ramp Roadway and surface with plant-mixed surfacing on cement treated base. Contract awarded to Chas. L. Harney, Inc., $28,741.55.

San Mateo County—SR 1—Across San Pedro Creek about 8 miles south of Junction of Routes 55 and 56. Construct a reinforced concrete bridge, construct a detour and grade approaches. Contract awarded to Thomas Construction Co., $38,539.50.

San Joaquin and Contra Costa Counties—SR 4—Across Old River, about 17 miles west of Stockton. Remove damaged timber and piling in the existing rest pier fender and replace with new materials. Contract awarded to H. F. Lauritzen, $4,635.

Santa Barbara County—FAS 1181—On Hollister Avenue between 1.6 miles west of Fairview Avenue in Goleta and Ellwood Overhead. Grade shoulders on portions of the project and construct a graded roadbed on the remainder of the project, construct cement treated base, placing plant-mixed surfacing over existing pavement and newly constructed cement treated base and apply seal coats, 2.9 miles. Contract awarded to Baker & Pollock, $101,679.40.

Santa Clara County—SR 17—Between 0.5 mile south of Los Gatos and Roberts Road. Construct a graded roadway and a lined channel; placing plant-mixed surfacing on cement treated base and untreated rock base; applying penetration treatment and seal coats and construct five bridges completion of which provides a new freeway with a reinforced concrete undercrossing at Santa Cruz Avenue; reinforced concrete bridge at Los Gatos Creek; steel overcrossing at the Los Gatos School for pedestrians; steel bridge at Los Gatos Creek and a steel utility crossing at Los Gatos Creek, 2.1 miles. Contract awarded to L. C. Smith Co., $1,198,516.61.

Solano County—SR 12—At Station 443÷25 in and near Fairfield. Revise the existing drainage facilities. Contract awarded to John H. McCosker, Inc., $3,582.

Stanislaus County—SR 33—Between 1.8 miles south of San Joaquin County line and Newman, 12.3 miles. Place plant-mixed surfacing over the existing pavement and construct untreated rock base shoulders. Contract awarded to Clements Const. Co., $57,229.

Stanislaus County—SR 109—At Modesto Irrigation District Lateral No. 3 near Modesto. Place a reinforced concrete pipe culvert grade and pave with plant-mixed surfacing on untreated rock base. Contract awarded to Friant Construction Co., $14,471.

DECEMBER, 1954

Alameda County—US 40—Between south of University Ave. and El Cerrito Overhead. Grade roadbeds and frontage roads, interchange ramps and detours, construct portland cement concrete pavement on cement treated subgrade, place plant-mixed surfacing on cement treated base and untreated rock base; construct traffic controls, highway lighting and two reinforced concrete bridges, completion of which provides an eight-lane divided highway with a University Ave. Overcrossing and a Gilman St. Undercrossing, 1.9 mile. Contract awarded to Stolte, Inc.-Gallagher & Burk, Inc., Oakland, $2,040,720.45.

Colusa County—SR 16—Across Bear Creek about 25 miles west of Williams. Repair bridge by replacing the existing timber truss span with a new structural steel stringer span. Contract awarded to R. E. Hertel, Sacramento, $11,760.

Contra Costa County—SR 24—Near Pittsburg, at the intersections of Arnold Industrial Highway with Bailey Road and with Somersville Road. Construct additional roadway width for storage lane by placing plant-mixed surfacing on untreated rock base, remove existing flashing beacons and install a three-phase full traffic-actuated signal system and flashing beacon system at two intersections. Contract awarded to Hall Sloat Electric Co., Inc., Oakland, $34,965.

Fresno County—US 99—Between Clinton Ave. and the intersection of Weber and W. Weldon Ave. Grade bridge approaches and place plant-mixed surfacing on untreated rock base and construct a steel bridge, 0.5 mile. Contract awarded to Gene Richards, Inc., D. M. Underdown and Gene Richards, Fresno, $221,020.40.

Fresno County—US 99—At various locations on US 99 in the City of Fresno. Remove portions of existing pavement and replace with plant-mixed surfacing on portland cement concrete base and apply seal coats to existing pavement at other locations, 0.5 mile. Contract awarded to Thomas Construction Co., Fresno, $13,856.50.

Fresno County—FAS 810—Between Howard Ave. and Garfield Ave. Construct a graded roadbed and surface with plant-mixed surfacing on cement treated

base, construct three bridges and extend an existing culvert, providing bridges at Crescent Canal, North Fork Kings River Overflow, and North Fork Kings River, 5.5 miles. Contract awarded to C. K. Moseman, Redwood City, $370,218.

Humboldt County — SR 96 — Between Willow Creek and Weitchpec. Install reflectorized guide posts. Contract awarded to Wulfert, Company, Inc., San Leandro, $28,955.50.

Imperial County—SR 80—Across Colorado River at Yuma, Ariz. Construct a bridge and one approach embankment with surcharge. Contract awarded to Fred J. Early, Jr., Co., Inc., San Francisco, $1,236,765.

Inyo County—US 395—Between 3 miles north of Cottonwood Creek and Diaz Lake, about 3 miles south of Lone Pine. Construct graded roadbed and surface with plant-mixed surfacing on untreated base, 7.6 miles. Contract awarded to C. V. Kenworthy, Stockton, $237,958.10.

Inyo County—FAS 1184—Between Junction State Route 76 about 1.8 miles north of Bishop, and Jean Blanc Road. Grade and surface with bituminous surface treatment of imported base material, 1.7 miles. Contract awarded to Bishop Engineering & Const. Co., Bishop, $54,402.68.

Kern County—SR 140—Between 1.4 miles north of Taft and Weed Creek. Construct a graded roadbed and place plant-mixed surfacing on cement treated base, completion of which provides a roadway on new alignment, 2.3 miles. Contract awarded to Griffith Company, Los Angeles, $160,859.50.

Kern and Tulare Counties—US 99—Between 1 mile south of Delano Underpass and 0.5 mile north of Kern-Tulare County line. Grade roadbeds and place portland cement concrete pavement, grade ramps, approaches and frontage roads and place plant-mixed surfacing and construct six bridges, completion of which provides a four-lane divided highway with an Airport Road Overcrossing, 11th Ave. Overcrossing, Fourth Ave. Overcrossing, Route 136-4 Separation, North Delano Overhead, and the County Line Overcrossing, 4.0 miles. Contract awarded to Gordon H. Ball and San Ramon Valley Land Co., Danville, $1,908,844.11.

Los Angeles County—SR 39—Across Little Dalton Wash. Construct a steel pedestrian bridge. Contract awarded to Monterey Construction Co., El Monte, $3,200.

Los Angeles County—US 101—Between Pioneer Blvd. and east of Rosecrans Ave. Prepare areas and plant ground cover plants and trees, 2.1 miles. Contract awarded to K. E. C. Co., Long Beach, $27,754.

Los Angeles County—Long Beach Freeway, between 223d St. and Atlantic Ave. Prepare areas and plant ground cover plants and trees, 4.6 miles. Contract awarded to Henry C. Soto Corp., Los Angeles, $46,151.

Los Angeles County—At the intersections of Lakewood Blvd.-Rosemead Blvd. with Imperial Highway, Washington Blvd., Whittier Blvd., Beverly Blvd., Mission Drive and California St. Modify the existing traffic signal systems and highway lighting and modify or reconstruct channelization. Contract awarded to Fischbach & Moore, Inc., Los Angeles, $52,527.

Los Angeles County—At the intersections of Manchester Blvd. with Hillcrest Blvd. and with La Brea Ave., in the City of Inglewood. Install highway lighting and modify the existing pre-timed signal systems. Contract awarded to Electric & Machinery Service, Inc., South Gate, $9,190.

Los Angeles and Orange Counties—Across Coyote Creek Flood Control Channel at Carson St. and Norwalk Blvd. Construct two steel bridges and approaches at Coyote Creek at Carson St. and at Coyote Creek at Norwalk Blvd., 0.9 mile. Contract awarded to Basich Bros. Const. Co., R. L. Basich, N. L. Basich and O. B. Pierson, Garvey, $480,978.90.

Los Angeles County—FAS 833—Between the south city limits of Palos Verdes and Narcissa Dr. Construct a graded roadbed and surface with plant-mixed surfacing on untreated rock base and imported base material, 3.6 miles. Contract awarded to Tomei Const. Co., Van Nuys, $354,040.85.

Lake County—FAS 1043—Between Scotts Creek Bridge and 1.6 miles northerly, about 2 miles west of Lakeport. Construct a graded roadbed, place imported base material and apply seal coat, 1.6 miles. Contract awarded to Lange Bros., Lakeport, $24,579.60.

Marin County—US 101—Between Manzanita and Golden Gate Bridge. Place plant-mixed surfacing on cement treated base, tile the tunnels, install highway lighting, illuminated signs and tunnel lighting, 3.7 miles. Contract awarded to A. G. Raisch Co., San Rafael, $1,192,952.98.

Mendocino County—US 101—Between Reeves Creek and 0.9 mile north of Hilvilla. Construct a graded roadbed and surface with plant-mixed surfacing on cement treated base, completion of which provides a four-lane roadway on new alignment, eliminating curves. Contract awarded to Fredrickson Bros., Emeryville, $579,796.05.

Mendocino County—US 101—At the intersection of Main St. with Commercial St. in the City of Willits. Install a semitraffic-actuated signal system and highway lighting. Contract awarded to L. H. Leonardi Electric Const. Co., San Rafael, $7,375.

Merced County—At the intersections of Bennett Rd. and V St. with US 99 in the City of Merced. Install traffic signal system and highway lighting. Contract awarded to Industrial Electric Co., Modesto, $6,541.

Monterey County — SR 120 — At San Vicente School. Prepare shoulders on the existing roadway and apply road-mixed surfacing, 0.2 mile. Contract awarded to Bickmore-Harper, Inc., Santa Maria, $1,547.50.

Napa County—FAS 824—Between Trancas Ave. and Silverado Trail. Construct a graded roadbed and surface with untreated rock base and seal coat, completion of which provides approaches to a future bridge, 0.4 mile. Contract awarded to Friant Const. Co., Fresno, $59,815.85.

Riverside County—US 60, 70, 99—In the City of Banning, at the intersection of Ramsey St. and San Gorgonio Ave. Install complete in place, a full traffic-actuated signal system. Contract awarded to Paul R. Gardner, Ontario, $8,899.

Sacramento and Placer Counties—US 40—Between Ben Ali and 0.5 miles east of Roseville. Place cement treated and untreated base and surface with plant-mixed surfacing. Grade portions of east and west bound roadways. Grade and surface connection roads and approaches. Construct drainage, traffic control devices, completion will provide four-lane divided highway on new alignment, 13.1 miles. Contract awarded to Baldwin Contracting Co., Inc., Marysville, $1,576,913.05.

Sacramento County—SR 24—Between Sacramento River Bridge near Isleton and 2 miles south of Freeport. Install guide posts, salvage and reset guide posts, reflectorize the existing guide posts and install metal plate guard railing. Contract awarded to Charles I. Cunningham, Oakdale, $6,449.50.

Sacramento County—At the warehouse site on Folsom Blvd. near 59th St. Grade and surface hardstand and storage areas and construct a metal building, construct a drop inlet and slip joint, place imported subbase material, untreated base, plant-mixed surfacing and apply seal coat. Contract awarded to Brighton Engineering Co., Perkins, $18,744.70.

San Bernardino County — At Eighth St. and Southern Pacific Railroad Crossing in the City of Colton. Completion of this contract will provide a steel bridge at Eighth St. Underpass, a concrete bridge at Eighth St. Underpass, a concrete bridge at J Street Off-ramp Undercrossing, and approaches constructed by grading and surfacing with plant-mixed surfacing on cement treated base and existing pavement, 0.2 mile. Contract awarded to R. M. Price Co., Altadena, $540,309.70.

San Bernardino County — FAS 710 — Between Waterman Ave., the east city limits of San Bernardino, and Palm Ave., on E. Ninth St. Construct a graded roadbed, place plant-mixed surfacing on local material, imported base material and on existing pavement and apply seal coats, 4.0 miles. Contract awarded to R. A. Erwin, Colton, $215,896.20.

San Diego County—US 101—At Camp Pendleton main entrance, about 0.1 mile north of Oceanside. Provide a reinforced concrete bridge at Camp Pendleton Undercrossing, with grade separation, ramps and frontage roads, surfaced with plant-mixed surfacing on imported base material and portland cement concrete base. Contract awarded to R. E. Hazard Contr. Co. and W. F. Maxwell Co., San Diego, $349,760.15.

San Diego County—US 101—Between Miramar Rd. and Torrey Pines Grade. Construct earth berms, fill side gutters, construct guard railing and remove and trim trees, finish roadway, apply penetration treatment and place plant-mixed surfacing, 2.3 miles. Contract awarded to Milleman-Sooy & Jackson, Redlands, $42,906.

San Diego County—US 101—At 0.1 mile south of south city limits of Carlsbad and on the San Luis Rey River Bridge. Install illuminated sign standards and electrical equipment. Contract awarded to Ets-Hokin & Galvin, San Diego, $4,411.

San Joaquin County—US 99—Between Turner Station and Kingsley Rd. Construct a graded roadbed for northbound traffic lanes and pave with portland cement concrete on cement treated subgrade and grade and surface frontage roads with plant-mixed surfacing on untreated base and construct concrete bridges, completion of which provides a new four-lane divided highway with two separated and parallel bridges at French Camp Slough, at Lone Tree Slough and at Little John Creek, 3.1 miles. Contract awarded to A. Teichert & Son, Inc., Sacramento, $727,570.50.

San Mateo County—US 101—At the intersection of El Camino Real and Howard Ave., in the City of San Carlos. Install a two-phase full traffic-actuated signal system with pedestrian actuation equipment and highway lighting. Contract awarded to L. H. Leonardi Electric Const. Co., San Rafael, $12,718.

San Mateo County—Bayshore Freeway, approximately 1,500 feet northerly of Butler Road Overcrossing. Construct scale house improvements and channelization. Contract awarded to Love & Haun, San Francisco, $2,713.

Santa Barbara County—US 101—Between 1 mile east of Carpinteria and 0.5 mile east of Arroyo Parida. Prepare ground and plant cover plants, trees and shrubs, 3.4 miles. Contract awarded to Justice-Dunne Co., Oakland, $24,101.60.

Santa Barbara County—US 101—At the intersection of US 101 with Fairview Ave., about 5½ miles west of Santa Barbara. Widen the existing roadway by placing imported subbase, imported base and untreated rock base, surfacing with plant-mixed surfacing and apply seal coats, 0.4 mile. Contract awarded to Bickmore-Harper, Inc. and Contractors Equipment Rental Service, Santa Maria, $31,816.

Santa Clara County—US 50—Between 0.1 mile south of Moorpark Ave. and Scott St., near San Jose. Widen the existing highway and surface the widened areas with plant-mixed surfacing on cement treated rock base, place plant-mixed surfacing on the frontage road and furnish and install traffic signal system. Contract awarded to Edward Keeble, San Jose, $37,600.

Santa Clara County—FAS 999—Across Stevens Creek, on Homestead Road, about 5 miles west of Santa Clara. Completion of this contract provides a four-lane roadway width, by widening the existing bridge with reinforced concrete slab construction. Contract awarded to Carl N. Swenson Co., Inc., San Jose, $56,755.30.

Santa Clara County—FAS 1002—Across Stevens Creek on Fremont Ave. between Burns Ave. and Mercedes Ave. Widen the existing bridge and approaches. Contract awarded to Lew Jones Const. Co., San Jose, $64,736.25.

Shasta County—US 99—Between 0.5 mile north of Pit River Bridge and Sidehill Viaduct. Construct a passing lane on existing roadway with plant-mixed surfacing on untreated base, 0.3 mile. Contract awarded to Morgan Construction Co., Redding, $4,990.

Shasta County—US 99—Between Mountain Gate and Bass Hill. Grade roadbeds, place plant-mixed surfacing on cement treated base, grade ramps, approach and frontage roads and place plant-mixed surfacing on untreated base, completion of which provides a four-lane divided highway on new alignment with approaches and frontage roads, 2.9 miles. Contract awarded to Fredrickson & Watson Const. Co., Oakland, $785,555.55.

Sonoma County—US 101—At the intersection of Santa Rosa Freeway with Steele Lane, approximately 0.6 mile north of northerly city limit of Santa Rosa. Intall three-phase traffic-actuated signals and advance

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January to December, 1954

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ROD RICHARDSON

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inally employed in banking, he entered the accounting field, following service in the Marine Corps during World War II. Immediately prior coming to Sacramento, he was Director of Employee Relations for U. S. Rubber Company at Los Angeles.

In Sacramento he was active in community affairs, directing public relations activities for the American Red Cross, Sacramento County Heart Association, American Cancer Society, Mercy Hospital Expansion Fund, and Sacramento County Crippled Children's Society, among others. He was recently elected as President of Sacramento Chapter 2 for 1955, the largest single unit of the California State Employees' Association, with a membership of over 8,000 in this part of the State. He is also an active member of the Public Relations Society of America and belongs to the Press and Union League Club of San Francisco.

The Benmatt Organization is a metal fabrication manufacturing firm with wholesale and retail outlets all over the North American Continent. Richardson's election is part of a program of expanded operations that will be initiated in 1955, and his duties will be those of an executive assistant to the president, with managerial responsibility in production operations, merchandising, fiscal control and public relations.

In Memoriam

LUTHER ORR STEPHENS

Luther Orr Stephens, 50, Associate Highway Engineer with the Division of Highways, passed away in his home in Sacramento on January 11, 1955, after an illness of several months.

Stephens first came to work for the State in 1928 as a draftsman in the District III office, at that time in Sacramento. He subsequently served in District II at Redding, District IV at San Francisco and District IX at Bishop, transferring to the office engineer's section of the headquarters office at Sacramento in 1935. He had been in the Design Department since 1949.

Stephens was born in St. Louis, Missouri, and studied engineering at Sacramento Junior College and the University of California at Berkeley.

From 1925 to 1928 he worked for the Sacramento County Surveyor's Office.

Stephens was a member of the California State Employees Association and Sacramento Lodge 40, F. & A. M. He was one of the organizers of the Public Works Athletic Association and was its president for many years.

He is survived by his wife, Beryl; a son, Earl Orr, Sacramento; and his mother, Mrs. Marie Morrow, Sacramento.

TRIPLE THREAT DRIVERS

Are you a triple threat driver? The California State Automobile Association says you are if you get out of your automobile on the side toward traffic. By so doing you endanger yourself, you risk having your car smashed up, and you also run the hazard of causing other drivers to become involved in a chain-reaction smashup, with several cars involved and a good chance that someone will lose his life.

New Honor for George T. McCoy

G. T. McCoy, State Highway Engineer, has been elected Western District Vice President of the American Road Builders Association for 1955. He succeeds Harmer E. Davis, Director of the Institute of Transportation and Traffic Engineering of the University of California.

The new president of A. R. B. A., announced at the organization's annual convention held in New Orleans in January, is J. N. Robertson, Director of Highways of the District of Columbia. The immediate past president is Robert M. Reindollar of Baltimore, Md.

Other Californians elected by the association for 1955 include T. W. Switzer of Visalia, Road Commissioner of Tulare County, as district vice president for the county and local roads division; and Bob Glenn of the I. T. T. E. staff of the University of California, as district vice president of the educational division.

CONTRACTS AWARDED

Continued from page 61 . . .

warning flashing beacon and construct channelization. Contract awarded to E. A. Forde Co., San Anselmo, $28,955.50.

Sonoma County—SR 12—At Bisso's Corner about 1.6 miles south of the City of Sonoma. Construct a superelevated shoulder and traffic lane on the existing curve with plant-mixed surfacing on untreated base and imported borrow, 0.2 mile. Contract awarded to I. J. Ely Co., Larkspur, $8,627.25.

Stanislaus County—SR 120—Between the San Joaquin county line and 1 mile north of Oakdale. Construct a graded roadbed and place plant-mixed surfacing on untreated rock base, 3.5 miles. Contract awarded to M. J. Ruddy & Son, Modesto, $213,111.14.

Tuolumne County—SR 108—At 0.5 mile east of Twain Harte. Grade and pave with plant-mixed surfacing on untreated rock base and imported subbase, 0.2 mile. Contract awarded to Beerman & Jones, Sonora, $15,133.

GOOD VISION NEEDED

About 90 percent of all the actions a driver must take are based on messages received through his eyes. Many persons who have normal vision by daylight are not able to see equally well at night. As a driver ages, his resistance to glare decreases and while he may have normal night vision for his age, glare from oncoming headlights will affect him more seriously than it would a younger person.

HIGHWAY COMMISSION APPOINTMENTS BY GOVERNOR

H. STEPHEN CHASE

FRANK B. DURKEE

FRED W. SPEERS

Governor Goodwin J. Knight in January announced the retention in office of Director of Public Works Frank B. Durkee, reappointed H. Stephen Chase of Sacramento as a member of the California Highway Commission, and appointed Fred W. Speers, newspaper publisher of Escondido, to succeed Charles T. Leigh, San Diego, whose term on the commission had expired. Durkee is chairman of the commission by virtue of his position of Director of Public Works.

Chase was appointed on the Highway Commission by Governor Earl Warren in November, 1951, succeeding the late Homer P. Brown of Placerville who resigned because of ill health.

Chase, who is vice president and manager of the American Trust Company and a director of the California Western States Life Insurance Company, was born in San Jose in 1903, educated in the public schools there and was graduated from Stanford University and from the Harvard University School of Business Administration.

He went to work for the American Trust Company in 1927 after his graduation from the business school. He worked in branches of the bank in San Francisco, San Jose, Redwood City and Santa Rosa, before his transfer to Sacramento in 1940.

Chase also has been active in community affairs, including service as chairman of the California War Chest campaign in 21 Northern California counties during World War II. He also has aided the Community Chest, Red Cross and other civic activities.

Speers is co-publisher with H. R. McClintock of the *Daily Times-Advocate* and the weekly *Times-Advocate* of Escondido.

He has been president since April, 1954, of the Palomar Savings & Loan Association of Escondido and a member of its board since its founding in 1951; is a director, La Jolla-San Diego County Theatre and Arts Foundation, a former member of State Advisory Council, California Newspaper Publishers Association, and secretary since 1950 of Republican County Central Committee of San Diego County. He has been director of Escondido Chamber of Commerce for past three years. Speers is a Major, Air Force Reserve. He served on Tinian in the Marianas during World War II with Sixth Bombardment Group. He is holder of the Bronze Star, Air Medal, four battle stars and qualified as both combat and counterintelligence officer. Prior to coming to California in May, 1947, he had been publisher from 1937 to 1946 of the North Platte (Neb.) *Daily Bulletin*. He graduated at Stanford University (A.B. in history) June, 1928. He had attended Davenport, Iowa, high school. He was born there July 26, 1906, and married October 12, 1935, to former Victoria Rountree, a law graduate at Cornell University at Ithaca, who has been admitted to practice in New York and Florida. Both were members of the party of 16 American newspaper people who visited Russia, Poland and Czechoslovakia in spring of 1954.

printed in CALIFORNIA STATE PRINTING OFFICE 10304 (55 38,400)

California Highways and Public Works
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