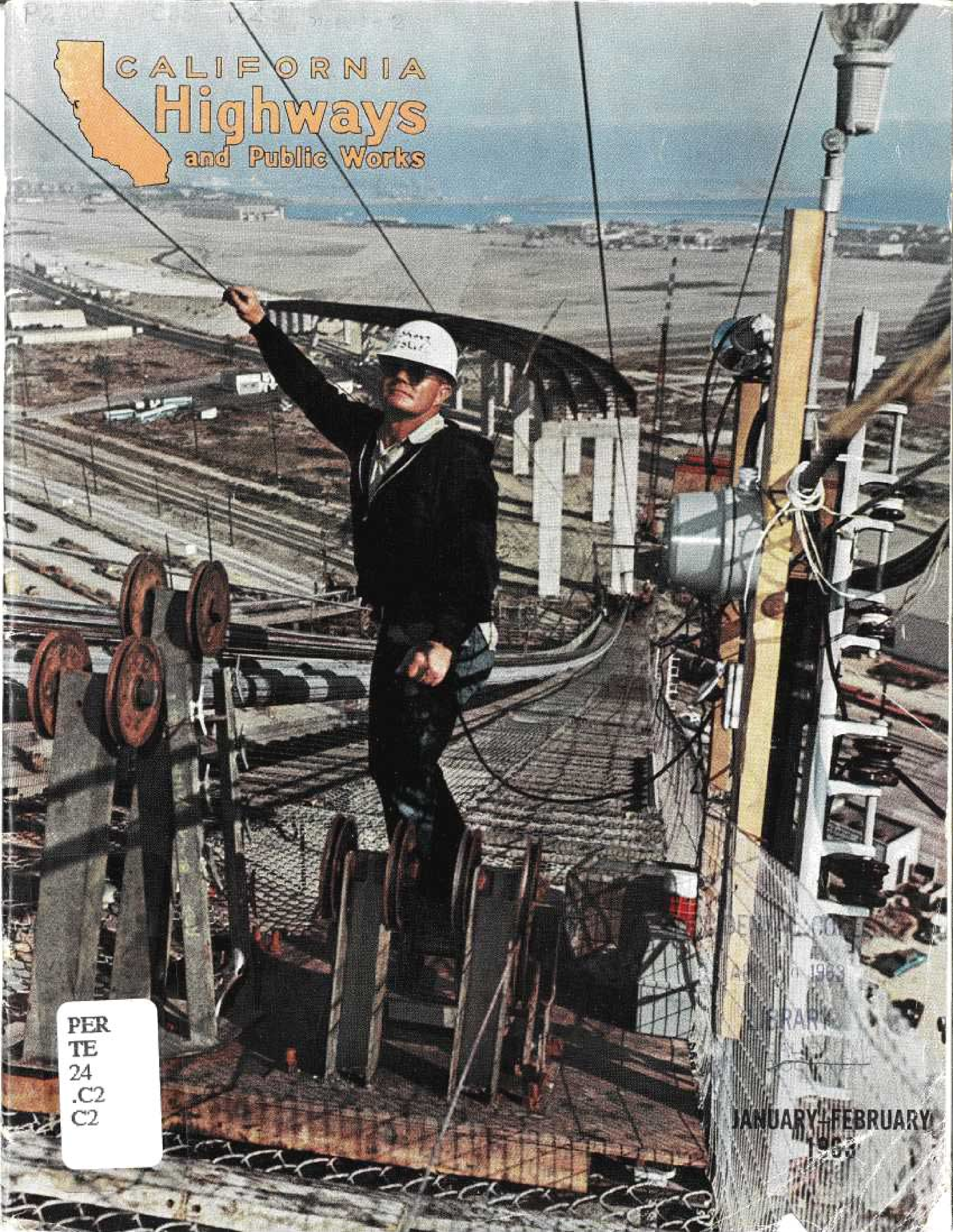
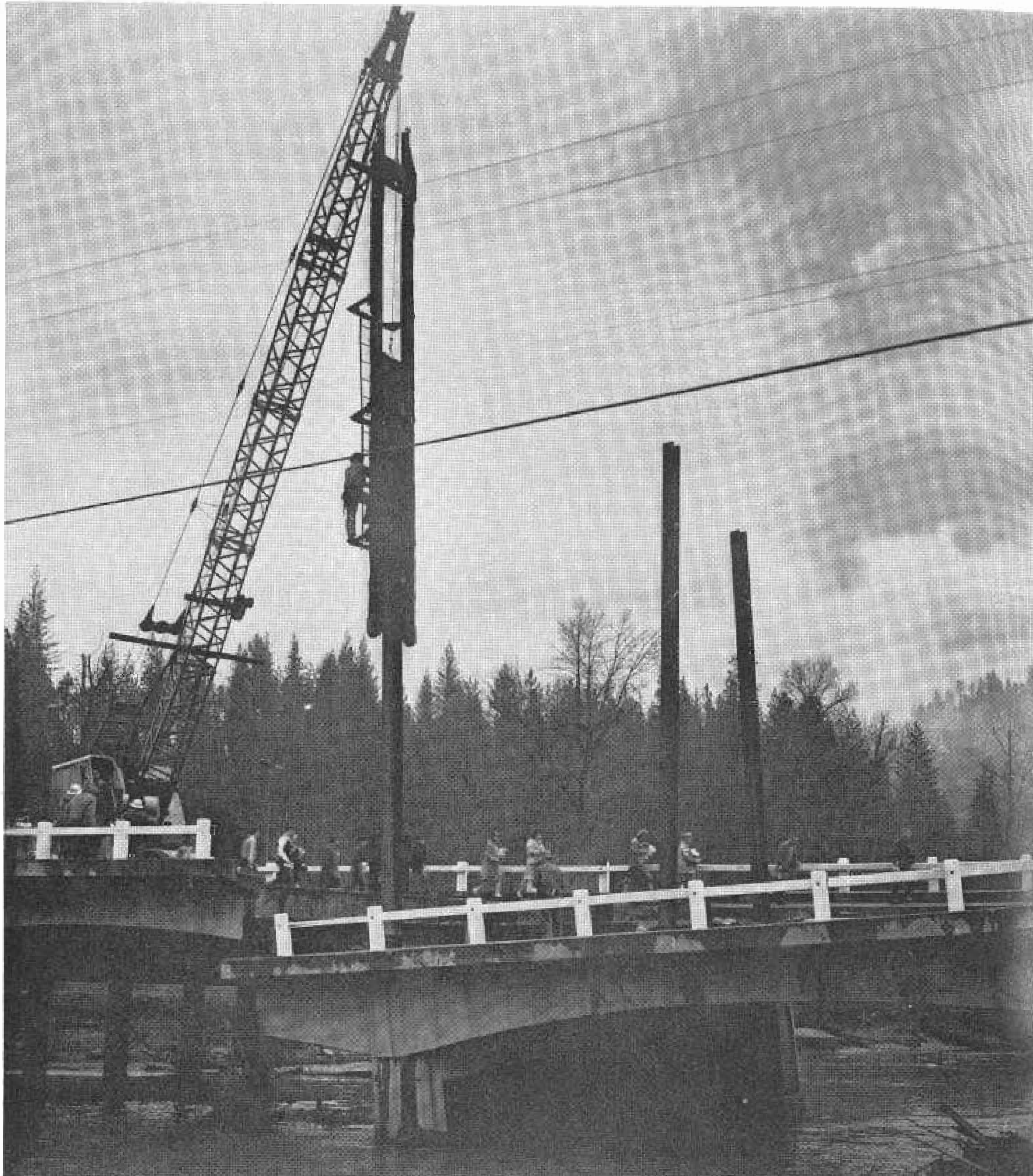
CALIFORNIA Highways and Public Works



JANUARY–FEBRUARY 1963



When January 1963 went out like a lion with a roaring three-day month's-end storm, as much as 16 inches of rain fell on some sections of the Sierra Nevada. With virtually no snowpack to absorb the water, and the ground hard frozen, the runoff was like that from a tin roof. By the second day of the storm, normally mild mountain streams had changed into raging torrents, and every road across the Sierra south of Sign Route 36 was closed by slides and washouts. Photo above shows school children changing from one school bus to another at Spanish Creek bridge just north of Quincy on U.S. 40 Alternate, on February 8th, while the bridge was still under repair. (Photo by Robert Mulno.) For more storm photos see pages 33, 34 and 35.

California Highways and Public Works

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FRONT COVER: Division of Highways Photographer Robert Dunn climbed to the top of the tower to get this shot on the uncompleted Vincent Thomas Bridge connecting the City of San Pedro and Terminal Island in Los Angeles Harbor. Photo shows contractor's man at work on cable spinning, which was completed in early December 1962. (See story page 9 et seq.)

BACK COVER: At some risk to self and equipment, Division of Highways Photographer William Ruland took this time exposure night picture on U.S. 40 while skidproofing operations were going on. (See story page 44 et seq.)

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Santa Maria

U.S. 101 Freeway Skirts Rapidly Growing City

By L. D. KRAATZ, and L. A. PAGLIA, Resident Engineers

Recent completion of an 8½-mile freeway project bypassing the City of Santa Maria on U.S. 101 has eliminated a major bottleneck for through traffic on this important north-south coast route. With the exception of some portions of U.S. 101 in Santa Barbara and a minor deficiency in Buellton, a motorist can now travel from the south Santa Barbara county line to the north San Luis Obispo county line on four-lane divided highway for 170 miles without seeing a stop sign or a traffic signal.

This significant achievement was brought about, in part, by the rapidly changing complexion of the northern Santa Barbara County area.

The City of Santa Maria, located in the middle of a long, flat agricultural valley formed by the Santa Maria River, had for many years been a stable, peaceful small city depending on extensive agricultural and oil operations for its economic life. The city was fairly evenly divided by U.S. 101, which ran in a north-south direction through town. Commercial development both north and south of the main sections of town with its consequent heavy cross traffic slowed down through traffic and greatly increased local traffic congestion.

For this reason alone, the Division of Highways as early as 1953 conducted engineering studies of many alternate routes of U.S. 101 in this area so as to alleviate these major local traffic problems. An alignment bypassing the city on the east was finally selected because of considerably lower right-of-way acquisition and highway construction costs.

Traffic Congestion Magnified

The existing problem of traffic congestion was intensively magnified by the activation of Vandenberg Air Force Base, close to nearby Lompoc, as a missile-testing and training center on April 1, 1957. At that time the population of Santa Maria was slightly more than 13,000 people. Immediately after the activation of Vandenberg Air Force Base, the city was jolted into a frantic burst of activity. The town mushroomed almost overnight, burst its seams and began spreading in all directions. Five years later, the city has doubled its population (current estimate: 28,800) and the end of this growth is not yet in sight.

Recognizing the increased urgency for highway improvement in this booming area, the California Highway Commission provided right-of-way and then construction funds as early as possible, and the project was advertised for bid in August 1960.

Madonna Construction Company of San Luis Obispo had submitted the

Our New Freeway

The following editorial appeared in the *"Santa Maria Times"* on October 1, 1962

Santa Maria's new freeway is now in operation.

In the mill for something like seven years, it was opened last Friday with appropriate ceremonies in which city, county and state officials participated.

The history of the freeway has been a stormy one, as is often the situation when a city is bypassed.

Initially, the controversy raged around where it should be located—on the east side of the city or on the west side.

Once this was resolved, although not to the complete satisfaction of many, there were other problems. The freeway agreement between the city and the State was a stumbling block for a number of months.

The main points of contention centered around the city's seeking to get more specific in the agreement, as opposed to the generalities in the original proposal. Many hours were spent by city and state officials ironing out the differences.

But finally they were resolved and two years ago work started on the 10-mile project.

Now that it is completed, there will be some interesting points to bear watching.

State officials report it is expected to reduce the traffic count on Broadway, old Highway 101, by about a third. The count formerly was 30,000 vehicles a day. This will be reduced to about 19,000, officials say.

What effect will this have on business in the city?

The State Highway Division has made some extensive studies on this point, and these studies generally conclude that after an initial falloff, business quickly returns to the prefreeway level.

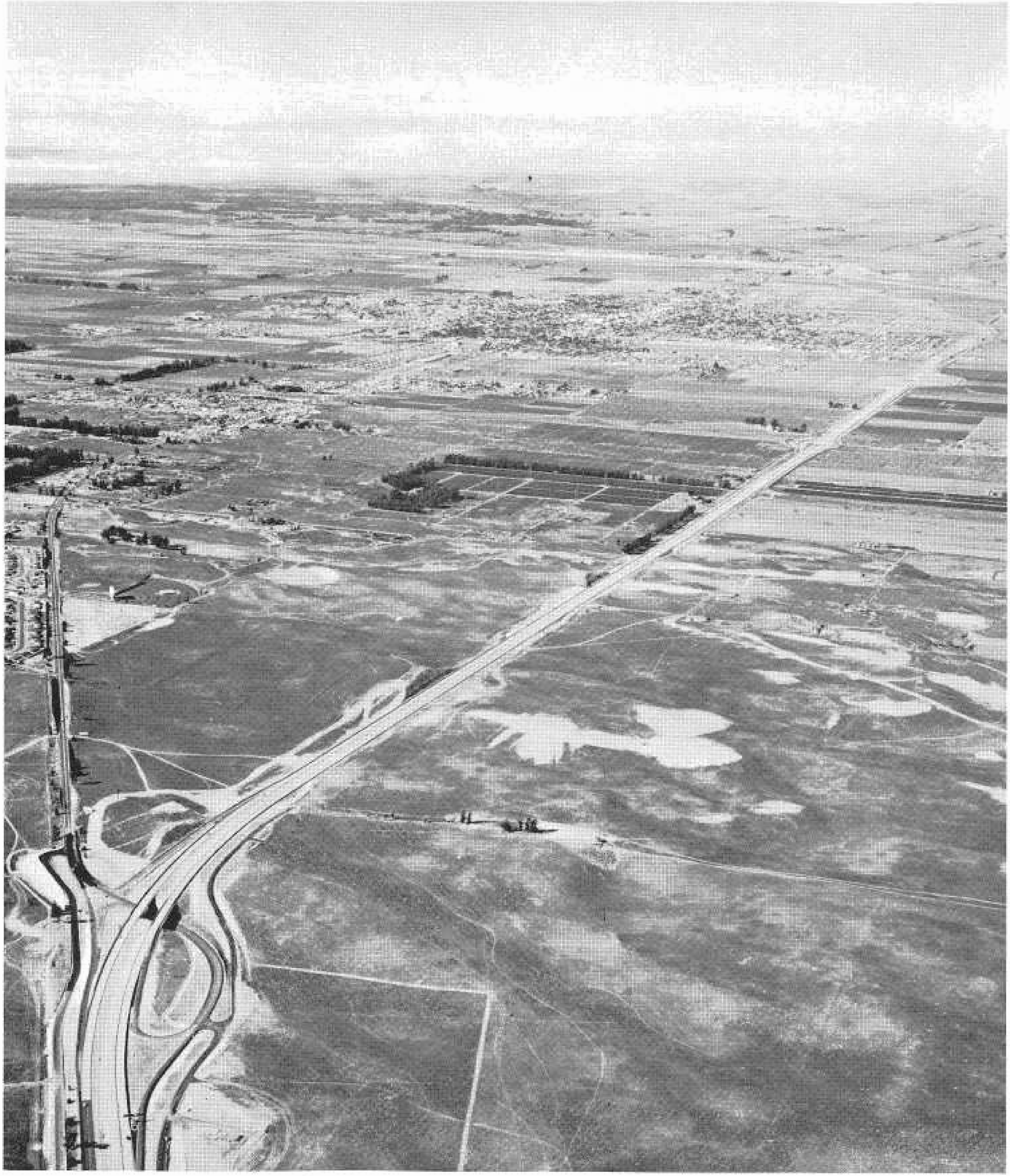
In a growing community such as ours, it is questionable if the effects of the freeway bypassing the heart of the community will be noticeable to any degree whatsoever.

The freeway location on the east side of the community has one valuable aspect. Except for a very few eyesores, it shows a very attractive section of the city.

The attractive residential areas, the well-groomed grounds of Hancock College and Fesler School, and the many attractive vegetable fields will give Highway 101 travelers a favorable impression of our community.

In the not too distant future, Santa Maria's newest industry, Columbia Records, will have its plant in operation along the freeway, another favorable mark for the community.

Summed up, it has been a long wait, but one that was well worth it.



An aerial photo of the Santa Maria Freeway bypass shortly after it was opened to traffic in October, 1962. The view is northward.

BEFORE. Traffic in Santa Maria prior to the completion of the freeway bypass. The view is looking northward.

AFTER. Traffic in Santa Maria after the opening of the freeway bypass in October, 1962.

lowest of seven bids received, $5,606,-099.75. The contract was awarded on October 27, 1960, and the contractor began work on the same day.

Major work consisted of excavating some two million cubic yards of material, placing 8½ miles of base and concrete pavement, and building 14 major structures at nine different locations. Two of these structures are long twin bridges spanning the normally dry Santa Maria River. As innocuous as this stream appears in dry months, it is capable of flowing in excess of 10 feet deep from bank to bank. Therefore, in anticipation of this sizeable flow, it was necessary that the twin bridges be approximately 2,100 feet long.

290 Girders Needed

The twin bridges crossing the Santa Maria River used precast, prestressed concrete girders, each of which is 72 feet in length and five of which are used in each span. The contractor utilized concrete pouring pads and metal forms to fabricate a total of 290 girders necessary to complete the structures.

The girders were poured in groups of four and cured and stressed while still on the pouring pads. After stressing, the girders were lifted into place and the pads cleared for the next series of pours. Because of the large number of girders needed, pouring and stressing was nearly a daily ritual throughout the construction contract.

The two million cubic yards of roadway excavation and imported borrow were concentrated in sizable cuts at each extreme end of the project, thereby involving a maximum haul of about four miles, and an average haul of two miles.

To accomplish this major task, the contractor used six rubber-tired scrapers with capacities of up to 40 cubic yards. These scrapers were very rapidly loaded using tandem push tractors, and the material was hauled to embankment areas at speeds up to 35 m.p.h. As expected, some difficulty was experienced in scraper-tire damage and wear due to large loads and high speeds; but it was worth the effort in that daily production of 8,000 cubic yards of material was not uncommon.

In general, material excavated for construction of the southern half of the project consisted of very fine cohesionless dune sand. The excavation and placement of this material thoroughly tested the contractor's ability and ingenuity in order to maintain the high daily production necessary. The contractor accomplished this mainly through the use of a piped irrigation-type watering system, and through the importation of clay soils to construct and maintain haul roads.

Anchor-chain Drag Used

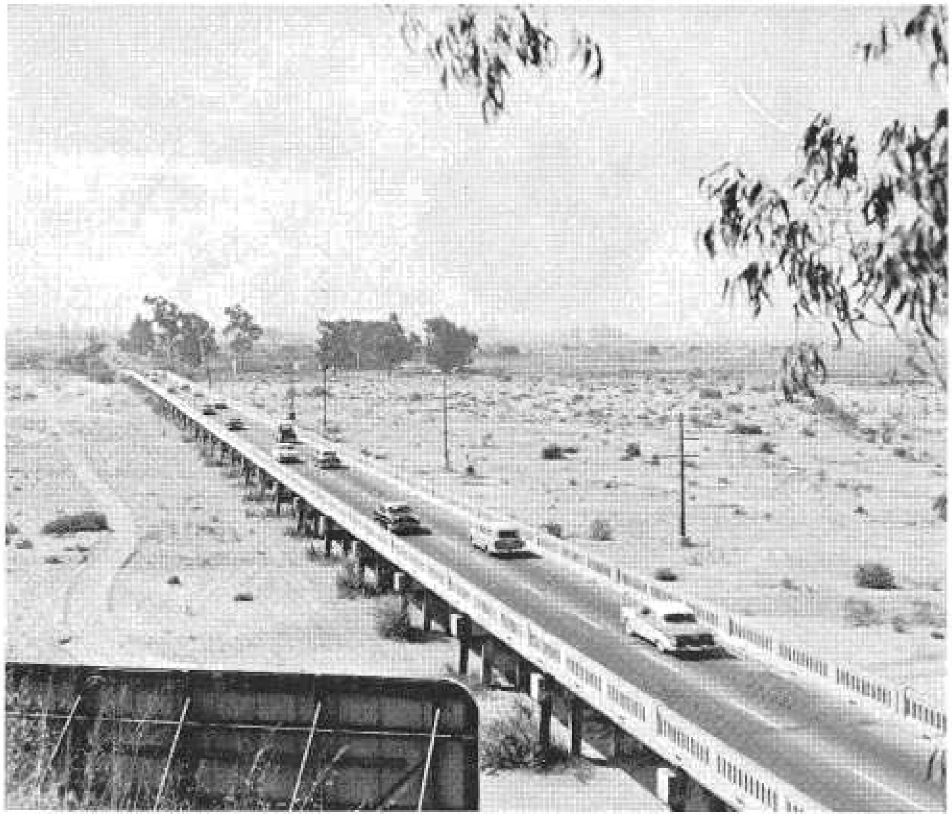
The troublesome sandy slopes were satisfactorily finished through the use of an 80-pound-link anchor-chain drag followed by the application of straw, seed and fertilizer for permanent erosion control.

Embankment material used to construct the northern portion of the project was unstable, expansive clays. For this reason, the structural roadbed finish was composed of river-run local borrow, aggregate subbase, aggregate base, cement-treated base and concrete pavement for a total thickness of three feet.

In paving operations, approximately 48,000 cubic yards of concrete pavement were placed using conventional side forms and traveling concrete-mixer methods. Daily production ranged from 1,000 to 2,000 cubic yards. Unusually high daily productions of 1,200 to 1,500 tons were maintained in placing 62,000 tons of asphaltic concrete for mainline shoulders, ramps and frontage roads. This was accomplished through the use of bottom-dump trucks and two self-propelled pavers with pickup attachments.

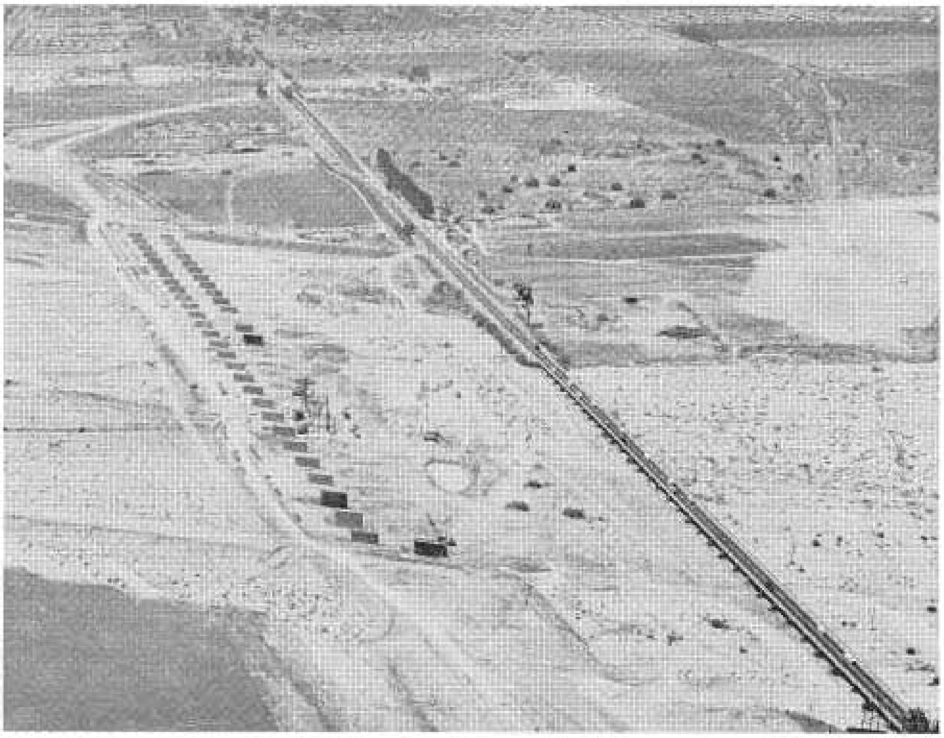
Another major item of work was the removal of the longstanding existing bridge across the Santa Maria River, considered to be a deterrent to the free flow of the river whose channel had otherwise been confined by the construction of stone-faced levees by the U.S. Corps of Engineers.

This reinforced concrete bridge, 1,370 feet long, consisted of 36 short spans, each 38 feet long. Each span was 28 feet wide with four T-girders supported on reinforced concrete pile bents.



BEFORE. Traffic crosses the old bridge over the Santa Maria River prior to the construction of the freeway.

AFTER. These twin bridges now carry traffic on the new freeway across the Santa Maria River channel.



This aerial photo was taken while the twin bridges were under construction. The old structure is to the right.

The contractor "sawed" through these pile bents using an 80-pound-link anchor chain connected at each end to a crawler tractor. Each span was then cut longitudinally with a headache ball and cutting torch, and the halves of the span were dragged approximately 2,000 feet to placement along the north bank of the river for maximum bank protection at minimum possible cost.

Old Bridge Demolished

An older timber bridge with concrete deck, bridging the overflow channel of the Santa Maria River, was also demolished and removed from the right-of-way area.

During construction of the freeway, traffic counts revealed that on Broadway (U.S. 101) in the center of the Santa Maria business district, average daily traffic was 24,000 vehicles. Recently completed traffic studies show that traffic volume on Broadway has been cut by 5,000 vehicles per day as a result of freeway construction. This reduction in traffic volume includes most of the heavy trucks that previously had to use Broadway. They are now using the best possible truck route, which is on the freeway bypass.

The lesser traffic volume combined with the nearly complete elimination of truck traffic through town has relieved traffic congestion in the City of Santa Maria to a very significant degree.

These traffic studies revealed that traffic required approximately 20 minutes to get through the City of Santa Maria prior to completion of the freeway bypass. Traffic using the freeway bypass is now able to cut to less than half the former required travel time.

The major portion of the project was opened to traffic on September 28, 1962. All finishing touches were completed by November 1.

Planning and design was accomplished by District V personnel under former District Engineer A. M. Nash. The contractor was represented by Superintendent Milton J. Gracia. Construction inspection of the project was under the direction of District Engineer E. R. Foley, Assistant District Engineer G. Wofford, District Construction Engineer R. E. Alderman, and Bridge Representative J. D. Norberg.

Grapevine Grade Accidents Reduced

The conversion of the once-hazardous Grapevine Grade portion of U.S. 99 north of the Los Angeles-Kern county line from four-lane highway to eight-lane divided freeway has substantially reduced injuries and fatalities.

A recent study by the Division of Highways comparing accident statistics for an average of the two-year period before freeway construction with the year ending in June 1962, found a two-thirds reduction in accident frequency as well as severity and an 89-percent reduction in fatality rates despite a 10-percent increase in average daily traffic.

The number of accidents dropped from 114 to 41, over 70 percent of the latter attributable to abnormal physical conditions of drivers, defective vehicles and bad weather. More than half the accidents on the freeway involved only one vehicle.

Injuries were reduced from 77 to 25 and fatalities from eight to one—an intoxicated pedestrian.

For several years prior to the construction of the freeway, one of the greatest hazards on the steep, 6-percent grade was the problem of runaway trucks. Nine such accidents occurred in the average of the two years preceding freeway construction, as against one in the post period covered by the study.

Overtaking accidents of all types were most dramatically lessened with rear-end accidents reduced from 59 to 16. Highway engineers credit part of this improvement to reserving some of the right-hand lanes for the exclusive use of slow-moving trucks.

Conversion of the 6.6-mile highway section to eight-lane freeway, completed in July 1960, at a cost of $7,430,000, has made accident rates comparable to other rural freeways throughout the State.

In a letter to Bradford Crittenden, Commissioner of the State Highway Patrol, Womack expressed appreciation for co-operation in providing accident data and for the patrol's excellent job of enforcement and surveillance on the new freeway.

Cable Spinning

Terminal Island Bridge Suspension Cables Completed

By JOHN B. POPPE, Assistant Resident Engineer

Early in December 1962 the spinning of cable wires was completed for the Vincent Thomas Bridge connecting San Pedro and Terminal Island. Stretching over 3,050 feet from anchorage to anchorage, climbing 360 feet to the tops of the towers and gracefully sweeping 215 feet above the water, the twin suspension cables wait to support the steel and concrete roadway which will carry the traffic across the channel of the Los Angeles harbor.

Two 13⅜ inch diameter suspension cables carry to the supporting towers the entire dead load of the 1,500-foot main span and a portion of dead load of the two 506-foot side spans. During periods of maximum load, each cable will be stressed to slightly more than 9,600,000 pounds. To carry this large force, each cable is made up of 4,028 cold - drawn, high - strength wires, placed in parallel. The spinning of these parallel wires was begun on September 17, 1962, and was completed on December 3, 1962.

Preparation Necessary

A considerable amount of preparation was necessary before the first wires for these cables could be placed. On June 18, 1962, John A. Roebling's Sons, subcontractor to the Kaiser Steel Corporation, began erection of the catwalks which crossed the channel and provided the work platform for

THE CATWALK. The photo shows the four supporting cables, wire mesh, wood cleats, two side cables and side wire mesh.

the cable spinners. Each of the two catwalks was supported by four one-inch diameter steel strand bridge cables over which heavy chain link mesh was placed. Wood cleats at two-foot centers were fastened on top of the mesh to provide stiffness and a sure footing for the steep sections of the catwalk.

Two additional cables served as handrails and helped support the catwalk through connecting posts at 40-foot centers. A side mesh of wire fabric was fastened to these vertical posts to increase the safety of the walk. In addition, a system of tiedown or storm cables was used to prevent excessive sway and deflections during high winds.

Roebling predetermined the necessary lengths of these catwalk strands to reach from anchor to tower, tower to tower, and tower to anchor. The strands for the side spans were unreeled on the ground, lifted up to their positions from the anchors, over the cable bents, and up to the towers. Two of the strands for the main span were taken across the channel by barge and lifted in place from tower to tower. The remaining strands for the main catwalk span were then highlined across the channel, using these first strands for support.

Mesh Sections Hoisted

After support strands for the catwalks were positioned, a series of double chain link mesh sections, each 3 feet wide by 100 feet long, was hoisted in rolls to the tower tops. The ends of the wire mesh sections were fastened in position loosely for sliding along the supporting strands and then about 10 feet of mesh was slid out from the tower. A wooden clamping beam was then fastened loosely in place and more mesh was slid out. At intervals, handrail beams and steel tramway suspender beams were fastened on in place of clamping beams. After the chain link sections had been slid and pulled for 1,500 feet between the two main towers and from the towers to anchorages, the clamps were tightened to hold the mesh securely in place.

Construction of the tramway then followed. The tramway is similar to a chair lift ski tow except that, instead of several chairs, only the spinning wheel is pulled along the tramway rope. The tramway was constructed of two additional lengths of bridge strand for each of the two main cables and was supported by spinning towers located on top of the main bridge towers and bents. In the spans, the tramway was held down parallel to the catwalk by steel suspender ropes.

Unreeling Area

During the catwalk erection, work was also progressing on preparations for the wire unreeling area. Here were installed eight vertical axle drums, or swifts, from which the wire for the cables was unreeled. Ordinarily, suspension bridge wire is manufactured from billets and drawn into coils weighing about 600 pounds (in this case about 6,000 lineal feet). Several coils are then spliced together and wound onto drums holding about 8,000 pounds of wire. The wire would then be unreeled from these drums during the spinning of the cable. On this project, Roebling eliminated this step by unreeling during spinning directly from the wire coils.

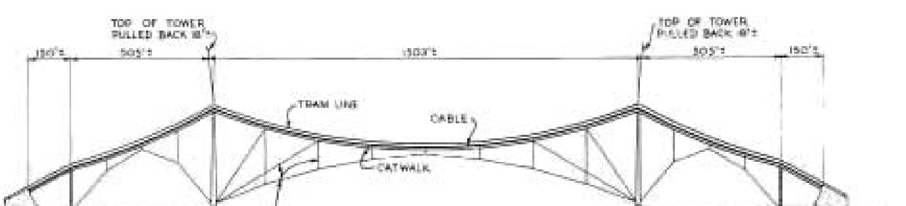
They, in effect, brought the factory to the job. Eight vertical axle drums, or swifts, were installed. Since only four wires were pulled across at one time, four swifts were available for loading during trips. The first coil placed over the swift came to rest on the flange at the bottoms, then as each new coil was loaded onto a swift, the bottom end of that coil was spliced to the top end of the previous coil so that a continuous length of wire of up to 36,000 feet could be drawn off each swift before reloading.

Splices were produced by inserting the ends of wire to be connected into a ferrule, a metal sleeve about two inches long and containing a threaded, hardened metal insert. An internal stop positioned the wires so that each end penetrated to the center of the ferrule. The ferrule was then pressed in an electrically powered hydraulic jacking machine equipped with dies which reduced the diameter of the ferrule by 10 percent.

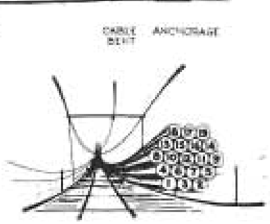
Both the splicing machine and the ferrules were manufactured by Cables Covers, Limited, of England. This reduction was produced by over 75 tons of force from the splicing machine and caused the hardened metal insert to grip the wire and the sleeve so firmly that the splice proved to be stronger than the original wire.

When the wire had been nearly drawn off one swift, the end from that swift was spliced to the beginning of the loaded companion swift so that a never-ending length of wire was available to construct the cables. Periodically sample splices were made from the machine and tested to failure. In no case was there a failure within the splice.

A tower between the swifts and the tramway was constructed for the support of floating sheaves. This consisted of four sets of double sheaves, located about 50 feet up, and four more sets near the ground level. The wire from the swifts passed over the top sheaves and down under those at the bottom to form a giant loop. When the wire was pulled across the bridge, the wire



VINCENT THOMAS BRIDGE
CABLE, TRAMLINE & CATWALK LAYOUT



CABLE SECTION

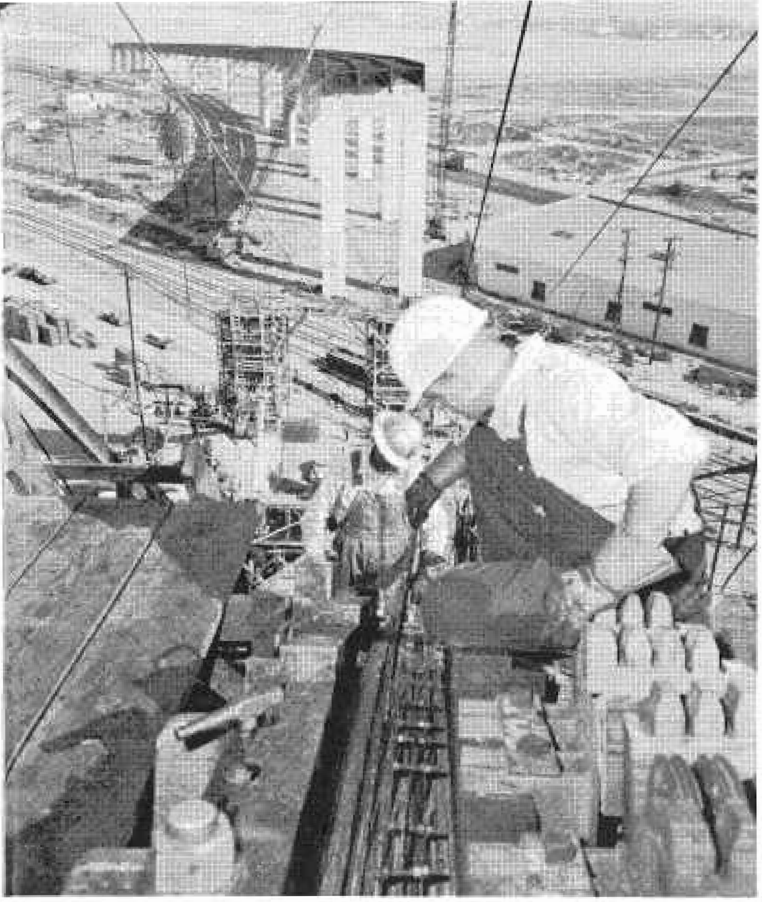
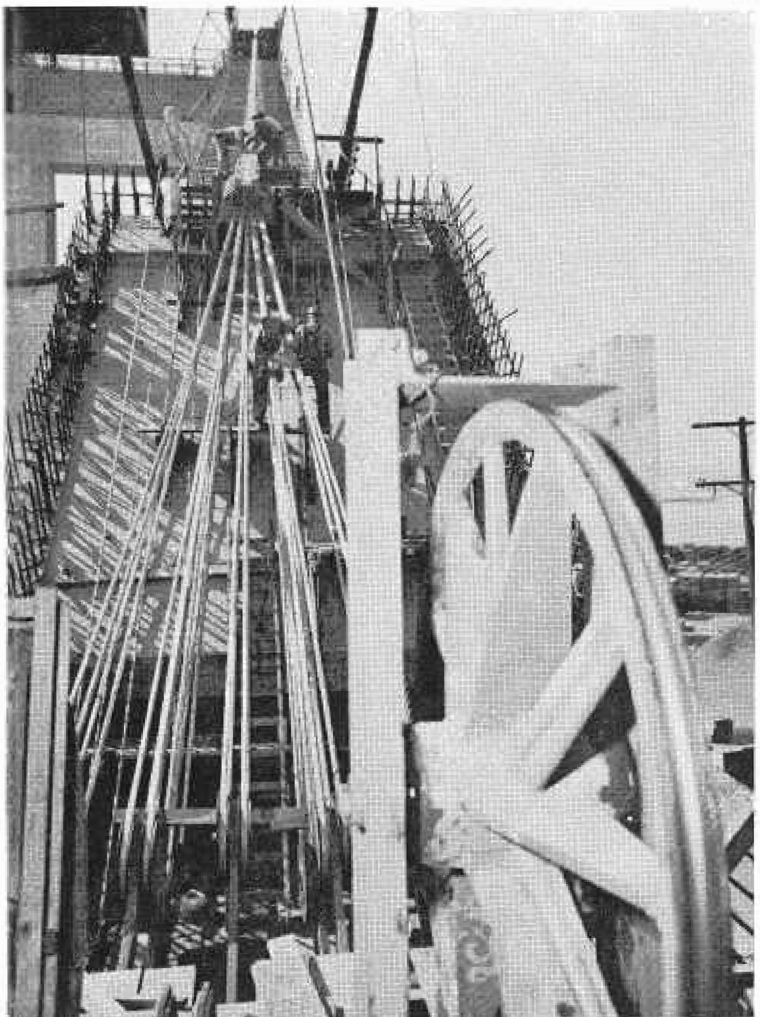


PHOTO ABOVE. Looking east from the top of the Terminal Island cable bent. After the wires are pulled along the bridge from anchorage to anchorage, they are tested for sag from the guide wire and then positioned one by one in the large steel tower shoes. PHOTO BELOW. This picture, taken at the Terminal Island anchorage, shows the splay of the cable strands from the splay casting at the top of anchorage to the circular strand shoes at the bottom. This portion of anchorage will be boxed in with concrete.

PHOTO ABOVE. The picture shows a single wire being reeled from a swift to one of the top sheaves of the floating sheave tower. PHOTO BELOW. Looking east from near the top of the Terminal Island tower, several of the 19 strands have been spun. The 19 strands will be squeezed into one compact cable $13\frac{3}{8}$ inches in diameter, then after full dead load from the supported roadway below has been imposed the cables will be tightly wrapped with galvanized wire and painted.



tension would cause the lower set of sheaves to rise and ride suspended on this giant loop. This absorbed the shock of starting before it could be transmitted to the swifts, permitting the swifts to start slowly and smoothly. It also gave time to stop the swifts when the tramway stopped and the floating sheaves slowly dropped.

Result in Savings

This whole process of spinning direct from swifts saved not only the work and equipment of unreeling onto drums but saved a considerable amount of heavy equipment that would have been needed to start and stop the heavy reels.

Position Determined

Before spinning can be started, it is necessary to determine the position that the cable must take in its unstressed condition so that as the total structure load is applied, the cables and roadway will deflect to the dimensions and elevations as planned for the finished structure. The cable takes the shape of a catenary in its initial position of supporting only its own dead weight. By working back from the final dimensions and elevations to the initial catenary dimensions and elevations, it is possible to calculate the elongation that will take place in the cable due to the applied dead load of the structure.

As the load is applied to the cables, their sag increases and also the cable supports at the top of the towers move in. The vertical deflection of the cables at the center of the main span, from their spun position to their final position, is 12.08 feet and the span length between towers reduced from 1,503 feet to 1,500 feet by the deflection of each tower 1.50 feet toward the channel.

To determine the change in length of cable from its free cable condition to its fully loaded condition, many things must be considered. For instance, for any one loading condition the horizontal force in the cable is constant, which means that the cables at the towers exert only vertical or axial loads on them. Since the horizontal pull on the cable is constant, the tension in the cable must vary with every change in slope. The slope of the cable approaching both sides of each tower is nearly the same so that friction in the saddle both during construction and in the final structure is sufficient to prevent slipping. The load on the back stays and anchorage produces further elongation which must be considered.

Calculation Made

Calculation must also be made for changes in temperature which cause variations in cable length and variation in tower position must be considered. In the main span, for instance, calculations indicate that a difference in the horizontal distance between the towers of 1″ results in a variation in sag of 2″±, and in the side spans a difference in the horizontal span length of 1″ results in a variation in sag of 7″±.

The length of cable from anchorage to anchorage was calculated to be 3,053.6 feet in its unstressed, no-load condition. As the structure is completed and the cable is subjected to the full dead load forces, calculations show that it increases in length 67 inches to 3,059.2 feet. From these calculations, the locations of the guide wires can be determined.

Surveyed Into Position

Two guide wires, one on each side, were then surveyed into the exact position that this theoretical caternary should take. The survey was made at night so that changing temperatures would have the minimum influence on the wire lengths and tower positions. The guide wires furnished for this survey had previously been loaded to the calculated stress of the finished elongated cable, and while in this loaded condition, marked with the correct cable lengths. These marks were positioned at the centers of the saddles before the wire was surveyed. This mechanical means of accounting for the effect of changing from the loaded cable to the catenary agreed very closely with the survey results.

After positioning of the guide wires, the cable spinning was started by leading four wires from the swifts, through the floating sheaves, under the strand shoes which hold the wire at the anchorage, and then onto the bridge where the ends were fastened at a convenient place. The wires were then looped up near the strand shoes and over the spinning wheel ready for a trip across the bridge. When the tramway was started, the wheel moved off, pulling the wire up from the swifts, over the top of the wheel and laying the wire along the catwalk. When the wire reached the other side, the loop pulled across by the wheel was removed and placed around the strand shoe at that anchor. The wires then started at the first anchor, passed around the strand shoes there, continued across the bridge to the second anchor, around the strand shoes and back across the bridge and down to the swifts. The wheel was taken back empty to the first anchor, and the wire leading back to the swifts was passed again under the strand shoes and over the wheel, and a second trip begun.

The two main 13⅜-inch cables were constructed of 19 separate strands, each strand containing 212 wires. These wires were individually adjusted to the same approximate sag as the guide wire as they were brought up into the strand. When the first strand of 212 wires was completed, it was then surveyed into position in the same manner as had been done with the single guide wire. Subsequent strands were adjusted to match this control strand.

Cables Built Concurrently

Both cables were constructed concurrently. A layer of strands on one cable was completed, and then a corresponding layer was constructed on the opposite cable while the strands of the first cable were prepared for adjustment. By this means, the forces on the supporting towers were kept reasonably equal and both cables were ready for use at nearly the same time.

After all strands for a cable were completed, the entire group is squeezed into one compact cable 13⅜ inches in diameter. The next step is to hang suspender ropes from the cables for support of the trusses and roadway below. These suspender ropes are looped over and seated in preformed grooves in large split castings tightly bolted to the main cables by high strength bolts.

Wrapping of the two main cables is not started until after the full dead

This aerial photo, looking southwest, shows the bridge under construction with the catwalk and partially completed cables suspended between the towers.

load of the roadway deck system has been applied.

Work Started

Work on the 16½-million-dollar project was started in May 1961. The substructure contract was let to Guy F. Atkinson Company and was completed in July 1962. Guy F. Atkinson Company also has the contract for the approach roadwork leading to the bridge on both sides and including the toll plaza and administration building on the Terminal Island side. The largest contract for the superstructure was let to Kaiser Steel Corporation. The erection of the towers was sublet to Yuba Erectors and the manufacture and spinning of the cables to John R. Roebling's Sons. The project is scheduled for opening to traffic the latter part of September 1963.

The bridge was designed by the State of California, Division of Highways, Bridge Department, with W. J. Jurkovich in charge of design and J. M. Curran, Resident Engineer, in charge of construction.

FOREST HIGHWAY FUNDS ALLOTTED STATE

The California Division of Highways, U.S. Forest Service and U.S. Bureau of Public Roads, have jointly announced the allocation of federal forest highway funds for California for the fiscal year which begins July 1, 1963.

Funds were allotted for the following construction projects:

$850,000 to Forest Highway Route 6, Beegum-Peanut Highway, Trinity County, for grading of 4.5 miles of State Sign Route 36 between the Trinity county line and 4.5 miles west.

$690,000 to Forest Highway route 7, Mendocino Pass, Glenn County, for clearing and grading 7 miles of county road between the forest boundary and 7 miles west.

$500,000 to Forest Highway Route 35, Calaveras County, for grading (portion) and surfacing of 5.8 miles of State Sign Route 4, Ebbetts Pass Highway, between Dorrington and 5.8 miles east.

$550,000 to Forest Highway Route 39, Tuolumne County, for grading (portion) and base on 6.1 miles of State Sign Route 120, between 6 miles east of Pilot Ridge and Yosemite Park boundary.

$1,000,000 to Forest Highway 48, Fresno County, for grading 1.9 miles of State Sign Route 168 between 2.8 and 4.7 miles west of Pine Ridge.

$375,000 to Forest Highway 93, Siskiyou County, for surfacing 30 miles of county road between Cecilville and Callahan. $375,000 work acceleration funds are also available to supplement the forest highway funds.

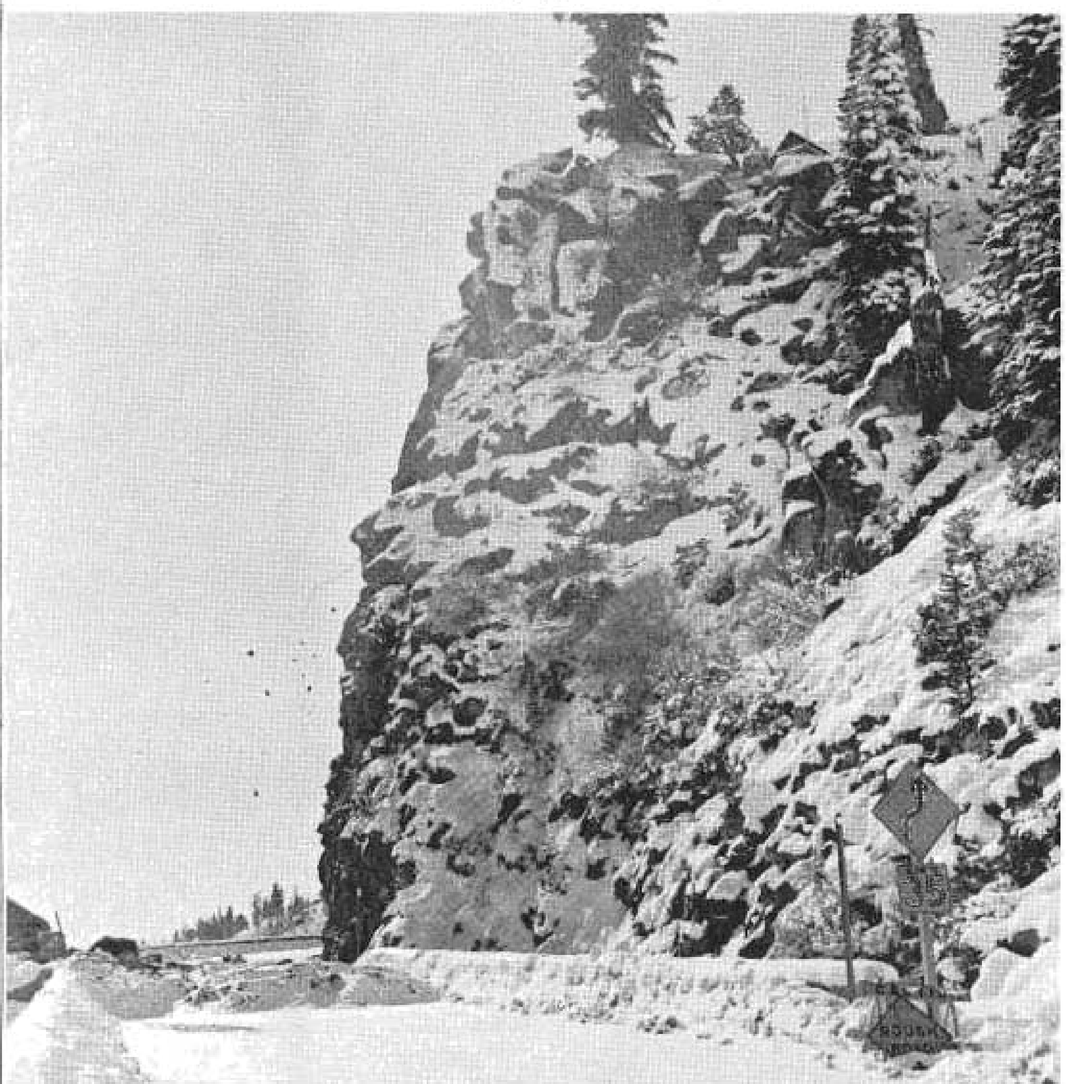
CITIES GET $9.6 MILLION

The Department of Public Works apportioned $9,651,130 to the 380 incorporated cities in California as their share of the state tax on gasoline.

This apportionment is 1.5 percent greater than the quarterly allotment made last October.

Cliff Face Threat

500 Tons of Granite Hanging Over Major Route Poses Problem



Scene of rock fall area on U.S. 50 near summit of Echo Pass. Two workmen may be seen at top of cliff just to left of base of big tree near brink. Bridge 25-44 in foreground.

About 100 cubic yards of rock broke loose from the cliff above and fell on U.S. 50 just east of Echo Summit at approximately 7.15 p.m., November 10, 1962. Luckily, no vehicles were near at the time.

The road here is virtually carved from a rock face which rises 1,000 feet, almost perpendicularly, from the valley floor. At the point of the rock fall most of this drop is below the road. Maintenance in this area in winter at 7,000 feet altitude, is always difficult.

Nevertheless within two hours after the fall Echo Summit maintenance crews, working in the dark, had cleared a one-way road. By noon of the next day the entire road surface was cleared, and normal traffic conditions reinstituted.

Fearing possible further falls, inquisitive maintenance men inspected the sheer cliff above the highway at this place, and found a crack extending downward along the rock face which threatened to release an even greater fall of rock. Observation over several days showed the crack was opening an infinitesimal amount each day, and that eventually another 350 yards or so of rock would fall.

Damocletian Sword

Rather than leave some 500-plus tons of rock hanging like a sword of Damocles above the road, the Echo Summit maintenance crews, after consultation with District III Headquarters at Marysville, decided to shut off the highway and clear the potential fall before it could do any damage.

This necessitated a detour, but because of the especially rugged terrain, the only possible route was over the obsolete, discarded, Old Meyers Grade road. Before any work could be done on the rock face, it was necessary this route be reconstructed. Even then, due to its narrowness, sharp switchbacks, and steep grades, only radio-controlled, one-way traffic could be handled over it.

A further problem was Bridge 25-44 (Dry Bridge), mentioned in the report below. This bridge, a sidehill viaduct of concrete girder construction over 100 feet long and 24 feet wide which carried the highway around a particularly difficult section of cliff, could be severely damaged should the rock fall land in the wrong place.

Since highway maintenance men are not expected to be "powder monkeys," expert advice from private industry was sought. Rental of private equipment was also necessary, and an emergency allotment of $20,000 was set up for the job.

On the following pages is the highway superintendent's report of how the job was done.

And How It Was Removed

Dynamite, Bulldozers, Expert Advice, Nerve Solve Problems

By E. D. WILLIS, Highway Superintendent

Superintendent's Report

Work on the detour began November 19, 1962 and was completed November 26, 1962.

Due to weather conditions work on the rock formation was delayed until November 28, 1962.

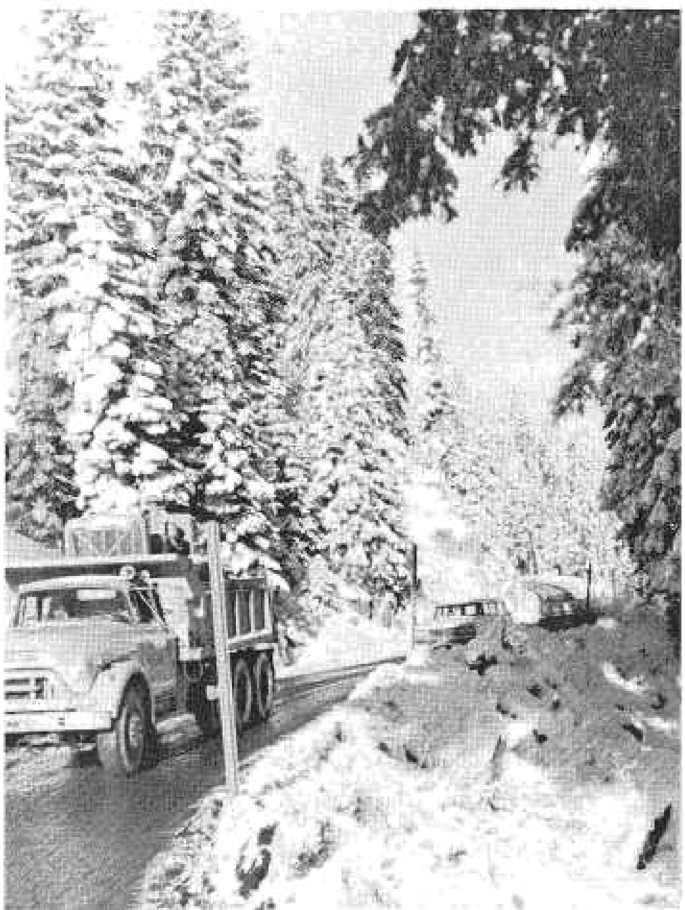
At 9 a.m., November 28, 1962, traffic was routed over the Old Meyers Grade and drilling and blasting operations began on the rock formation.

Truck - and - trailer combinations, overlength loads and single-drive three-axle trucks were restricted on the detour, due to two switchback turns being too sharp to negotiate.

Work was started immediately to widen the turning radius of these turns to accommodate all but overlength loads under normal conditions.

Men working on rim of cliff—note safety lines. Drop here is about 75 feet to highway, nearly a thousand feet more to valley floor. Car parked on closed U.S. 50 may be seen beyond right elbow of upper figure.

Photo at left below shows traffic moving in one-way groups over narrow switchbacks of old Meyers Grade road. Photo at right is highway maintenance truck with portable generator and radio equipment, here at east end of detour in radio communication with west end of detour.



Traffic over detour temporarily halted while grader widens road on one of switchbacks on detour.

Powder Expert Located

During preparations for removing the rock formation, Don L. Calvin, highway foreman, learned of a powder expert in the employ of Granite Construction Company, on location near Woodfords, California.

We contacted the company's project superintendent, Mr. Richard Lewis. Mr. Lewis advised us that he had a very good powderman in the person of Mr. Richard Absher in his employ. We learned that it would not be possible for us to hire Mr. Absher except on Saturday and Sunday because he was needed on his job during the regular workdays. Mr. Lewis volunteered to bring Mr. Absher to Echo Summit on Friday, November 23, for consultation.

Mr. Lewis and Mr. Absher arrived at Echo Summit Maintenance Station at 1 p.m., November 23.

Sand Cushion on Bridge

Mr. Absher surveyed our problem, then suggested steps to follow to accomplish the rock formation removal with the least possibility of damaging the Bridge No. 25-44. If surrounding rocks were loosened it was feared they might become dislodged and damage this bridge. A cushion of sand was placed on the bridge deck to prevent damage from falling rocks caused by blasting.

After consultation with Mr. Absher, Foreman John J. Montgomery felt he could accomplish the rock removal, with advice from Mr. Absher.

Mr. Lewis advised us that Mr. Absher would be available to use anytime during the workday for consultation only, so that a minimum amount of time would be spent away from his job. I expressed to Mr. Lewis our appreciation for their advice and the valuable time he and his man spent helping us with this unique problem.

Foreman John J. Montgomery, Lawrence W. Pearce, highway maintenance man III, and Merlin Winji (contractor operator), started drilling operations on top of the rock at 9 a.m., November 28.

Workers Wear Safety Lines

It was necessary for these men to secure lines and wear safety belts for this operation. I feel these men are to be commended for their special service to the Division of Highways for volunteering to place themselves in danger by standing on this loosened rock formation to drill holes to place dynamite. There was a possibility that the action of the jackhammer would cause this rock formation to fall from under their feet, especially after blasting had begun.

To keep from loosening nearby rocks, damaging Dry Bridge, and nearby summer cottages, the drilled holes were loaded very light. Holes were drilled from 2 feet to 6 feet in depth. In the first series of five holes, five pounds of powder was used. This charge broke approximately 10 cubic yards from the top and front of rock.

> Weapons for avalanche control this winter at Echo Summit are threefold; (1) a jeep-mounted 105-mm recoilless rifle manned by the California National Guard (2) a 75-mm recoilless rifle manned by the U.S. Forest Service when necessary in the Frog Pond-Flagpole Curve vicinity on the east side of the summit and (3) a new device called an "Avalauncher" which is something like a high-powered baseball thrower.
>
> All these devices are for destroying cornices which threaten to become avalanches, before they become dangerous. The "Avalauncher," which fires an explosive shell somewhat like a trench mortar shell, is a smaller, more easily portable device for use against smaller cornices. It will be manned by Division of Highways crews trained by Monty Atwater of the U.S. Forest Service.

On the second series of holes a proportionate amount of powder was used, resulting in 20 cubic yards removed. A loosened surface condition resulted and it become necessary to set individual charges to clean up the surface in order to drill another series of holes. Footing for the drillers was very limited up to this point. Although light snow fell almost all day November 28, these men continued drilling and blasting operations.

Mass Lets Go

The surface of the rock at this time was below ground level with a larger

Portion of the some 500 tons of granite dropped by final charge November 29th. Further blasting was necessary to break pieces small enough for bulldozer to handle. (Photos by Robert Dunn)

surface area to drill. This third series of four holes was loaded with 17 sticks of 40 percent dynamite, and detonated at 11.45 a.m., November 29. All concerned were relieved to learn that this charge loosened the remainder of the rock mass and caused it to fall to the highway below, well clear of Bridge 25-44.

We now had 300+ cubic yards of rock to remove. The D-8 tractor dozer, 3 cubic yard loader and compressor were moved in immediately to begin cleaning the roadway. A 12-foot roadway was cleared by 4.45 p.m., November 29. Due to the condition of the road surface and time involved to change the detour it was decided to allow all vehicles which had been restricted on the detour to use this roadway, so restrictions could be lifted.

Clear on November 30

Removal work was resumed at 8 a.m., November 30, and by 11 a.m. all rocks were clear of the roadway.

The falling rock masses caused extensive damage to the road surface and base. The remainder of the day was spent restoring the roadway. All necessary repairs were completed by 3.30 p.m., November 30, at which time the road was opened to all traffic.

Construction Index Shows Marked Drop

The California Highway Construction Cost Index for the fourth quarter of 1962 stands at 232.6, a decrease of 56.5 points or 19.5 percent under the third quarter of 1962, returning the index to the level of 1960 and 1961. However, none of the larger projects used for the index computation in the fourth quarter is located in mountainous terrain, where the cost of highway construction is usually higher.

The index for the year 1962 has been computed at 256.2, 17.1 points or 7.2 percent higher than the figure for the year 1961.

The number of bidders per project during the fourth quarter averages 6.1, an increase of 1.6 over the previous quarter.

Luddy, Woolley Reappointed to Highway Commission

ARTHUR T. LUDDY

ROGER S. WOOLLEY

Governor Edmund G. Brown announced on January 17, 1963, the reappointment of Arthur T. Luddy of Sacramento and Roger S. Woolley of San Diego to four-year terms on the California Highway Commission. Both men were first appointed in 1959.

Luddy, who served as vice chairman of the commission in 1962, is an executive of the California-Western States Life Insurance Company. His interest in highway matters has grown in part out of his extensive travels about the State as an insurance man during the past 40 years.

He has been active in civic affairs in the Sacramento area, including a term on the city planning commission. He is also prominent in Catholic circles and was recently made a Knight of St. Gregory the Great.

Woolley is an attorney whose home is in Rancho Santa Fe. He had been a member and officer of the San Diego Highway Development Association for several years prior to his original appointment to the commission.

A native of Chicago, Woolley was educated at the College of William and Mary, London University, and the Columbia University Law School. He served in the U.S. Navy in World War II.

IN MEMORIAM

Bridge Department

Milton C. Kjer, bridge construction inspector II.

District III

Floyd E. Byars, highway engineering technician I.

District IV

Edward Leong, assistant highway engineer.

Rolf W. Sollie, engineering aid II.

L. Albert Weymouth, principal highway engineer.

District X

Kermit M. Cagle, drawbridge operator.

Shop 2

Gerald M. Sindorf, heavy equipment mechanic.

State-owned Toll Bridges

Arthur Fross, toll bridge electrician.

Albert A. Mellis, highway maintenance man II.

Big Bear Road

'Arctic Circle' Section Widened to Four Lanes

By L. M. BARNETT, District Construction Engineer, and J. L. RIDDELL and W. McKNIGHT, Resident Engineers

On September 12, 1962, the last of three contracts was completed between Lakeview Point and Big Bear Dam, expanding from two to four lanes the 5.4 miles of highway that is locally referred to as the "Arctic Circle."

Big Bear is one of the most popular resort areas in Southern California and is accessible by three main routes: State Sign Route 18-30 from San Bernardino Valley, SSR 38 from Redlands via Mill Creek Canyon and Barton Flats, and SSR 18 from Lucerne Valley on the desert side.

The Big Bear Lake valley recreational area, 90 miles from the vast Los Angeles metropolis, was not being adequately served by the existing two-lane highway. The most treacherous portion of this highway was between Lakeview Point and Big Bear Dam, where the number of vehicles in one direction oftentimes exceeds 600 per hour. It was constructed in 1926 on the precipitous mountain terrain as a narrow, twisting two-lane road and remained in that condition until the first of three major improvement projects was started in 1957.

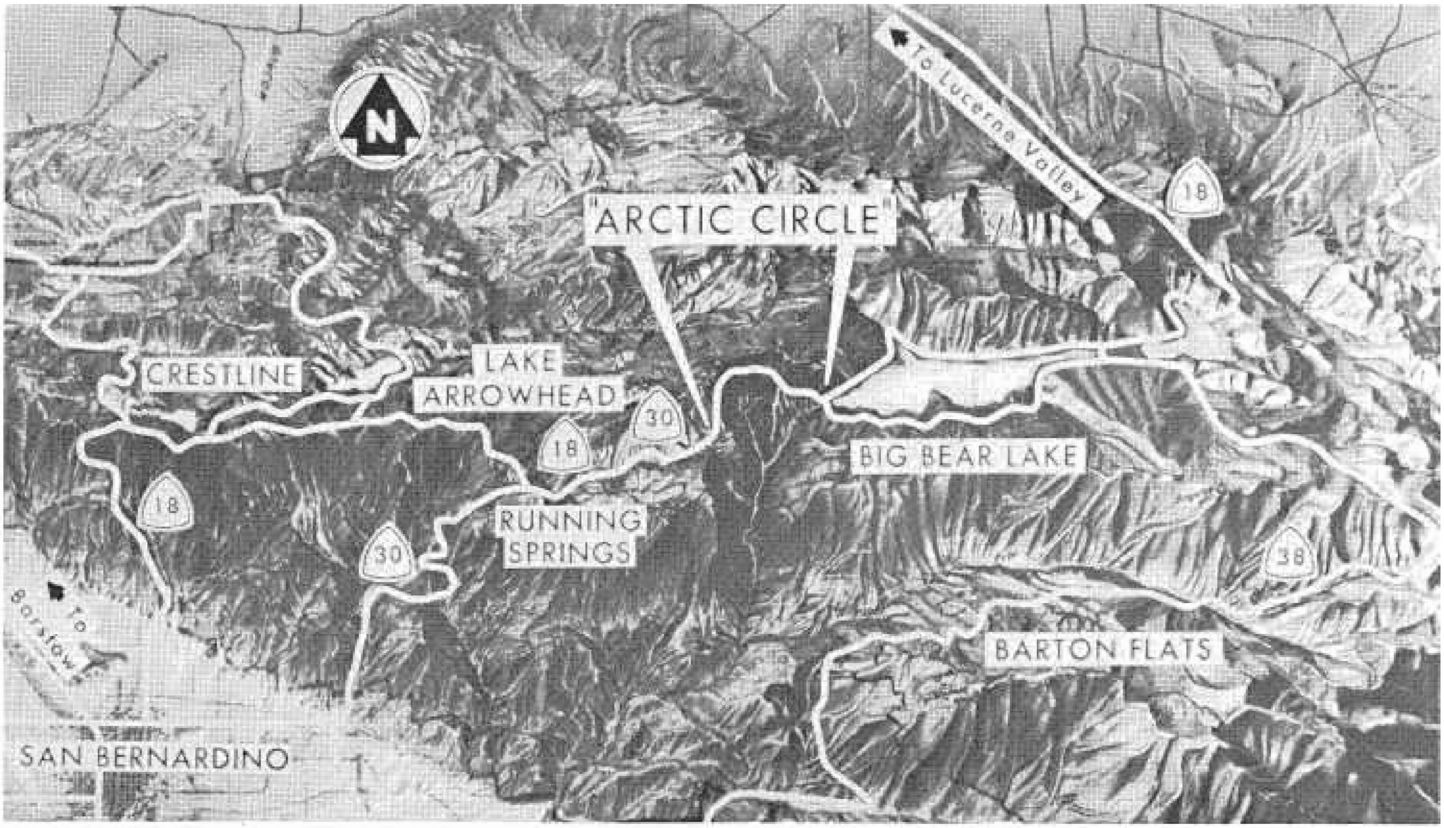
Since that time, three contracts have been completed providing four lanes of undivided roadway all the way along the "Arctic Circle." On the old winding two-lane road, it was almost impossible for anyone to overtake a slow-moving vehicle for the whole 5.4 miles. Passing maneuvers are now possible throughout the area.

Adverse Weather Conditions

The last two contracts were started in January and February of 1962. The day after the first bids were opened, it began to snow and continued until over five feet had accumulated. This

Construction equipment widens the two-lane ledge section of the Big Bear Highway.

A crew completes paving of the fourth lane on the new widened portion of the Big Bear Highway.



A topographic map of the Big Bear Lake area showing the location of the "Arctic Circle" section of Sign Route 30 on which the construction work described in this article took place.

was the beginning of extreme storm conditions. The area was receiving its heaviest snowfall in years.

Normally the contractor would not attempt to work under conditions as adverse as these. (He would be compensated with working days at the end of his contract.) However, these two contracts were different in that they had a middle-of-the-job requirement that the road could, under no circumstances, be closed to traffic after June 14. This opening requirement was compelled by the large additional tourist traffic that moves into this resort area after school vacations begin.

Early Opening Date

This early opening date meant that the contractors had to substantially complete the major grading by that time. So, snow or no snow, they moved in with their equipment and started clearing and excavating. Approximately 770,000 cubic yards of earth and rock had to be excavated and compacted in embankments within the tight time schedule. At one time, there were 29 dozers, four large shovels, two large rubber-tired loaders, and 44 trucks on roadway excavation working 12-hour shifts all within the confined limits of their project.

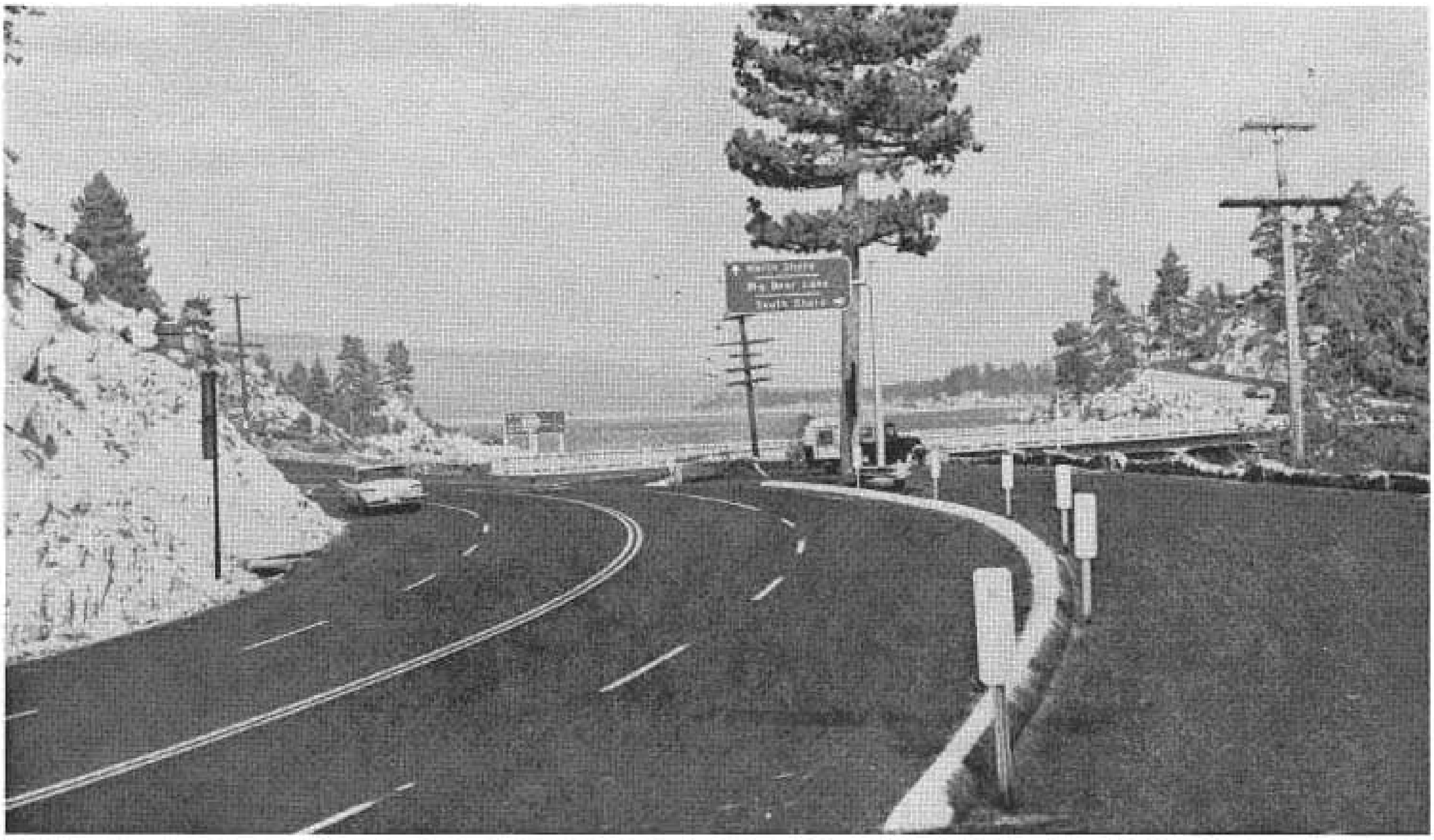
Surveyors Overcome Obstacles

It was much easier, however, for this heavy equipment to push through the deep snow than it was for the surveyors. Nevertheless, since the equipment operators had to have slope stakes for a guide, the arduous task of trying to shinny up the precipitous snow-covered slopes was started. Even during fair weather conditions, these prodigious mountains are a challenge to a surveyor's ruggedness and ingenuity. The rocky mountainside from which the road is carved is near vertical. The cuts extend up to 120 feet and the fills down to 300 feet. In setting slope stakes, the surveyors often had to be supported with ropes.

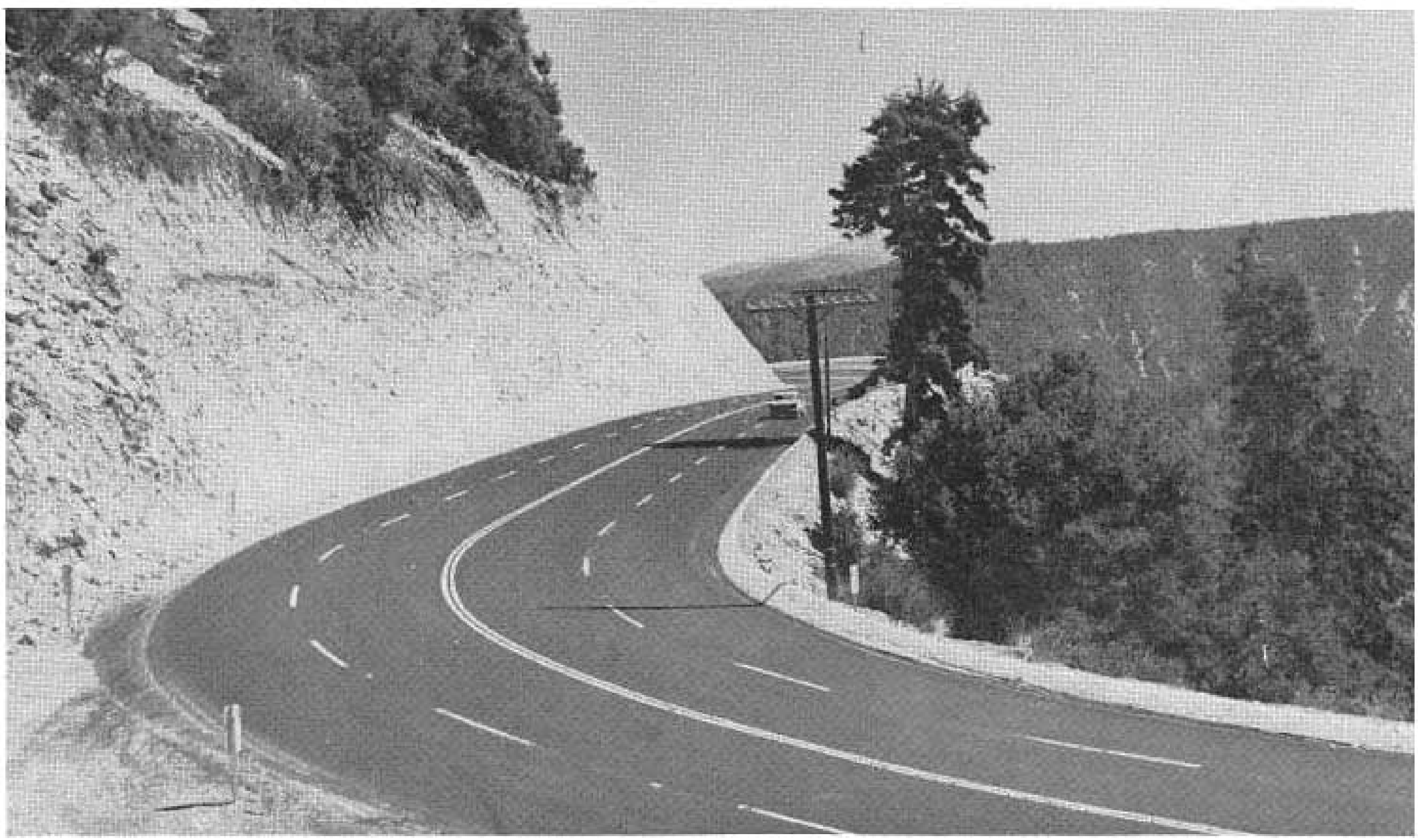
Surveying in snow country. A member of the party signals the others that he has finally found the "catch point" they have been looking for.

Surveyors Versatility

Southern California surveyors are normally more accustomed to adapting themselves to the flat valleys and extremely hot desert areas. However, they demonstrated their versatility in adjusting to this extreme change in climate and terrain. By donning earmuffs, mittens, and loggers' boots they were able to combat the heavy snows and steep cliffs and keep ahead of the contractor's operations. In order to relocate and find previously set survey points, it was often necessary to dig through five feet of snow and ice,



Looking out across Big Bear Lake from the east end of the road widening job.



A portion of the new four-laned "Arctic Circle" section of Sign Route 30.

often only to find the same point completely covered by fresh snow on the following day. At one time, eight survey parties were used placing clearing lath and slope stakes in order to insure that the contractor was not delayed.

Springs Used for Fountains

Several springs were encountered which threatened the stability of the highway. These springs were harnessed by installation of spring boxes and then put to good use by piping the water to various scenic lookout points. Rock drinking fountains were constructed at these locations to provide mountain spring water for the tourists.

This improvement is located within the limits of the San Bernardino National Forest and was constructed under United States Forest Service permit. U.S. Forest Service officials co-operated with the State of California in this improved roadway.

The second unit, built by Matich Constructors, was completed on August 18, 1962, and the third unit, built by the E. L. Yeager Company, was completed on September 12, 1962.

Heavy snow and slides will continue to be a problem along this section of roadway. However, the additional width and the improved alignment will now afford sufficient room in which to handle the snow and slide material without closing the road or seriously hampering the flow of public traffic; and, most important, the vacationer will no longer be annoyed by having to poke along behind a slow-moving vehicle.

TIMES PAST. Snow removal operations on the Big Bear Road. The year is 1930.

Preparing the Big Bear Road for oiling. The year: 1928.

Department Awards Record Landscape Job

The largest state highway landscaping contract in its history, $424,230.87, for trees, shrubs and ground cover on 4.8 miles of the Golden State and Glendale Freeways in Los Angeles, has been awarded by the State Department of Public Works.

In awarding the contract to the K.E.C. Company of Artesia, State Director of Public Works Robert B. Bradford pointed out that in the last few years the California Highway Commission has been budgeting about $4,000,000 a year for landscaping and other planting.

The contract awarded today involves installing an irrigation system and planting 2,660 trees, 32,000 shrubs and 622,400 ground cover plants.

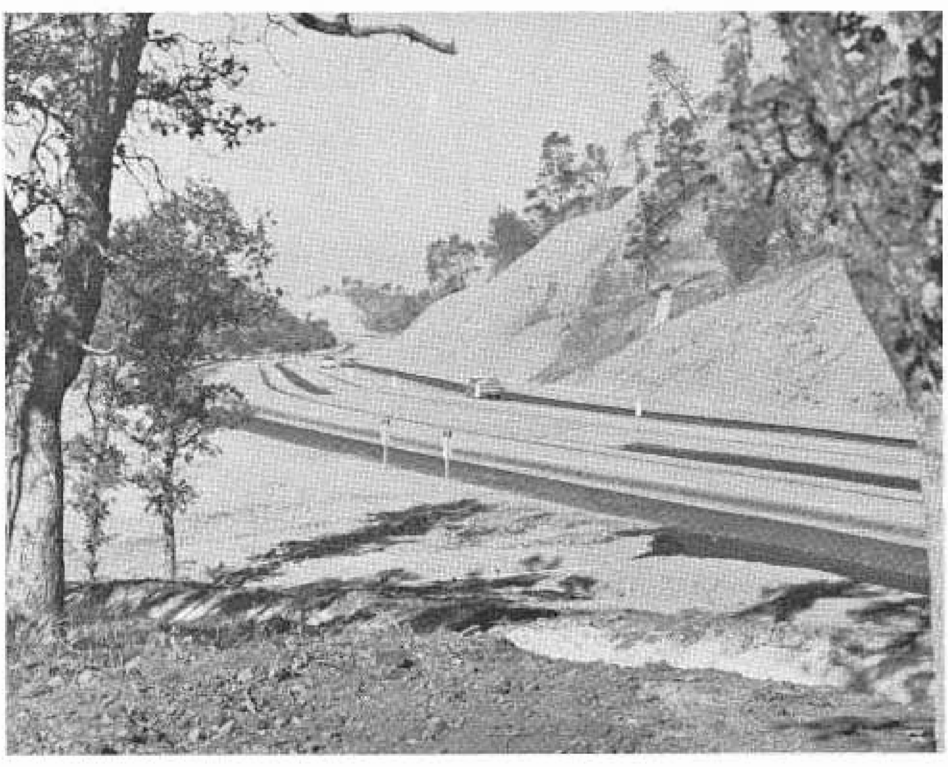
The work will extend for about 3½ miles along the Golden State Freeway (U.S. 6-99), between the Los Angeles River crossing near Elysian Park and Glendale Boulevard; and a little over a mile on the Glendale Freeway, including the complex interchange connecting the two routes.

Tehachapi Job

More of U.S. 466 Now 4-lane Freeway

By CHARLES H. JACKSON, Resident Engineer

PHOTO ABOVE. During the earlier construction phases of the project flagmen handed out leaflets explaining the reasons for traffic delays ahead. BELOW. View of completed roadway. Note concrete lined ditches above cuts to prevent erosion.



Transformation of U.S. 466 in eastern Kern County from an inadequate two-lane cross-state lateral to a modern four-lane freeway has taken another major step forward with the completion of 5.8 miles through rugged mountain country west of Tehachapi.

The new section, extending from Caliente Road about 27 miles east of Bakersfield to Keene, was opened to traffic on October 30, 1962.

It serves as an extension of the 12-mile foothill section of U.S. 466 to the west which was completed by District VI in December 1960, and described in the March-April 1961 issue of *California Highways and Public Works.*

The next step will be construction of a 7.6-mile section eastward from Keene to near the west city limit of Tehachapi. The California Highway Commission included $4,100,000 for the first unit of this project, the grading, and work is expected to start this spring.

Route Is Major Link

This route, known as the Tehachapi Highway in Kern County, is a link in a major transcontinental highway. Heavy traffic on this route includes a large percentage of trucks and out-of-state traffic as well as local traffic.

This new section of freeway begins about 27 miles east of the City of Bakersfield and ends some 10 miles west of the City of Tehachapi. Throughout its length it traverses difficult terrain of the Tehachapi Mountains.

The new 5.8-mile, four-lane, 60 m.p.h. full freeway replaces a facility which had become inadequate for today's traffic. Deficiencies of the previous facility were narrow width of pavement, long steep grades, winding alignment, restricted sight distance and lack of capacity due to slow-moving vehicles.

Only Feasible Line

The only feasible line of development for the new freeway was along the line of the existing facility so the existing highway was utilized wherever possible. Deviation from the original alignment was made where necessary to obtain acceptable line and grade standards.

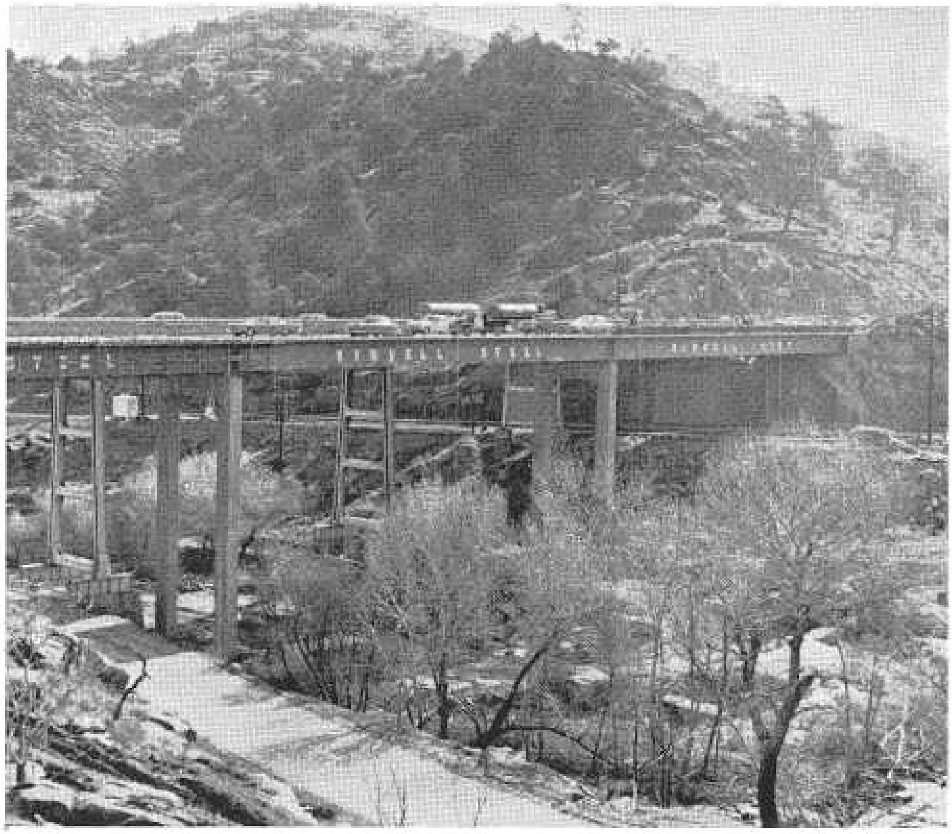
The old highway had 23 curves ranging in radius from 600 feet to 3,000 feet; 10 of these curves had radii of 1,000 feet or less. Maximum grade was 6 percent on a total length of 2.6 miles. The longest sustained 6 percent grade was 1.2 miles in length.

The new freeway ascends the slopes of the Tehachapi Mountains from elevation 2,084 feet to elevation 2,732 feet. Grades vary from a minimum of 0.25 percent to a maximum of 6 percent. The lone 6 percent grade is 0.6 mile long. There are 3.3 miles of grade varying from 3.15 percent to 5.50 percent. About 54 percent of the alignment is on tangent. There are 19 curves with radii varying from 1,200 feet to 15,000 feet.

During the grading phase of construction the contractor was required to permit public traffic to pass through the work with as little delay as possible. During pioneering and blasting operations traffic could not be permitted through the work areas. Scheduled two-hour traffic delays were placed in effect during this period. Signs were posted to give public notice of these delays. Radio, television and newspapers were used to keep the public informed. Handout leaflets, describing the work in progress and giving reasons for the detaining of traffic, were given to people stopped during traffic control.

Water in Short Supply

Water for construction purposes was in short supply locally. Reservoirs were built to impound water from Clear Creek. However, this source supplied an insufficient quantity at best; the creek dried up entirely dur-



New plate girder bridge at Tehachapi Creek during construction. County road under first span, railroad under third span and creek between.

Benched cut and heavy fill partly completed. Note steep haul roads in rugged terrain.

Looking westerly from end of project. New Tehachapi Creek Bridge on left in foreground and Keene Interchange in left center.

ing summer months. The main source of water was a well just west of Tehachapi. A pump at the well sufficed to overcome a short lift to the nearby summit. From here gravity flow was possible along the 9.5 miles of pipeline to the end of the project. Vibratory compactors were used in construction of embankments. In the granular soils encountered on this project vibratory compactors were able to achieve specified compaction without the addition of water. This eased the problem of water supply considerably.

During the winter of 1961-62 the project was plagued with too much water. Fog, rain, hail and snow forced work stoppages and made travel difficult. However, during heavy storms the route was kept open to traffic even when other routes in the Tehachapi Mountains without construction zones were closed.

Largest Single Item

Roadway excavation was the largest single item of work on the project. Construction required 1,950,000 cubic yards of roadway excavation. About 700,000 cubic yards were drilled and shot. Many of the cuts were deeper than 100 feet; maximum cut was 280 feet. Maximum fill was 200 feet. Steeply sloping hillsides made access difficult. Pioneering, excavating and hauling were often hazardous. It is noteworthy that in spite of the peril inherent in heavy construction through difficult terrain, work was completed without serious injury to contractor's personnel.

The alignment crosses numerous steep channels which carry runoff from the northerly slopes of the Tehachapi Mountains to Tehachapi Creek Canyon. Some 10,500 linear feet of corrugated metal pipe, ranging in size from 12 inches to 66 inches, were installed to drain the roadway and maintain the natural drainage pattern. Since native soil is largely granitic and quite erosive, ditches and benches on steep grades were lined with concrete, and energy dissipators were installed at pipe outlets to prevent erosion.

Construction of the project's 11 miles of 24-foot pavement required over 34,700 cubic yards of portland cement concrete. Paving was done with a Guntert & Zimmerman slip-form paver. Alignment, grade, and cross slope of the concrete pavement were automatically controlled. Offset line and grade wires in conjunction with the machine's electronic control probes permitted accurate control of the paving.

Polyethylene Ribbon Used

The longitudinal joint in the monolithically poured 24 foot width of pavement was formed by inserting a polyethylene ribbon (2 inches wide by 0.004-inch thick) in the fresh concrete immediately behind the slip-form paver. This was effective and joints so formed were less expensive than sawed joints.

The basic slip-form paver, with attachments differing from those used in paving, was used to trim cement-treated base. The electronic guidance system was used during this operation. The use of this equipment resulted in a truer section and grade than would have been possible had motor graders been used.

Interchanges were constructed at Hart Flat and at Keene to serve local traffic. Two bridges were built for these undercrossings. A third bridge was built adjacent to an existing bridge at Tehachapi Creek. The existing bridge was sufficiently adequate structurally to permit its inclusion in the new facility.

R. R. Hensler, Sun Valley, was prime contractor for the contract. R. L. Mason was the contractor's general superintendent. The work was done under the supervision of E. R. Foley and C. A. Shervington, District Engineers; J. R. Jarvis, District Construction Engineer; C. H. Jackson and R. M. Kelly, Resident Engineers. Final construction cost was $5,050,000.

San Mateo-Hayward Bridge

By NORMAN C. RAAB, Projects Engineer, Division of San Francisco Bay Toll Crossings

Bids were received on July 11, 1961 starting the overwater construction for the new seven-mile-long, four- and six-lane San Mateo-Hayward Bridge across San Francisco Bay replacing the present substandard two-lane structure which has been in operation since 1929. A 13¼-million-dollar contract was awarded to the low bidder, Peter Kiewit Sons' Company, to construct the first section of this project, a four-lane concrete trestle.

This is the fifth of 16 contracts contemplated for the 70-million-dollar project with consists of: a wide earth fill one-third of a mile in length at the east end of the bridge on which the toll plaza with its administration and maintenance buildings will be constructed; 4⅔ miles of four-lane precast concrete trestle, and two miles of six-lane, high-level steel structure over the navigation channel near the west end of the project.

The contract for the fill called for placing 425,000 cubic yards of selected earth material starting at the east shoreline. The fill, as it progressed westward, was wedge shaped in form, having its two faces at an angle of 30 degrees with the centerline of construction. The weight of the placed material caused the soft bay mud to be displaced seaward. Small blasting charges were employed to keep the mud in a mobile, semiliquid consistency along the working front.

Soft Mud Displaced

It has been estimated from the material placed that 80 percent of the soft mud was displaced; the fill and earth beneath has consolidated over two feet during the first 12 months. It is expected that another foot of settlement will occur within the next two years prior to the construction of the toll plaza.

Recent traffic studies have indicated that a modern four-lane divided roadway would provide ample capacity at the present rate of growth and with the present number of bay crossings until the year 1980.

The new trestle will initially provide for a four-lane divided roadway with provision for expansion to six lanes, when needed, by the addition of two lanes on the north side. This addition would not in any way interfere with traffic using the four lanes. The new single-deck steel structure is being planned for six lanes.

The four-lane trestle consists of four fundamental elements:

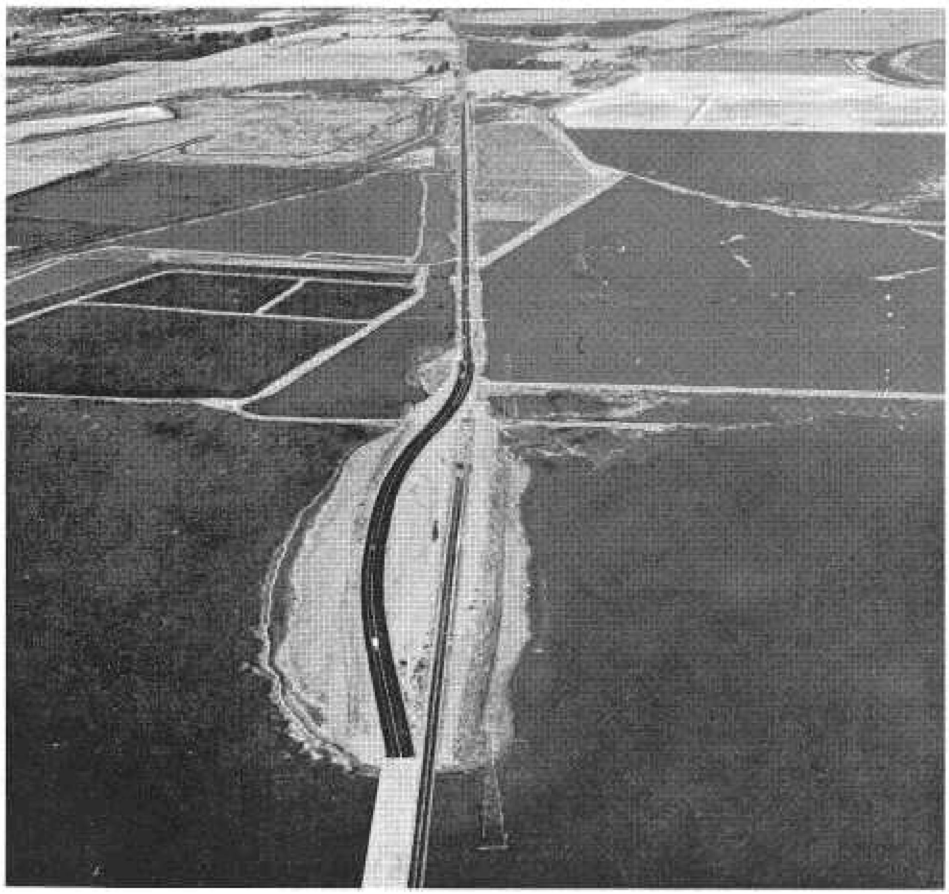
Six, 24-inch hollow prestressed concrete piles per bent.
Two precast concrete pile caps which are jointed into one during construction.
Four precast deck sections which are dowelled at one end to the cap.
Two precast concrete curb and rail units for each side of the roadway.

Other Roads Built

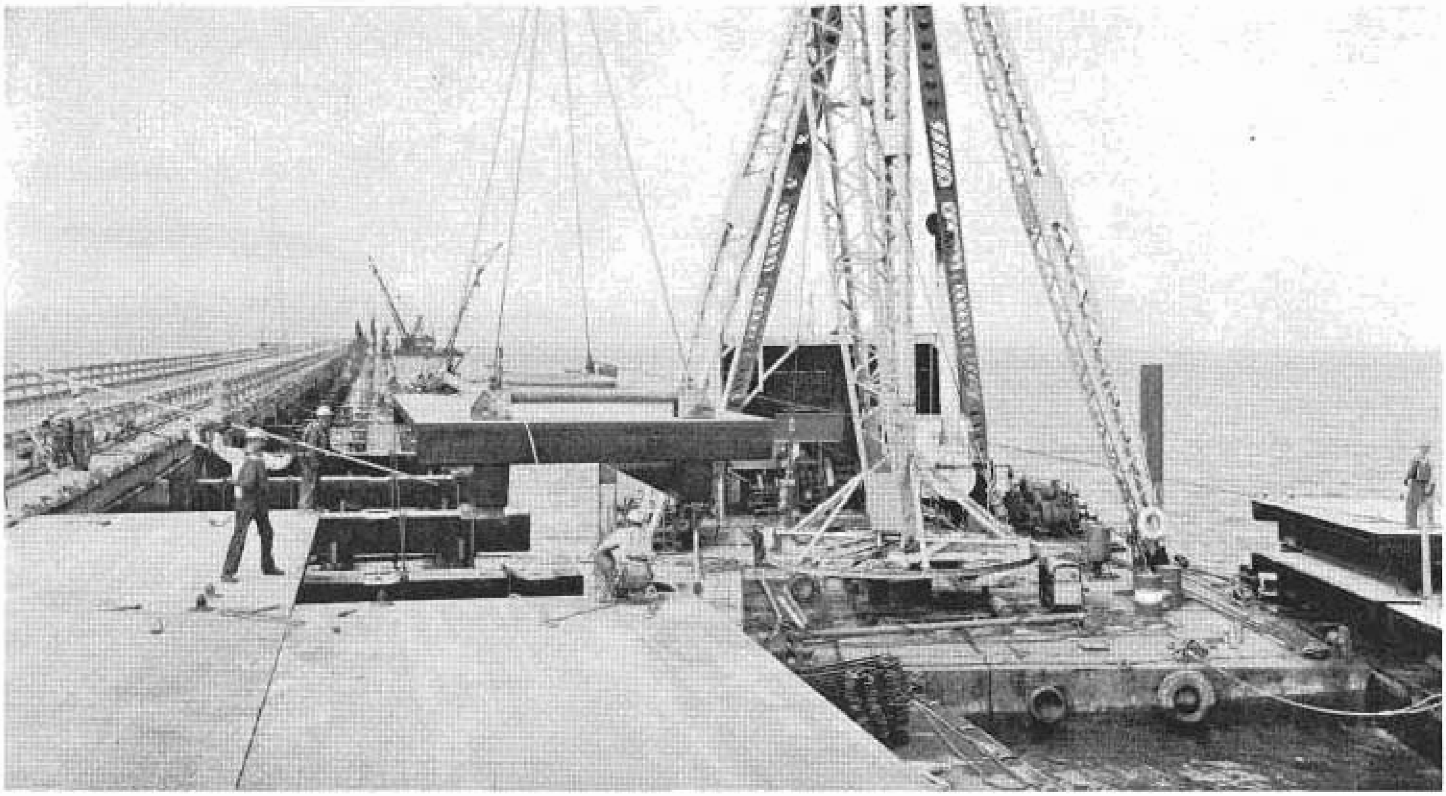
After erection, other appurtenant roadway facilities will be added for the safe and comfortable passage of vehicles.

The contract requires the furnishing of 4,840 piles, 60 to 90 feet in length; 1,620 pile caps; 3,212 deck units; and 47,700 lineal feet of curb and railing units.

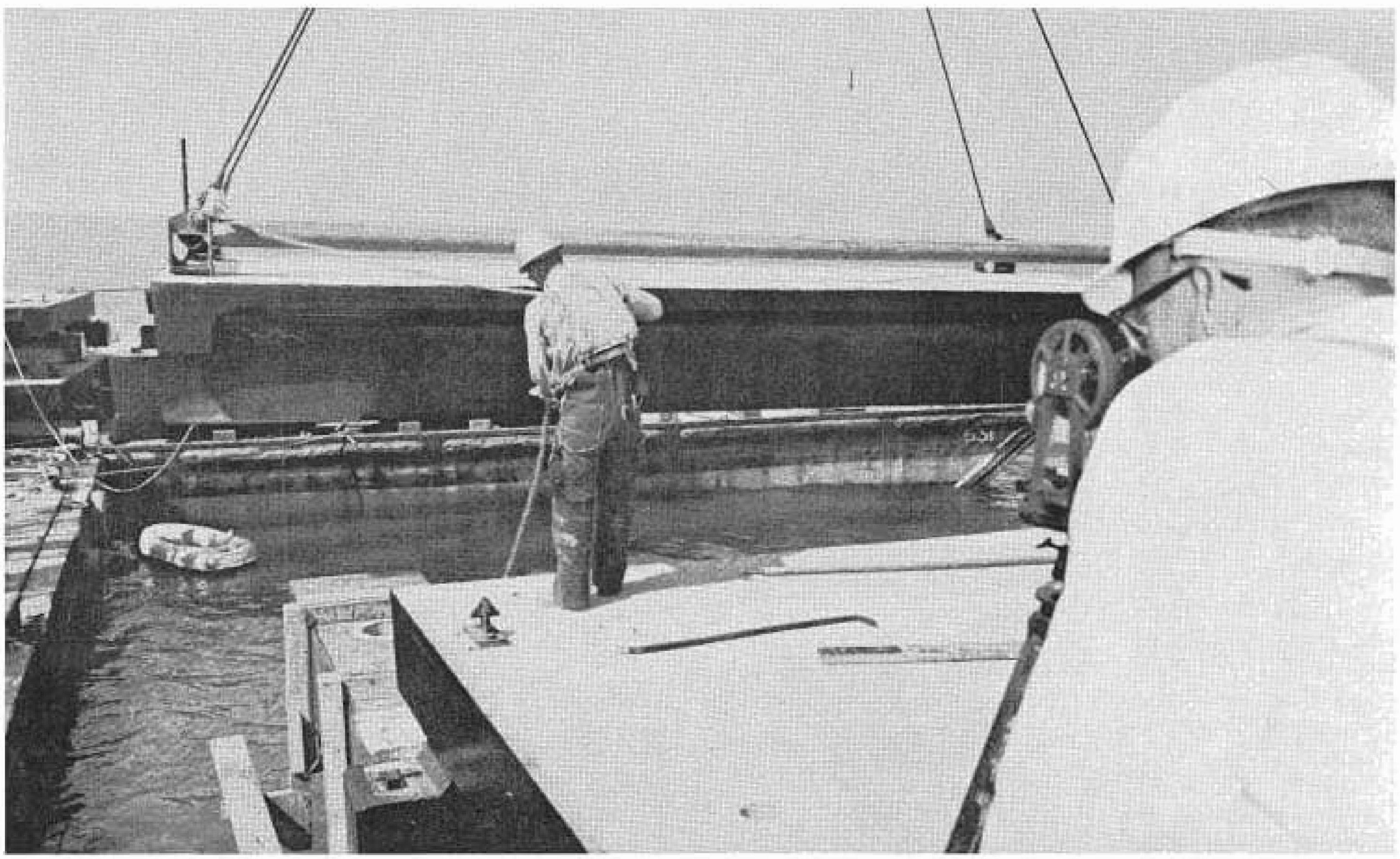
Due to the multiplicity of similar concrete parts, the contractor prepared a casting yard in the City of Richmond for an assembly line production of the different units. This consisted of placing the reinforcing in steel forms, casting, curing, waterproofing, and later barging the units to the site for erection.



Looking east toward Hayward, showing mole fill at east end of bridge project where toll plaza will be built. Note mud displaced by fill. Start of new concrete trestle in foreground.



TRESTLE CONSTRUCTION. Pile driving background followed by pile cutoff setting caps and deck units.



PLACING DECK UNITS. Large cores in deck for placing concrete in top of pile.

The yard, which is one-half mile in length and 250 feet wide, is divided into areas for casting piles, deck units, caps, curb and rail units; it also provides space for the curing and waterproofing prior to shipping.

Straddling the length of the yard are three gantries operating on one set of railroad rails spaced at 70-foot centers. These rail facilities not only handle the completed casting, but transport the materials needed in the construction.

Probably the most interesting and novel yard procedure is the continuous casting of the prestressed, hollow standard concrete piles.

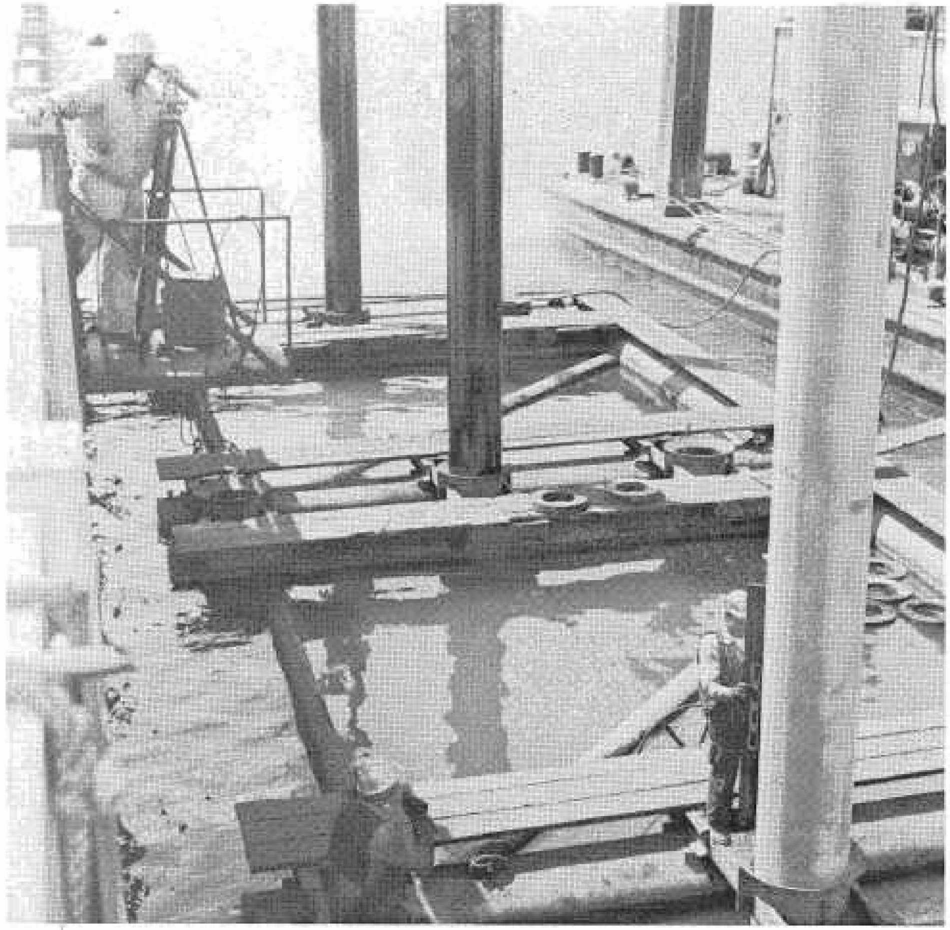
Four individual 900-foot beds were constructed by the contractor, each consisting of a 24-inch diameter, half-circular metal form encased in concrete. Flanges on both sides of top edges served as supporting tracks for the movable, half-circular upper form with material hopper and concrete vibrators attached.

105-foot Mandrel

Partially supported from the lower form by means of movable rollers and traveling independently at the same speed as the upper forms is a 15-inch cylindrical mandrel 105 feet in length which forms the 4½-inch shell thickness. These units are moved at a rate of five to seven feet a minute by a cable reeled in at one end of the casting bed. Circular removable partitions are placed in the form and are set to the length of the pile desired. They are notched to space and retain strands in proper location in pile shell. The speed of the movable forms is slowed to 1½ to two feet a minute at these partitions.

While casting is taking place in one bed, another retains the previously cast piles for curing, and the third bed is being cleaned.

The fourth form is prepared for casting which consists of placing a bundle of No. 5 spiral wire between each pile partition, stretching, 13 7/16-inch high-strength seven-wire steel strands the full length of the bed. They are clamped at one end and stressed at the other which are then positioned and supported by the pile partitions which are used to separate the continuous casting into the proper pile lengths. The spiral hooping is then spaced and tied to the individual strands along the length of the pile.



PILE DRIVING. Center pile of three-pile bent being plumbed in floating template.

Piles Are Heat Cured

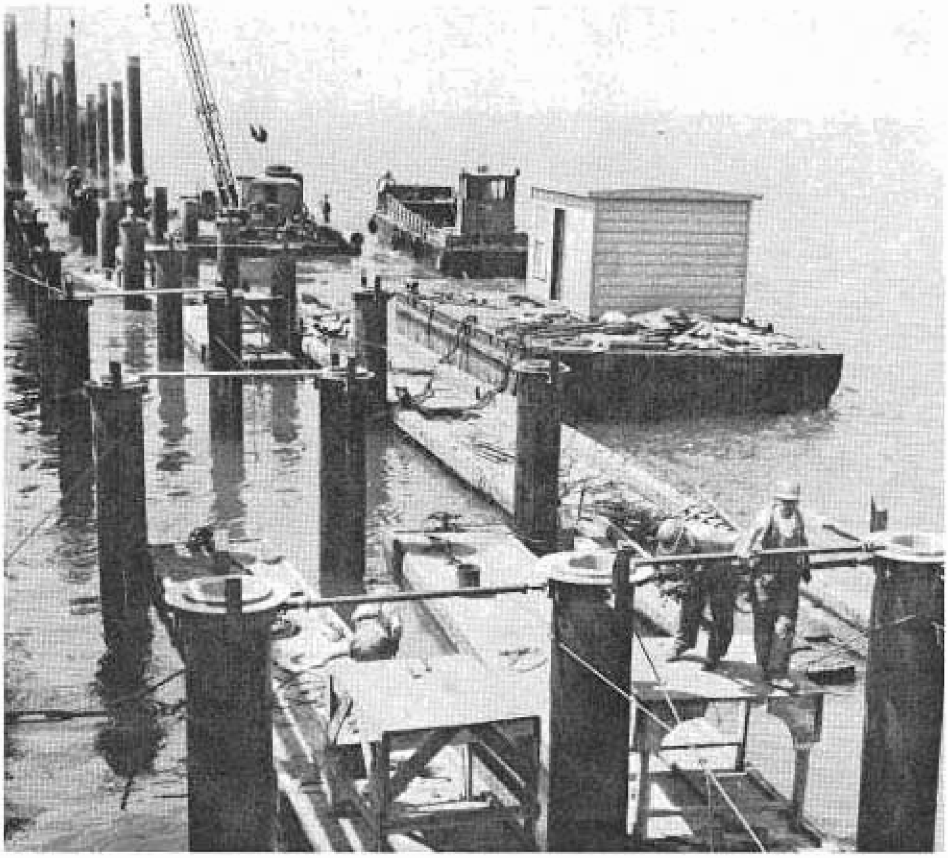
After casting, the piles are heat cured by placing a half-circular hood over the upper portion of the form and then admitting steam. The heat is gradually raised and then lowered through a 16-hour thermostatically controlled cycle. After the concrete has reached a strength of 4,000 psi, the stress at the ends of the steel strands is released, the wires are cut at the partitions, the piles are removed from the forms for drying and waterproofing, the forms are cleaned and ready for another cycle.

After casting and curing, the piles are removed by the gantries and placed on skids where the upper portion of the pile, which will project above the mud line after driving, is sandblasted and painted with three coats of waterproofing material. Two protective coats are placed on the pile caps and undersurface of the deck units prior to barging to the site.

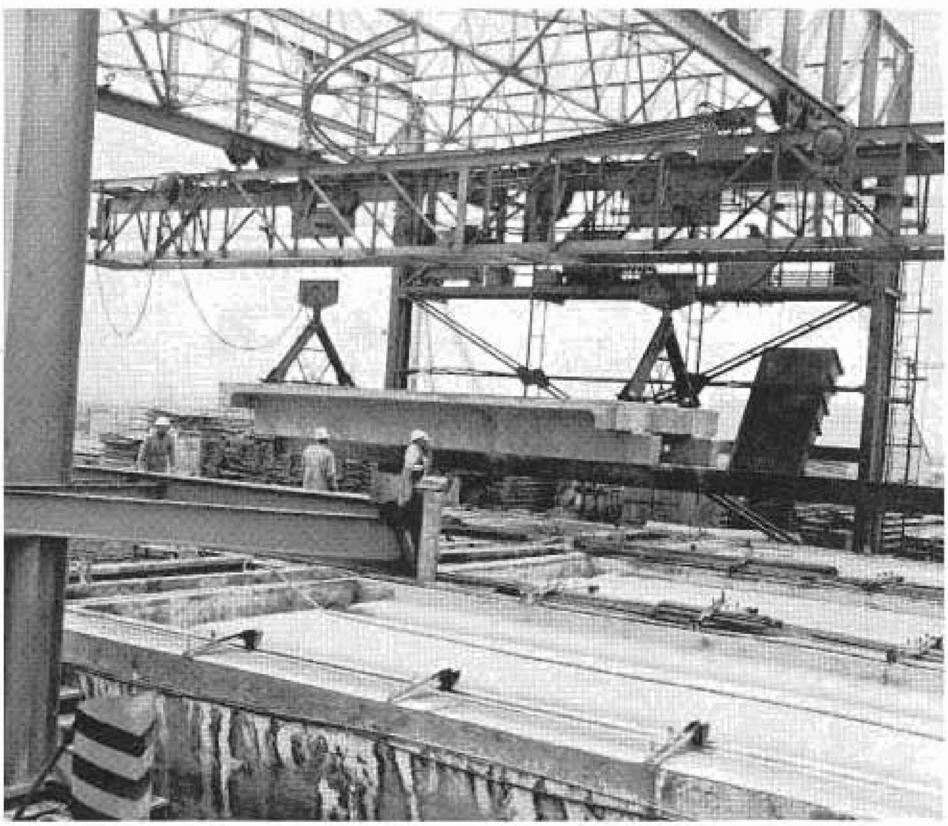
There are 16 steel forms provided for the casting and partial curing of the deck units. Prior to placing concrete, most of the reinforcing steel for the deck unit is assembled, tied together and placed in the forms. The armored roadway expansion joints are accurately set and fixed in the form; also, threaded steel inserts to which the curb and railing section will be bolted and placed at this time. In the event two additional lanes are needed in the future, the curb and rail units can be unbolted and shifted to the widened six-lane roadway. The pile caps also have provisions for their extension.

Dimensions Constantly Checked

Where there is a repetition in the fabrication of standard or duplicate units, checks must be continuously made of the dimensions to which the unit is cast. A slight error in any



PILE CUTOFF OPERATION. *Cutting off and aligning piles prior to placing caps.*



CONCRETE ROADWAY UNITS. *Cast unit being lifted from steel forms shown in foreground.*

length will lead to an accumulated error in the field resulting in either an under or overrun of distance. An error of over two feet occurred during the construction of the original trestle and is now being corrected in the new construction.

The roadway spans are steam cured and after the concrete has reached a strength of 2,400 psi, the units are removed from the forms, first by means of compressed air introduced through fittings on the underside of the form at the center of the slab to break the skin friction of the concrete on the steel faces, and secondly by the gantry's sling and strongback which transport the units to another area of the yard for air curing and waterproofing.

The pile caps, as well as the curb and rail sections, are cast in steel forms and handled in somewhat the same manner as the deck sections.

Three conduits are placed in each curb to provide for the main and secondary power lines and three additional conduits are placed in the railing for lighting, telephone and supervisory control wires.

Erection Procedure

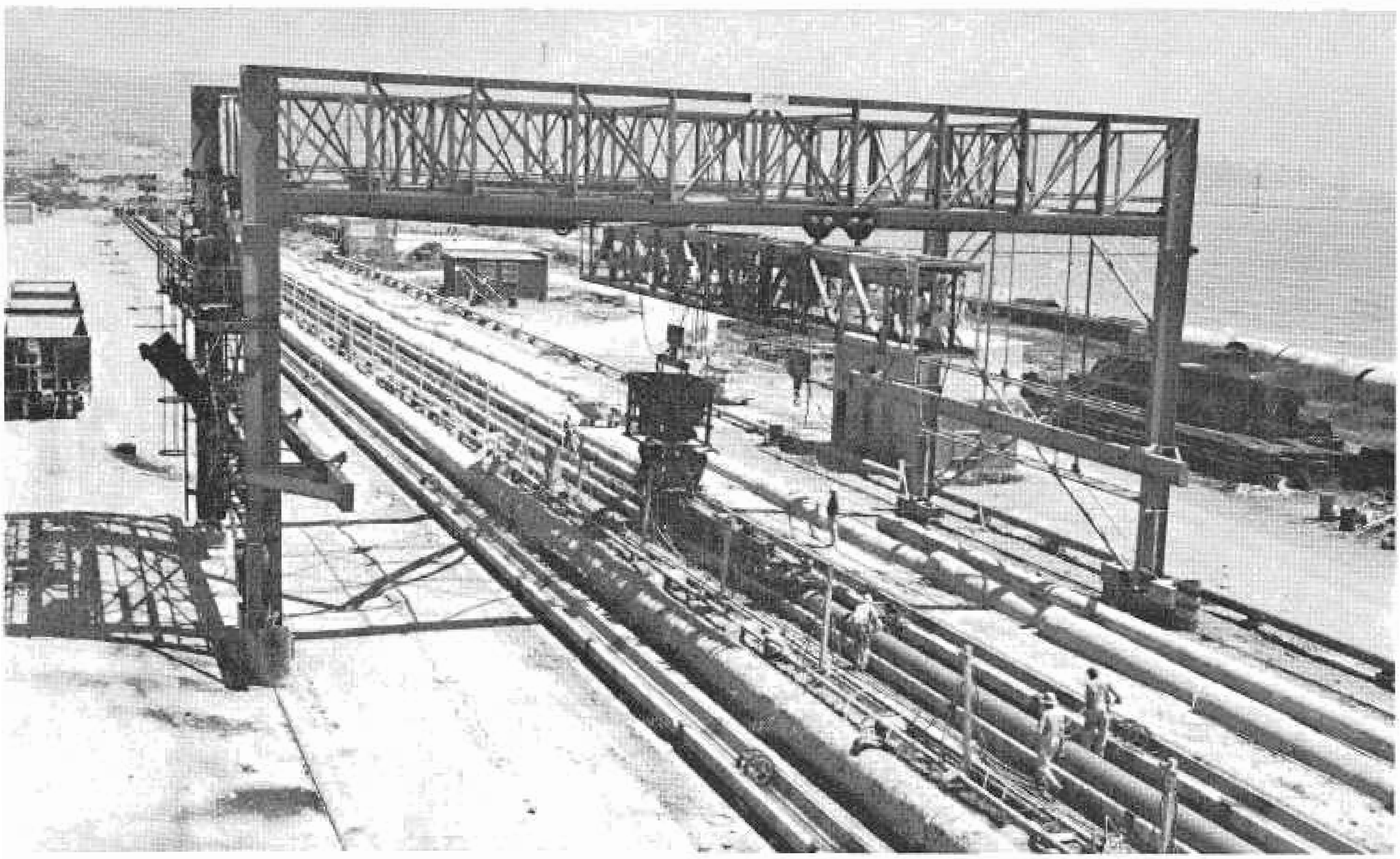
Funds for the construction of the new San Mateo-Hayward Bridge are derived from the net revenues of this crossing combined with those of the San Francisco-Oakland Bay and Dumbarton Bridges.

The plans call for the contractor to maintain two lanes of traffic, one in each direction, for the uninterrupted flow of vehicles. The contract also requires the new trestle be constructed contiguous to the old viaduct for detouring from one roadway to the other and for the providing of working space for the contractor's men and equipment.

Both the preliminary and final studies not only considered the methods and materials to be used in the construction but the production, furnishing, and placing of the various parts; also the salvaging and reuse of any units in the future due to expansion or damage to the structure.

A ruling of the U.S. Engineers required the removal of all material from the site, which included the railing,

CONCRETE PILE CURING showing cover for initial heat curing.



PILE-CASTING OPERATION showing top movable form being filled from bottom dump bucket.

deck units, caps, and piling of the old concrete viaduct.

After examining and taking core samples of the original piles, it was considered doubtful that they could be extracted without breaking at the waterline due to the small amount of steel reinforcing in the pile and the amount remaining after deterioration.

Pile Removal Costly

It was estimated that the cost of removing these old piles, which was later verified by the contract unit prices, would be greater than the driving of new piles.

Construction of the new north two-lane roadway required the following major operations:

Striping the present 27-foot roadway for two 12-foot lanes.
Erecting a barricade along the north lane.
Removing rail and curb of existing trestle.
Placing and centering twelve 24-inch piles in a jig.
Driving piles for north bents.
Cutting off pile ends to grade.
Placing and concreting pile cap to grade.
Placing two roadway units.
Leveling and dowelling units to cap.
Erecting curb and rail units on north side.
Striping new roadway.

The 27-foot wide roadway of the old trestle was restriped for two 12-foot lanes. A temporary timber curb with steel skid beam was erected along the north lane which provided working space for the contractor while dismantling the old concrete curb and rail.

Precast Piles

The driving of the precast piles was the controlling field operation and generally preceded all others.

The length of piles for the individual bents were ordered in advance by the engineer for casting and barging to the site as needed.

Payment for the piles in place was made on a lineal foot basis and a unit amount for the driving of each. The application of the waterproofing to the piles and other units and any repairs to the same same are included in the contract price.

To minimize the length of pile cut off after driving, extensive foundation exploration borings were made and this information was compared with the boring logs of the old structure and those obtained for a powerline which parallels the bridge. These in turn were compared with the length of piles that had been driven in the previous construction.

The piles are lifted from the barge by a Whirley type floating derrick of 75-ton capacity and placed vertically in a floating jog which accommodates 12 piles. The piles are plumbed and driven until a minimum capacity of 60 tons had been obtained. After driving, the template is separated and floated forward and accurately spaced for the setting of the piles in the next three bents.

The hammer is a double-acting steam hammer fitted with a special driving head modified by the contractor to minimize the breaking and splitting of the tops of the concrete piles.

Carborundum Saws Used

Circular carborundum saws were used to cut the piles to grade prior to the placing of the precast concrete caps. All piles cut off, as well as the curb and railing removed from the old structure, were placed on a barge and the debris was deposited in spoil areas obtained by the contractor.

Following the cutting off of the pile to grade, a collar devised by the contractor is bolted to their tops which provides for the bolting of an adjustable strut between the piles to obtain the nine-foot transverse spacing.

The three pile tops are brought into longitudinal alignment by the weight of the precast cap when lowered into the battered spacing plates on the collars.

The tops of the piles fit into a two-foot-two-inch diameter hole in the bottom of the cap. This circular opening is 2½ inches deep and is connected by another 15-inch hole with the top of the cap.

The cap was permanently attached to the upper part of the pile by lowering a circular cage of reinforcing steel three feet six inches into the pile; the upper two feet three inch length remaining in the cap. A 15-inch circular wooden plug was wired to the lower end of the steel to retain the concrete which filled the upper portion of the hollow pile and the circular hole in the cap. The concrete was poured through precast circular openings in the slab after the roadway units were placed and leveled.

The deck units are 14 feet 7 inches in width and 29 feet 11½ inches in length. Four units provide two 13-foot curb lanes, two 12-foot lanes, and a median strip of four feet.

Provision for More Lanes

If an increase in traffic requires additional bridge width, two additional units can be erected on the north side to provide two 13-foot curb lanes, four 12-foot traffic lanes, and a median strip of nine feet two inches.

The trestle consisted of a series of 30-foot simple spans of lightweight concrete, one end of which rests upon and is firmly anchored to the top of the concrete cap. The other end rests on a short cantilevered length of the preceding span by a metal shoe.

In the early planning stages this 30-foot span was compared with the cost of a 60-foot prestressed standard concrete design and a sand fill.

Records have shown that highway fills constructed upon the soft materials underlying the waters of San Francisco Bay are not stable and have required extensive roadway repairs. The settlement, the record of which is previously mentioned, for the fill on which the toll plaza is to be located is typical of other fills placed by the department. The initial cost of a fill with the amount of maintenance required over a 25-year period was not economically justified and consequently this plan was not adopted.

Another study using 60-foot prestressed concrete spans was considered and rejected due to cost resulting from the following:

Four piles in every other bent of the old trestle would have to be removed.
The ejection of the old piles would have increased the cost by $1,600,000.
The cost estimates for overwater construction indicated no savings for the longer precast, prestressed spans.
Larger floating handling equipment would have required a greater amount of channel excavation on each side of the new construction, thereby increasing cost.

The study for a 30-foot span revealed many savings, particularly when lightweight concrete was considered for the construction of the roadway units, together with curb and railing sections.

Overall Cost Decrease

The lightweight aggregate and extra cement required increased the concrete cost by $4.50 per cubic yard; however, the lighter load imposed upon the piles eliminated one pile per bent which gave an overall decreased cost of over $300,000. By so planning, the four piles in the original trestle did not have to be removed, as the three new piles were spaced to miss the old and were placed in the same plane.

When taking into consideration the rough water encountered in the erection, the amount of protective coating required, and the isolation of the site, the cost of $9.50 per square foot of roadway surface compares favorably with other trestles constructed under similar conditions.

Cast in "L" Shape

The rail and curb is cast in an "L"-shaped form which contains three two-inch conduits in the rail for primary and secondary roadway lighting electrical wires and three in the curb for the primary bridge electrical circuit.

The curb is 10 inches above the surface of the roadway and has a seven-inch face. The remaining three inches was left open for deck drainage. The rail and curb units are 29 feet 11½ inches in length, the same as the slab and are supported by five 18-inch x 24½-inch blocks through which two one-inch stud bolds are fastened into the deck inserts. This section can be moved intact if the roadway is widened for additional traffic lanes.

There is also cast into each wall a metal pullbox which will also house the ballast for the roadway lighting. The curb has a pullbox every 300 feet.

Inserts were aslo placed in the top of the wall to which will be fastened the brackets supporting a five-inch-diameter metal safety rail to be furnished under another contract. Additional inserts were provided in the wall of each span for roadway lighting, signs, and signals where needed; also, for the roadside emergency telephone boxes.

No Explosive Used

The breaking out of the old concrete structure proved to be a very slow and expensive operation as no explosive could be used in the demolition and all debris had to be moved from the site.

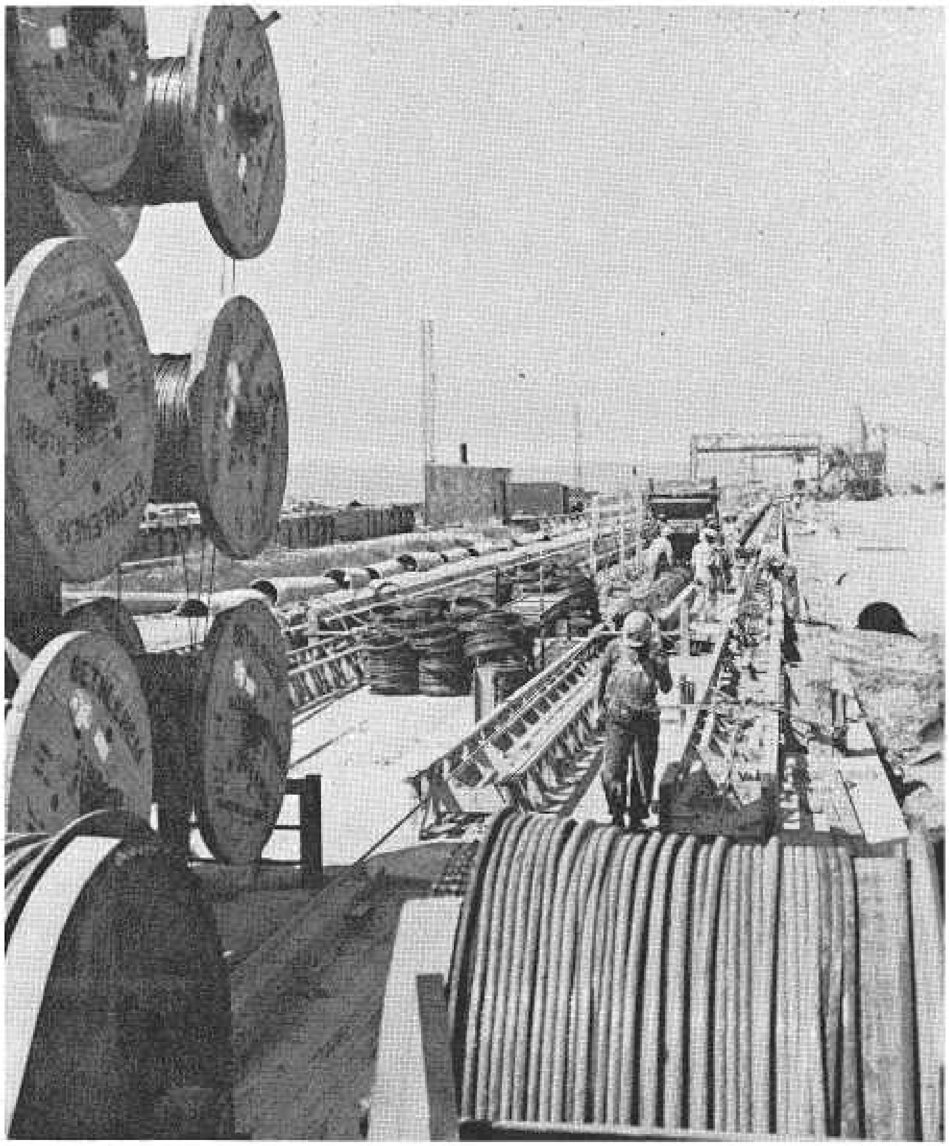
The contractor employed an air-operated hammer that was set vertically in a steel frame stand which was moved about on the bridge deck. Fitted into the hammer was a large steel spud which cracked the slab and girders at each bent. The assembly was moved by a truck crane ahead of the work.

The old concrete units together with the other broken parts were dropped onto the deck of a barge cushioned with old rubber tire casings to break the fall.

The tops of the four piles in the old bents were cut off just below the cap and these were deposited in the bay with the rest of the debris in certain designated areas.

The shimming of the roadway units to exact elevation has produced a level riding surface which should not require an aspalt topping for some time in the future. The open curbs provide a clean deck and good drainage.

(Additional articles will follow on the high-level steel crossing of the navigation channel and other features required by toll bridges.)



PILE-CASTING YARD showing stressing and hauling equipment.

Sierra County Supervisors Express Thanks

SIERRA COUNTY
BOARD OF SUPERVISORS

RESOLUTION NO. 958

WHEREAS, Sierra County has recently suffered the most severe flood and storm damage to its roads and bridges in many years; and

WHEREAS, Traffic over State Sign Route 49 leading south and west from Downieville, the county seat, was completely halted for some time due to the loss of the bridge at Indian Valley over the North Fork of the Yuba River; and

WHEREAS, Traffic over the same State Sign Route 49 leading north and east from said county seat was also halted, due to road damage between Downieville and Sierra City; and

WHEREAS, State Sign Route 49 is the only main access into and out of said county seat, and said area was therefore isolated from the outside during said period; and

WHEREAS, The State Division of Highways, through Mr. J. C. Womack, State Highway Engineer, and Mr. Alan S. Hart of the Division III office in Marysville, and through their local representatives Mr. John L. Snider, maintenance superintendent, and Mr. Donald A. Kipp, highway foreman, all combined to go out of their way to an extent this board feels was "far and beyond their ordinary duties" in seeing that said bridge was reconstructed, and said highway damage repaired, in a remarkably short period of time, thus assuring prompt resumption of transportation to said stricken area; and

WHEREAS, The McNamara Construction Company, Ltd., Bayshore Highway, Burlingame, California, currently engaged in private road construction in the Sierra County area, made available its equipment and manpower on an all-out day-and-night basis to assist in reopening said highway between Downieville and Sierra City.

Now therefore be it hereby resolved: That this board does publicly thank each and all of the above-named departments and individuals for their generous emergency co-operation and assistance, and the clerk is hereby directed to notify Governor Edmund G. Brown of said facts, by transmitting to his office a certified copy of the within Resolution, and to also mail forthwith additional certified copies to the following:

1. Mr. J. C. Womack, State Highway Engineer
   Sacramento, California
2. Mr. Alan S. Hart, District Engineer
   Marysville, California
3. Mr. John L. Snider, Maintenance Superintendent
   Nevada City, California
4. Mr. Donald A. Kipp, Highway Foreman
   Downieville, California
5. McNamara Construction Company, Ltd.
   Bayshore Highway
   Burlingame, California

The foregoing resolution was duly passed and adopted at a regular meeting of the Board of Supervisors of Sierra County, California, held on the 18th day of February, 1963.

ATTEST:
FLORENCE B. McCORMICK
Clerk of said Board

DON G. PATTON
Chairman, Board of Supervisors,
Sierra County, California

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

February 27, 1963

Board of Supervisors
Sierra County
Downieville, California

GENTLEMEN: Your resolution of February 18, 1962, regarding the reopening of Highway 49 in Sierra County following the recent record storm is certainly appreciated.

I do feel that an outstanding job was done in the emergency restoration by Division of Highways personnel and the construction industry people involved. However, this could not have been accomplished as speedily as it was without the full co-operation extended by local officials and residents.

The self-reliance of the people of the area and their recognition of the magnitude of the task was most helpful in the disruptive situation.

From a personal inspection on February 17 I know that we face a major and urgent job of permanent restoration. The division staff is now engaged in the planning necessary to fully restore two-lane operation, with appropriate protection against future floods.

Sincerely,

J. C. WOMACK
State Highway Engineer

Cut Cable Closes Rio Vista Bridge

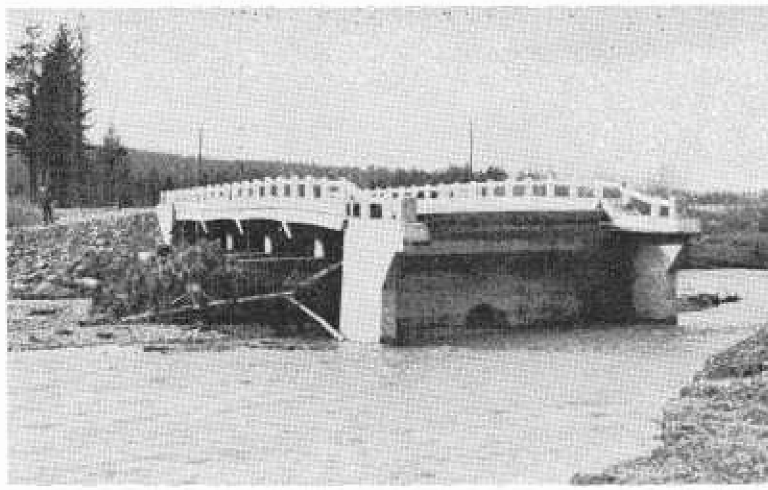
Dredging operations in the Sacramento River at the Rio Vista Bridge cut the underwater power cable for the bridge's lift span the night of December 18. Traffic on State Sign Route 12 which traverses the bridge was diverted to the Steamboat Slough and Cache Slough ferries until the morning of December 21 when temporary repairs were made. Considerable traffic delay continued until the drawbridge resumed normal operations the afternoon of December 24.

Sierra Rains

Washed Out Bridges And—

In the sudden torrents released by the rains at January's end, a few Sierra bridges were casualties. The Yuba River Bridge on State Highway 49 about 14 miles west of Downieville was one, illustrated with "before and after" photos above. Note that two spans and a pier were carried away. The two spans have been replaced by a 120-foot steel girder single span. Sulphur Creek (below) was repaired by jacking bridge and abutment back into place, refilling approach.

Abutment of bridge at Riverton on U.S. 50 which "almost went." At Sulphur Creek on S.S.R. 89, center right, stream not only tore out fill at abutment, but also undercut abutment.



Below. Bridge over Spanish Creek on U.S. Highway 40 Alternate, just north of Quincy, Plumas County, where stream undercut pilings sunk 10 feet below the streambed. Temporary repairs have been made; two spans will be replaced in spring.

Undercuts and Slipouts;

Above: Slipout on eastbound lanes, U.S. 40/Interstate 80 at Whitmore Maintenance Station, at about 5,000 feet altitude. Blue Canyon, a few miles east, recorded 16 inches of rain in 3 days. Below: Waters of Yuba River south fork near Cisco here partly receded after having savagely torn out several hundred yards of paving, subpaving, and fill on U.S. 40.

Routes through canyons in both the Coast Range and the Sierra suffered severe damage when rampant waters cut away adjacent highways. Above is State Sign Route 128 after it was torn up by normally small and peaceful Conn Creek near St. Helena in Napa County. Below is a single sample of the effect of widespread undercutting on State Sign Route 49 along the middle fork of the Yuba in the Downieville vicinity.

Slides, Mud, Debris, and Plugged Drains.

Waterborne debris plugged drains and cluttered road surfaces; saturated cut slopes slumped to the paving to keep weary maintenance crews working on a round-the-clock operation. In a few days most routes were open on a "subject to delay" basis; within two weeks traffic generally was normal.

U.S. 60 Freeway

Traffic Flows Over New 5½-mile Riverside Section

By TAYLOR SMITH, Resident Engineer

The first unit of the relocation of U.S. Highway 60 skirting the City of Riverside was completed in 1961, and the second and final unit was completed in January, 1963. The first 2½-mile section stated at Orange Street in Riverside and extended southeasterly to the existing four-lane section of Highway 60 near the University of California at the east city limits. Completion of the second section, 5.6 miles in length, between Sunnyslope and Orange Street greatly reduces traffic congestion on two of the city's principal east-west streets which previously served as the highway.

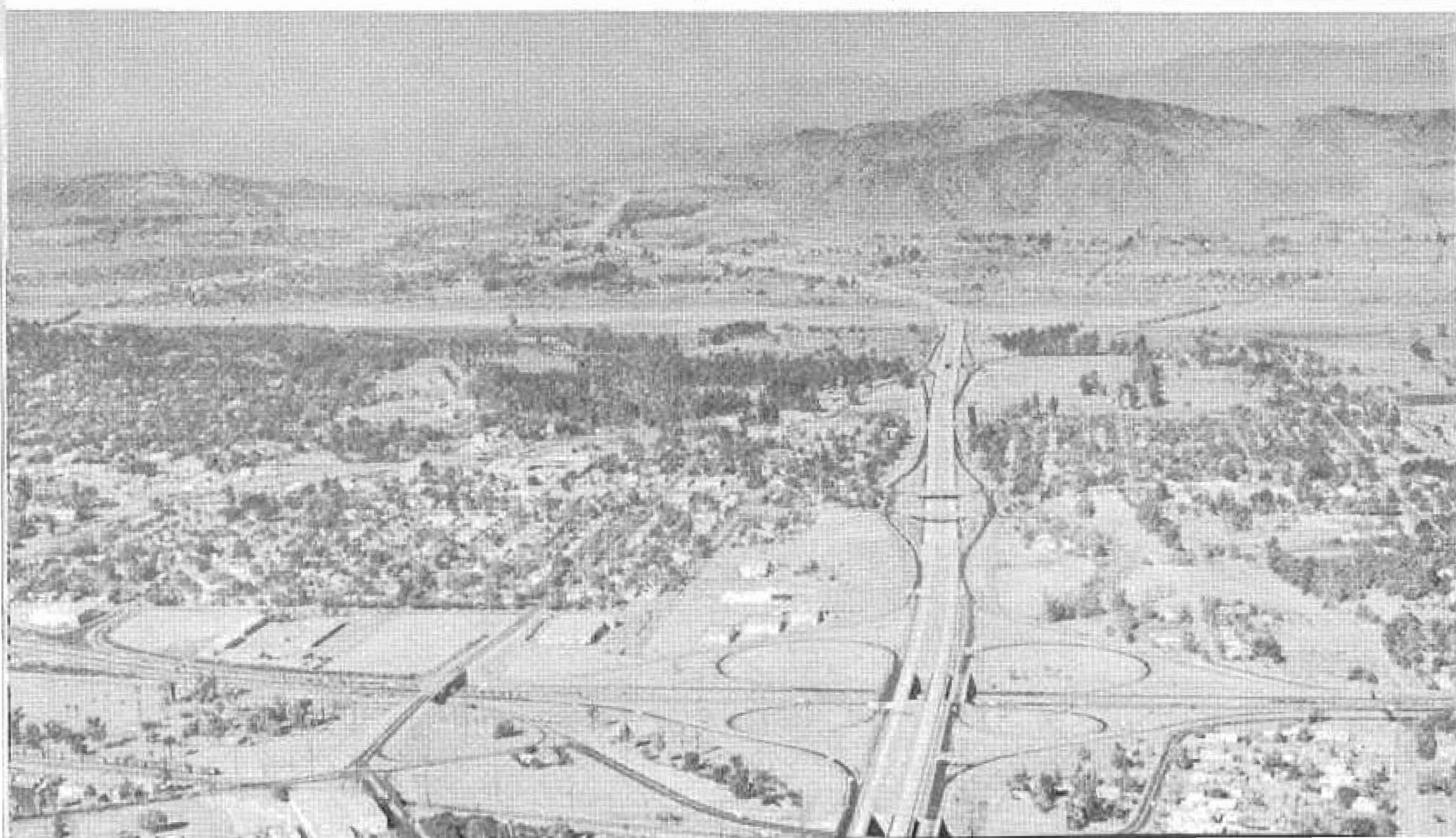
The route for this freeway was adopted early by the California Highway Commission in July 1954, primarily to assist city planners. It is interesting to note that the engineering for this project was sufficiently advanced so that the district was able to purchase property necessary for the freeway whenever a property owner desired to sell.

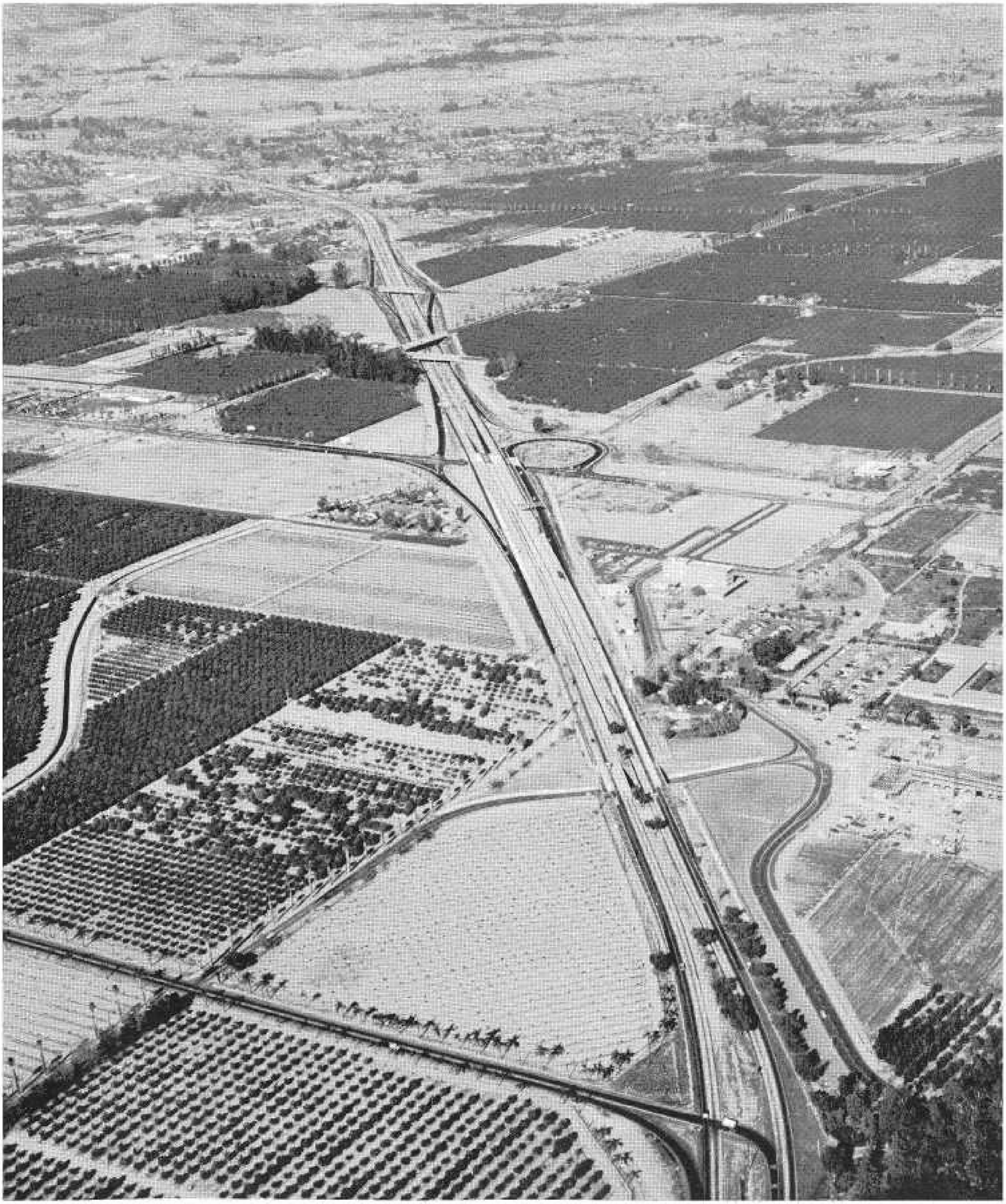
Enough Land Acquired

The new freeway is a four-lane divided highway with a 46-foot median. Sufficient land has been acquired for widening to six lanes with a 22-foot median when necessary. The through traffic lanes are of portland cement concrete over cement-treated base. Three overhead structures carry the roadway over the Union Pacific Railroad at Sunnyslope, the Atchison, Topeka & Santa Fe Railroad at Down Street, and the Southern Pacific Railroad at Chicago Avenue. A reinforced concrete bridge 1,054 feet long spans the Santa Ana River. A full cloverleaf separation was constructed at the junction of U.S. Highway 60 and U.S. Highway 91. Spaced throughout the two projects, 12 structures are provided for cross traffic on local city streets.

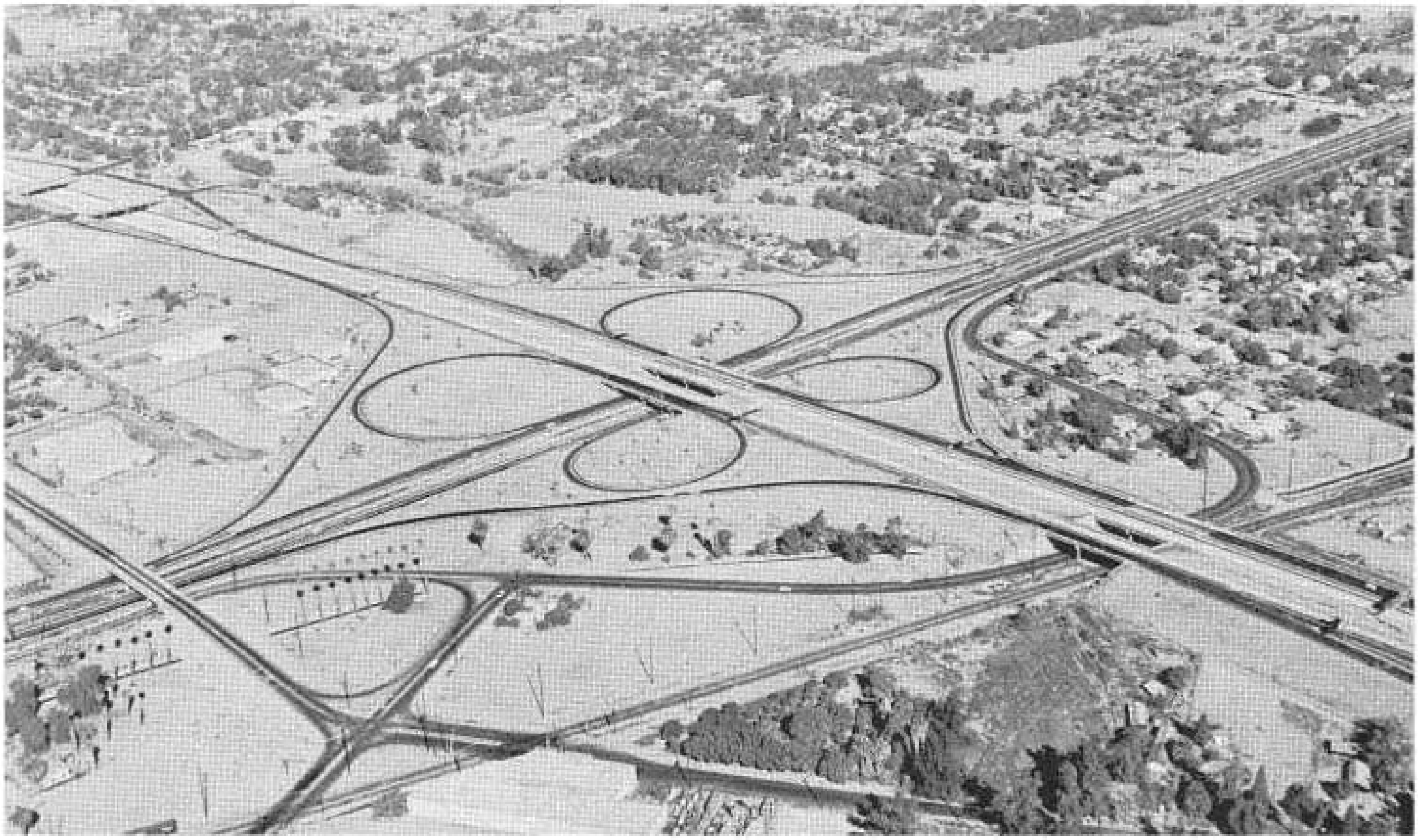
Portions of the embankments for the relocation were constructed with excess material from adjacent projects prior to the final contracts. In 1957, 325,000 tons of excess material from channel widening of the Santa Ana River was placed in the roadway prism. In 1959, 412,000 tons of excess excavation from construction of the north-south Riverside Freeway and 116,000 tons of excavation from interim construction of railway separation structures on the existing route of U.S. 60 in Riverside were placed in the embankments of the relocation. An additional 793,000 tons of imported borrow were placed under the two final contracts.

Looking west along the new alignment of U.S. 60 with the north-south Riverside Freeway in the foreground and the Santa Ana River in the background. Palm trees have been transplanted in the interchange area.





Looking northwest along the new alignment of U.S. Highway 60 from the University of California (right foreground) at the east city limits of Riverside, showing the Eighth Street Undercrossing, Linden Street, Iowa Avenue, and Blaine Street Overcrossings.



The U.S. Highway 60/395 Interchange with the Main Street and Orange Street Overcrossings at the extreme left and the Down Street Overhead at the right. Many of the transplanted palm trees are visible in the contour-graded areas.

Conventional Equipment

Conventional paving equipment placing 12-foot lanes with steel headers was used to place the concrete pavement on the completed unit between Orange Street and the university.

Lewis slip-form paving equipment was used for placing both cement-treated subgrade and concrete pavement on the second unit. The concrete pavement was placed in two-lane widths. A recent addition to the paving machine was a mechanism for placing a continuous polyethylene plastic paper in lieu of sawing the longitudinal joint between traffic lanes. Excellent results were obtained with the device which was occasionally referred to as the "outboard motor which pushes the paving machine."

The existing highway, relinquished to the city following completion of the relocation, has been improved by other interim projects in recent years. The old Mission Bridge across the Santa Ana River, was replaced with a new structure in 1958. The work was performed by the Division of Highways acting as agent for the Riverside Flood Control District, concurrent with Santa Ana River control work by the U.S. Army Engineers. In 1959, three underpasses and two railway separations were constructed on Eighth Street east of the Riverside Freeway. All of the city streets serving as the highway were resurfaced prior to relinquishment.

Travel Time Savings

The 7.8-mile relocation does not provide a savings in distance for through east-west traffic, but does effect a 10-minute savings in travel time by eliminating 15 traffic signals. It is estimated that the annual savings in time alone for through traffic will exceed $350,000.

An unusual request to modify the planned drainage system west of Bloomington Boulevard, so as to intercept and divert a portion of upstream drainage and dispose of it through a modified median storm drain, was received from the Riverside County Flood Control and Water Conservation District after construction had started on the project between Sunnyslope and Orange Street.

Although the project plans provided for construction of an 8-foot x 5-foot reinforced concrete box culvert to carry upstream drainage across the right-of-way without altering the existing drainage pattern, winter rains during the past season caused a great deal of apprehension among property owners downstream from the right-of-way.

Riverside County officials, recognizing that remedial action was necessary, faced the problem of either constructing a drainage system to take the water underground from the outlet of the culvert southerly through the suburb of Rubidoux to the Santa Ana River or having the Division of Highways modify its planned drainage system so as to divert the water to the Santa Ana River within the State's right-of-way. Inasmuch as the latter would eliminate costly utility relocations, would not disrupt local traffic, and would be less expensive, the county flood control district requested that the Division of Highways modify its planned drainage system by enlarging and extending the original design so as to intercept up to 85 cubic feet per second of storm runoff at the inlet of the planned culvert crossing the right-of-way.

County Does Design Work

Through the co-operation of county and state officials, agreement was reached whereby the county performed the necessary design work and bore the increased cost of the system. The work was performed by the contractor, the Winston-Green Company, concurrently with his other operations. County officials estimated that a savings of $50,000 to the county was realized by eliminating the need for the underground system downstream from the right-of-way.

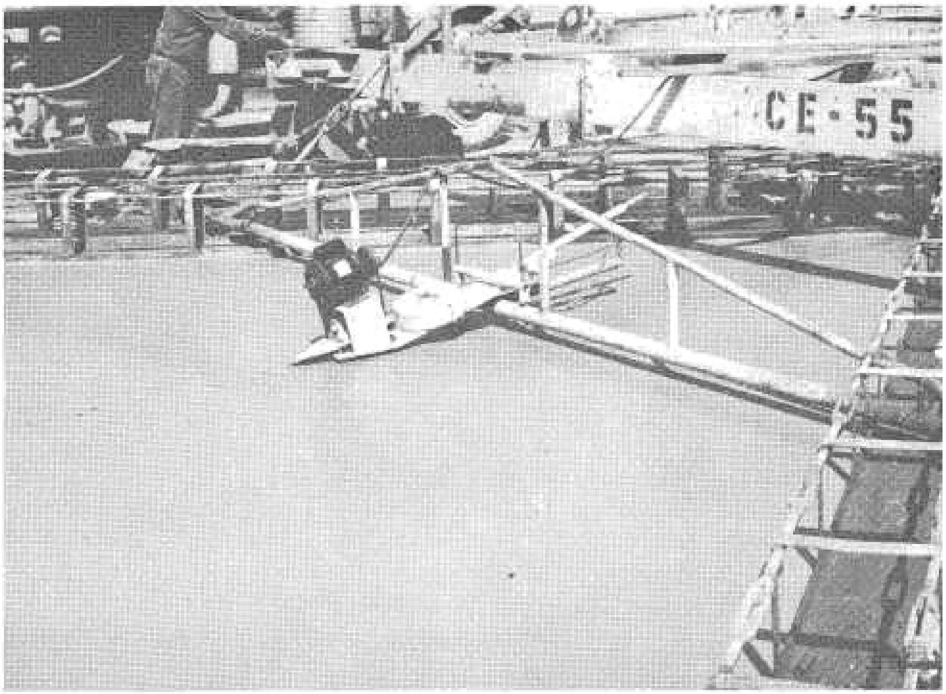
Although the section of roadway between Orange Street and the university was officially opened to public traffic on October 25, 1961, with appropriate ribbon-cutting ceremonies attended by state and local dignitaries, westbound traffic had a preview of the new freeway two weeks earlier. The International Raceway, located east of the City of Riverside, conducts the Grand Prize Sportscar Race each October. The race annually attracts an estimated 75,000 racing enthusiasts, whose exodus in 20,000 vehicles following the race has in the past caused monster traffic snarls.

In an attempt to alleviate the traffic congestion following the race, Riverside officials and the California Highway Patrol petitioned the contractor and the Division of Highways to open the westbound lanes of the freeway following the race to permit Los Angeles-bound traffic to reach the north-south Riverside Freeway without using the existing highway through the city. Although all surfacing had been completed on the westbound lanes, work on illuminated signs, roadside signs, guardrail, guideposts, etc., was still in progress.

Through the excellent co-operation of the contractor and city and state forces, temporary direction signing was erected and mobile generators provided to illuminate incomplete sign structures. The westbound traffic lanes between the university and the separation at the Riverside Freeway were opened at 3 p.m. and closed at 7 p.m. on October 16. Although an estimated 20,000 vehicles used the westbound lanes in the four-hour period, only one minor rear-end collision occurred and no damage was inflicted on the highway facilities. In previous years, with traffic on the old highway, the Riverside Police Department required 24 officers to direct and control traffic; while with traffic on the freeway, only 7 officers were required. All agencies concerned in the temporary opening of the roadway received many favorable comments.

The E. L. Yeager Company, E. L. Yeager Construction Company, Incorporated, and J. B. Stringfellow were the contractors on the completed $3,875,000 unit, with Resident Engineer Taylor Smith representing the State.

The contractor on the $4,860,000 unit recently completed is the Winston Brothers Company and Green Construction Company, with K. B. Stone, Resident Engineer for the State. D. B. Jennings acted as Bridge Department representative on both contracts.



The mechanism mounted on the slip-form concrete paving equipment places a continuous polyethylene plastic paper joint between traffic lanes.

BPR Announces New U.S. Road Totals

Roads and streets in the United States, under the jurisdiction of all levels of government, totaled nearly 3.6 million miles in 1961.

The data, compiled by the U.S. Bureau of Public Roads from information supplied by the states, show that rural roads comprise slightly over 3.1 million miles of the United States total; municipal roads 446,000 miles.

Some 985,000 miles of all roads and streets in the United States are unsurfaced. Of the surfaced mileage, 1.3 million miles are soil-surfaced or have surfaces of gravel, crushed stone, or slag. Nearly 1.3 million miles have surfaces ranging from bituminous surface treatment to bituminous and portland cement concrete.

The road and street systems in the United States have grown but little in extent, proportionately, in recent years. The nation's needs lie generally not in more mileage but in improvement or replacement of existing highways. As one indication of improvement progress, the mileage of unsurfaced roads and streets has been declining at an average rate of 3 percent during recent years.

Pixley-Tulare

13-mile Section on U.S. 99 Converted to Full Freeway

By K. P. OLIPHANT, Assistant Highway Engineer

Freeway conversion of 13 miles of U.S. 99 in Tulare County between Pixley and Tulare Airport was completed in November.

This project, beginning in May 1961, involved the construction of five interchanges, reconstruction of one mile of the east and west lanes near Quail and reconstruction of the west lanes from Tipton to the Tulare Airport. The construction cost was $3,400,000. Griffith Company was the contractor.

One of the most critical phases of this project was the construction, signing, and striping of detours to route motorists safely through the area. Detouring high-speed traffic on any road is a serious problem. Traffic on U.S. 99 through this part of the southern San Joaquin Valley is not only high speed, it is also relatively high in volume, averaging 14,000 cars

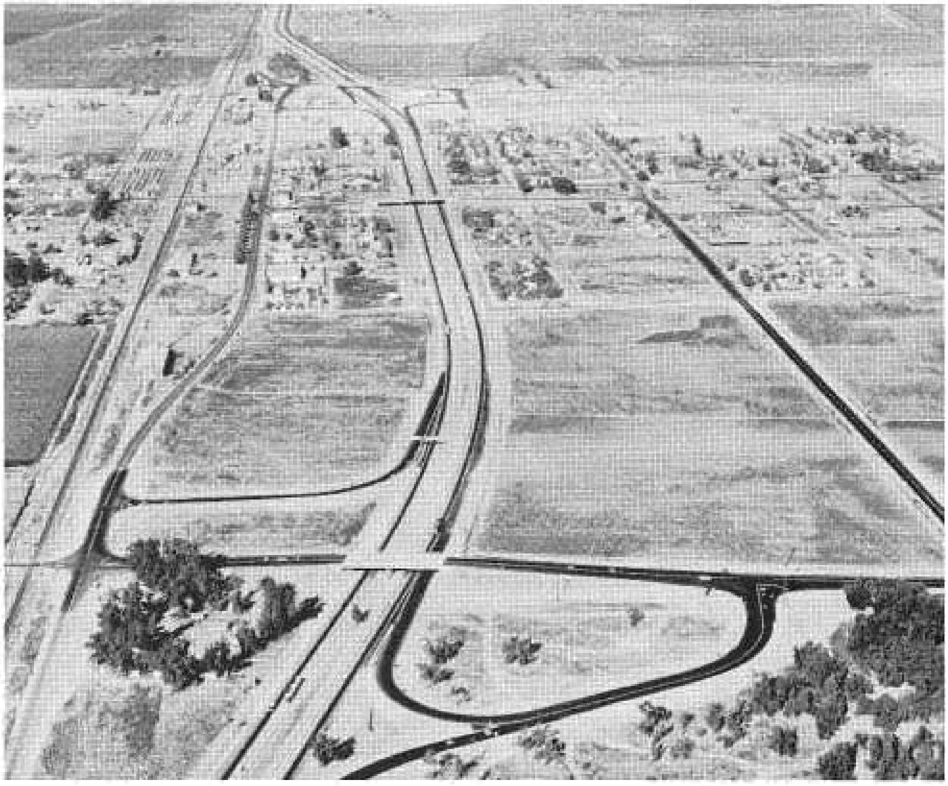


PHOTO ABOVE. Sign Route 190 intersecting U.S. 99 Freeway in foreground. Community of Tipton in upper part of photo. BELOW. This photo shows oversize signs cautioning motorists of "detour ahead."

per day. In order to provide for maximum possible safety for the traveling public, a great deal of planning, many new ideas, and strict traffic controls were incorporated into the detours.

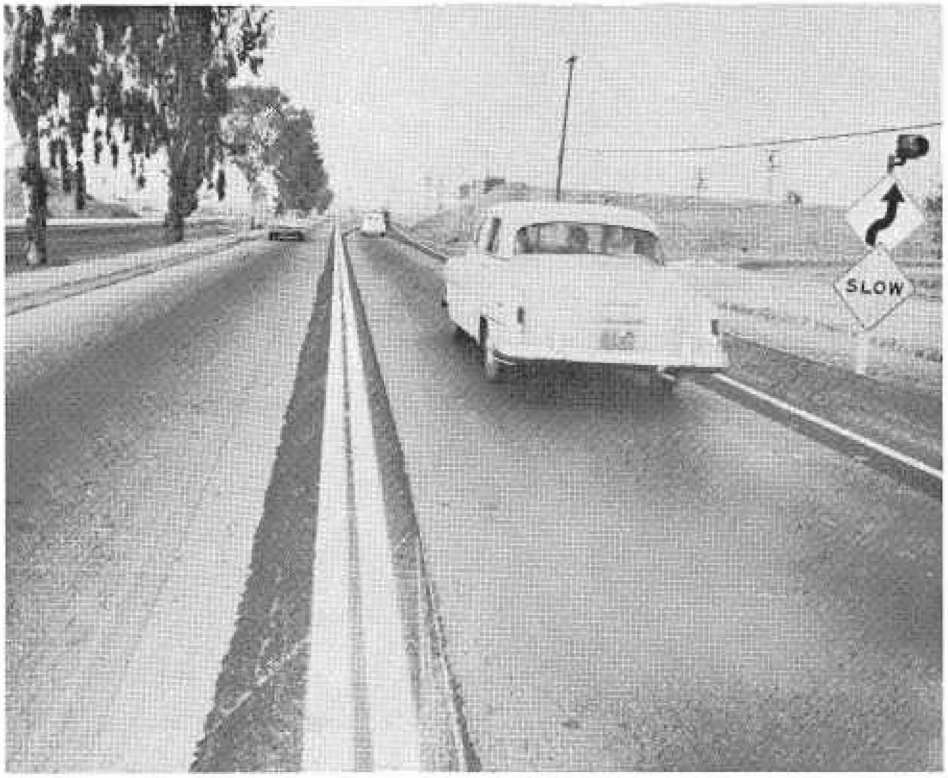
Some 4-lane Detours

Plans called for two-lane detours of a four-mile section between the Tule River and the Tulare Airport, and for four-lane detours from Tipton to the Tule River and a section near Quail. The two-lane detour was, of course, the most critical from traffic safety standpoint. Accordingly, the construction time schedule for this section was under very strict control, specifying only 82 working days for the completion of the west lanes, to be constructed in two separate parts. The first part was to be completed and opened to traffic prior to starting work on the second part. The contractor's forces performed very efficiently during this phase, completing the west lanes in only 71 working days.

With the knowledge that the motorist had driven many miles of full freeways, both north and south, of this project without the necessity for changing speed or making abrupt changes in alignment, we were confronted with the problem of providing the traveling public with the maximum advance information that the situation ahead was going to be different. Therefore, a number of oversize signs were installed. Many of these were made on plywood and were four feet by eight feet, and six feet by eight feet in size. Some of these warning signs were supplemented with flashing lights to further call attention of the approaching change.

Asphalt Blanket Placed

In the past, considerable difficulty had been encountered at the beginning of detours were traffic was forced to leave the concrete lanes and turn onto a blacktop detour. In order to reduce this problem to a minimum and to provide the motorist with the most adequate and visible turnoff to the detours, an asphalt concrete blanket was placed over the concrete pavement from the point where the detour centerline first deviated from the existing concrete pavement centerline.



This photo shows temporary "no passing" pad down the center of the roadway.

Channelized intersection delineation on asphalt concrete overlay.

U.S. 99 freeway looking north to intersection of Sign Route 190.

Additional delineation of the detour turnoffs was provided for by the installation of six-inch asphalt concrete dikes, with alternate sections painted white, along the outside edges of the detour curves. The turnoffs were further delineated by placing guide posts in paint buckets, behind the dikes. On the second-phase detours, paint buckets with reflective tape on the buckets were found to be more effective than guideposts.

Less Confusion

It was found that the above-described turnoffs worked more efficiently and with far less confusion to the traveling public than turnoffs where no overlay was used and where the turnoff was delineated by using large yellow barricades, reflectorized arrows and nine-unit reflectors.

The county road intersections were included in the phase I two-way detour. Channelization at these intersections was developed by widening one of the shoulders to provide sufficient width for left turn storage lanes. This was accomplished by overlaying the concrete pavement and painting the islands.

The project plans provided that no passing was to be permitted on any section of two-lane detour. An innovation used on this project, which worked extremely well, was a one-inch by two-foot asphalt concrete pad placed down the centerline of the east lanes for the primary purpose of painting a temporary "no passing" stripe. Next to increased traffic safety, one justification for the installation of this pad was to decrease the cost of and speed up the operation of stripe removal when it was no longer needed.

Stripe More Visible

Observation of traffic and inspection of the detours under all conditions indicated that the pad was extremely valuable. Since not only did it make the "no passing" stripe more visible, it also served as a deterrent to crossing the centerline. Very little violation of the "no passing" stripe was observed on the detours on this project.

The contractor and the California Highway Patrol contributed much to the effective operation of these detours. California Highway Patrolmen who drove the detours under all conditions were especially helpful with suggestions for improving their efficiency and safety. The detours were also driven regularly at night by some of the State's engineering personnel. These inspections frequently resulted in minor revisions to improve the detours.

We believe the innovations used in the design of these detours contributed significantly to the safe travel of motorists through the construction project.

HILL, DEFFEBACH, WEBB ARE NAMED TO NEW POSTS

Appointment of George A. Hill as traffic engineer for the Division of Highways and promotion of Richard E. Deffebach to succeed Hill as district engineer—planning, for the Los Angeles district has been announced by State Highway Engineer J. C. Womack.

Hill succeeds George M. Webb as head of the division's traffic department.

GEORGE HILL

Webb, a 34-year employee of the Division of Highways, has been assigned to the newly established position of traffic engineer – special studies, with responsibility for special research projects in the field of traffic as related to route planning.

Deffebach, the new district engineer, will be responsible for route studies, advance planning and programs and budgets for the state highway system in District VII, comprising Los Angeles, Orange and Ventura Counties. For the past four years he has been an assistant district engineer.

Joined Division in 1936

Deffebach was born and raised in Los Angeles and attended Los Angeles City College. He worked for the Division of Highways between 1936 and 1938, and then worked in manufacturing in Los Angeles. He returned to highway work in Southern California in 1940, and served with the Seabees in World War II, in the Pacific Theater and at the training center at Pleasanton.

In November 1945, Deffebach returned to District VII as an assistant highway engineer on construction projects. He became design engineer in 1953 and in 1958 was promoted to assistant district engineer.

RICHARD DEFFEBACH

Deffebach and his wife, Mildred, have two daughters, Nancy and Judy.

Hill, whom Deffebach is succeeding as district engineer—planning, has held that post since January 1960. He is a native of Oakland, and received his civil engineering degree from the University of California at Berkeley in 1937. He joined the Division of Highways the same year and served most of the next nine years in District VI (Fresno), except for World War II military duty with the Army Engineers in Alaska and the Pacific.

Studied at Yale

In 1946 Hill went to Yale University for a year's graduate study in traffic engineering. On his return he was assigned to District IV (San Francisco), and served there until 1953 in construction, traffic analysis and planning functions. In 1953 he was assigned to the design department in division headquarters in Sacramento and in 1955 became chief assistant engineer of design.

GEORGE WEBB

Webb was born in Prineville, Oregon, and was educated in that State. He went to work for the Oregon Highway Department in 1919. In 1928 he came to California and worked as an instrumentman on the location surveys for the Feather River Highway.

Varied Assignments

From 1929 to 1937 he was a resident engineer on construction projects in the Redding district, then spent a year with the division's bridge department in Sacramento. From 1938 to 1942 Webb held various assignments in the Eureka district, including that of district traffic engineer.

From 1942 to 1953, except for 2½ years as an officer in the Army Transportation Corps in World War II, Webb was an assistant traffic engineer and assistant planning engineer at the division's Sacramento headquarters. He was promoted to traffic engineer in 1953.

TWENTY-FIVE-YEAR LIST

The following employees received 25-year awards since the September-October issue of the magazine.

Headquarters Office

Clyde I. Basler
William B. Carter
"Joe" Palmer
Stephen S. Pavitt

Bridge Department

Edward M. Derby

Materials and Research Department

Jessie E. Early
Gifford V. Stafford

Headquarters Shop

Leland Lane Wall

Shop 6

Ida M. Noble

State-owned Toll Bridges

George P. Higgins

District II

Ellis C. Engle
Robert A. Murry
Phyllis A. Pollard

District IV

Will F. Bruning
George W. Lee
George L. Richardson
Gum Y. Wong

District V

Frances Marjorie Fisher
Paul W. Freeborn

District VI

Winfred Earl Thomas

District VII

Richard E. Deffebach

District VIII

Dana A. Yates

District IX

Henry C. McAllister
Matias Perez

District X

Glenn H. Barr
M. F. Mason
John J. Quinn
Robert R. Westphal

Skidproofing

Deck Roughening Carried Out At Night to Minimize Delays

By R. D. KINSEY, Assistant District Engineer

The deck of the El Cerrito Overhead in the City of Albany on U.S. Highway 40 was recently serrated in order to provide increased surface traction in wet weather.

The El Cerrito Overhead was originally constructed in 1936. This structure is now carrying three lanes of northbound traffic as part of a six-lane freeway. Due to very heavy traffic through this location, now in excess of 37,000 vehicles per day, the bridge deck had lost some of its surface resistance.

Previous experiments have been satisfactorily carried out in District X at Turlock and District VI at El Tejon, both on U.S. Highway 99. These indicated that small grooves cut longitudinally in the deck would materially increase any traction when the surface is wet.

Commission Allots Funds

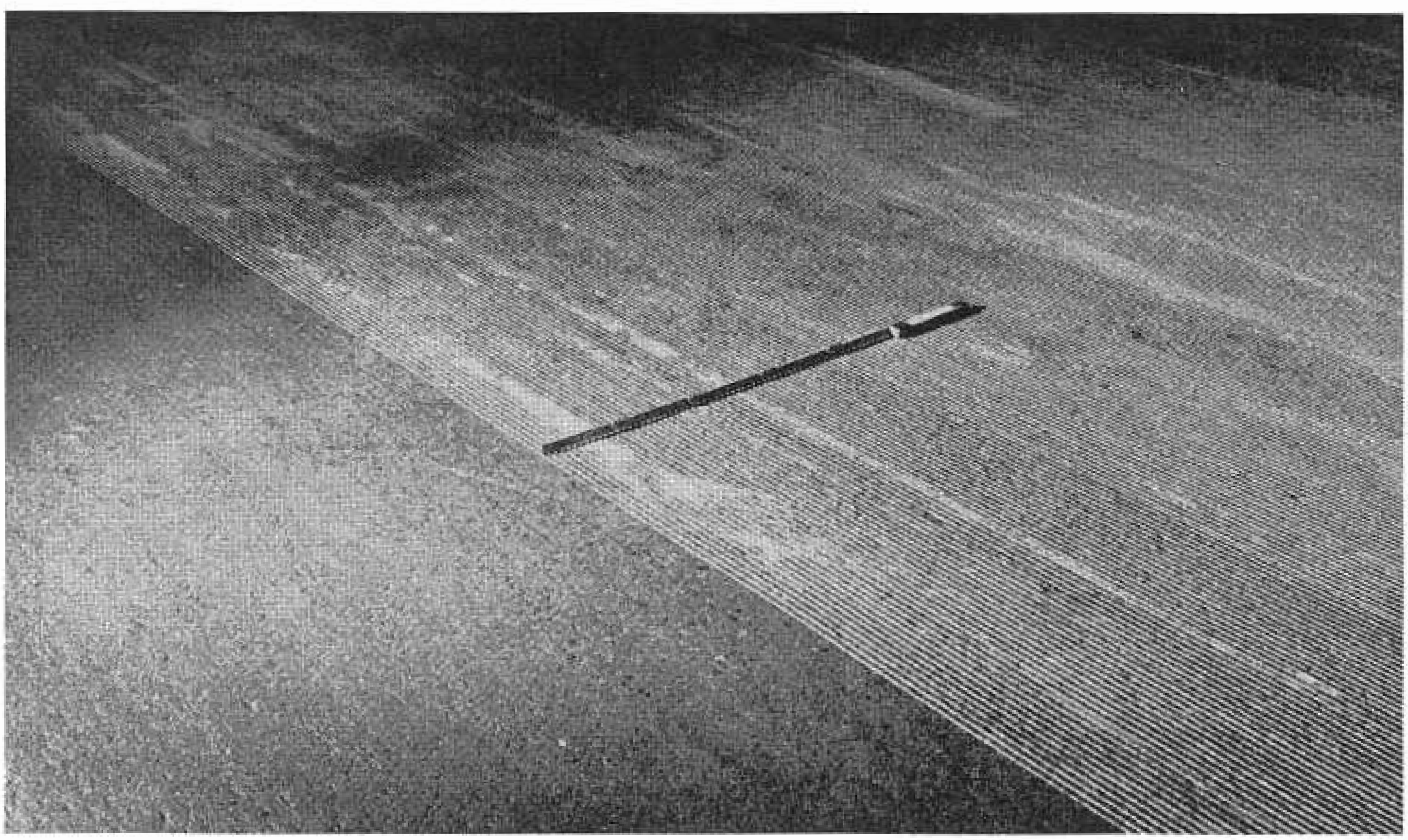
The California Highway Commission allocated funds on June 26, 1962, in the amount of $16,500, to provide for 81,000 square feet of deck roughening. The roughening was performed by using a concrete bump cutter with $\frac{1}{8}$-inch wide diamond faced saws spaced $\frac{3}{16}$ inch apart and in a gang saw 24 inches in width. Cutting operations required twenty passes for the entire width of the bridge, which is 1,500 feet in length.

Before work was started on this surface, extensive investigation was made as to the hours of minimum traffic load. It was determined that the only time it was possible to reduce the number of traffic lanes on this structure would be during the night between the hours of 8 p.m. and 6 a.m. All work on the structure was performed between these hours commencing at 8 p.m. on Monday and completing at 6 a.m. on Saturday.

Skid Resistance Increased

Skid resistance tests made after completion indicated that resistance had been increased with a minimum coefficient of friction of 0.26 and a maximum of 0.35, the average being 0.32. On this project $\frac{1}{8}$-inch wide cutter blades were used, and a spacing of $\frac{3}{16}$ inch apart was determined as the best for the desired results.

A closeup of the bridge deck after a section (right) had been cut to increase skid resistance.



Important features of the machine operation and speeds have not been evaluated here. Costs of this method will vary as a function of the speed of operation of the equipment. In this case higher costs than usual resulted because of the nighttime operation and heavy traffic conditions. On this project the total final costs were $13,800. This represents a cost of $0.16 per square foot.

The results of the operation were very effective and indicate that the worn surface of concrete can be satisfactorily made more skid resistant in wet weather by this procedure.

Harry Mathewson

J. Harry Mathewson, Assistant Director of the Institute of Traffic and Transportation Engineering at the University of California at Los Angeles, died on October 11, 1962.

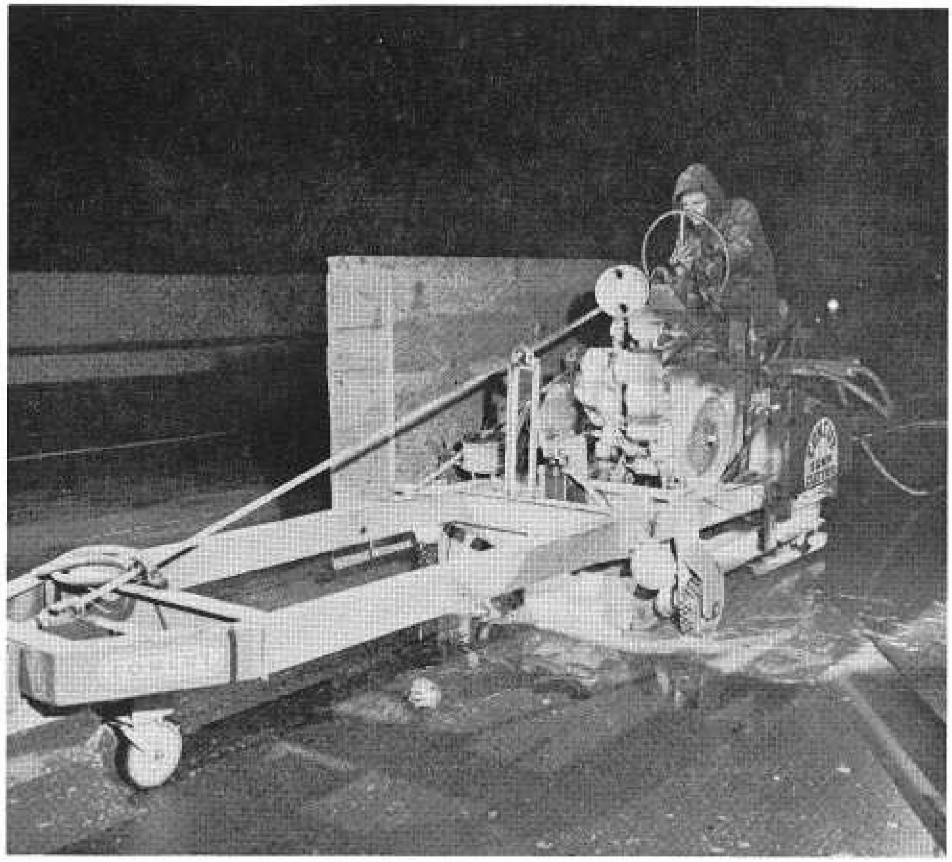
He played a leading role in the development of the institute's research activities, including the Los Angeles group's major contributions in the fields of automobile collision research and driving simulation.

Mathewson aided in many co-operative studies with the State Division of Highways, one of the most recent being the bridge rail testing in conjunction with the bridge design of the San Francisco Skyway.

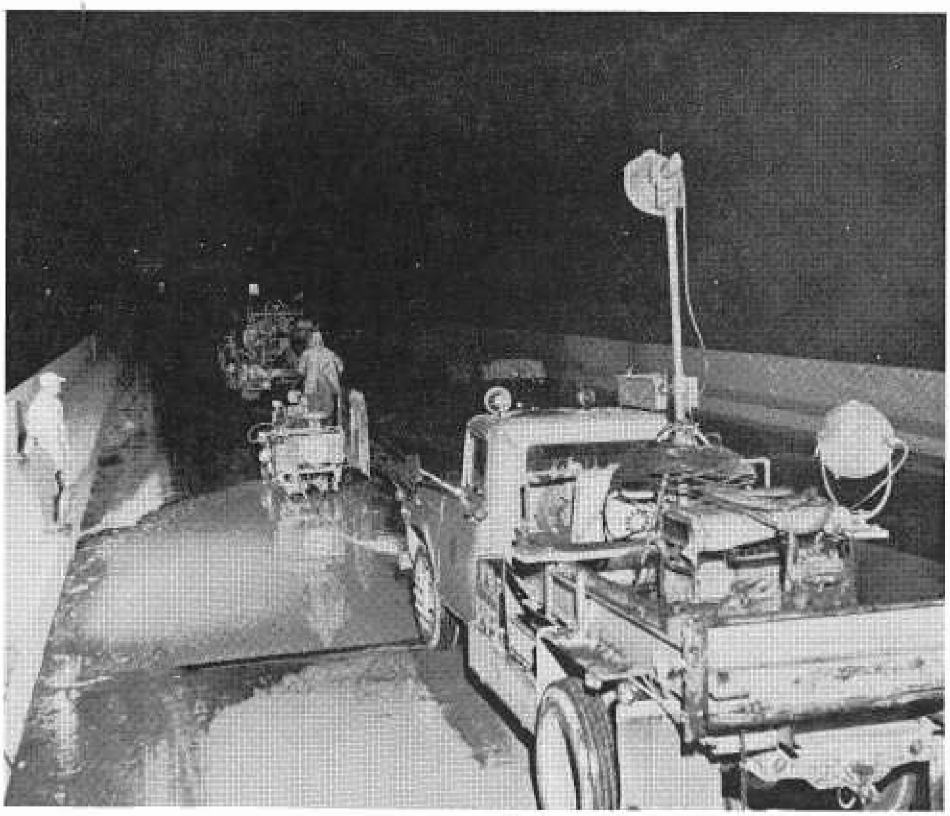
Mathewson was born in Scotland in 1899. He was graduated with honors from the University of Michigan in 1931. From 1931 to 1942 he spent five years teaching at the University of Toledo and six years in private engineering. He obtained his M.S. degree in engineering in 1938.

During World War II he served as safety consultant to the U.S. Air Forces for two years, then in the grade of lieutenant commander as assistant head of the Safety Branch, Navy Department, from 1944 to 1946.

He joined the University of California at Los Angeles in 1946, holding the National Safety Council professorship in engineering. He participated in establishing the ITTE at Los Angeles, being appointed assistant director in 1948.



A closeup of the cutter used in the surface cutting operations.



A photo of the train of equipment used showing the water supply truck in the background and the cutter and light truck in the foreground.

Lady Engineers

Professional Role of Distaffers In Highway Work Increasing

By LOUISE GOHDES, Assistant Information Officer

California's Division of Highways employs women engineers ranging from the associate level down to junior civil engineer—and may soon have women stepping up into the ranks of senior highway engineer. A capable woman "mans" the position of personnel officer for this agency of 16,000 employees. And still other women hold responsible positions in various categories.

Far from being an innovation, this situation has existed since 1948, when Marilyn Jorgenson, with a brand new degree in civil engineering from the University of Minnesota, received her appointment as junior civil engineer in Los Angeles. And although now the division has quite a number of women in the profession (District VII—Los Angeles, Ventura and Orange Counties—alone has eight associate and assistant engineers of the fairer sex), Marilyn has chalked up a few firsts. She was the division's first woman to become associate highway engineer, and she was the first woman squad boss in charge of a design crew.

Associate Highway Engineer Ann Hansen looks up from notes as she reviews a scale model of future District IV freeway project. Technical reports and research are a major part of her work in Traffic Engineering.

In 1957 Marilyn became Mrs. Alvin Reece, and is now the mother of four-year-old Kirsten—blonde, like her mother. How does *Mr.* Reece react to his wife's being an engineer? He's proud! And he himself is an engineer—with the Los Angeles County Flood Control District.

Designs Interchanges

Back to Marilyn, and what she does. She's recently gained distinction through supervising the design of the three-level San Diego-Santa Monica Freeway Interchange, with new high-speed ramps. Both the San Diego and the Santa Monica are interstate system freeways.

Because speed standards for on- and off-ramp traffic flow were recently upgraded, Marilyn reworked angles of curve radii to accommodate speeds of 50-55 miles per hour. This was only one of many changes with which she had to deal as new specifications were developed. She says that the present design was finally approved 2 years—and 30 preliminary plans—after the project was originally assigned to her.

Because plans had to be drawn around a school, a church, a sanitarium, and several large apartment buildings, the design presented additional challenges. Eight people worked with her on the project. As now designed, the southbound San Diego to westbound Santa Monica link of the freeway marks it as the largest single span branch connection in the state's highway system. Since acceptance, her plan has been used as a prototype of bigger and better interchanges to come.

Lifetime Work

Marilyn finds the work so interesting that she expects to stay at it "for the rest of her working days." She finds it extremely satisfying to see the fruits of her labors take form in steel and concrete. And her efforts are now bent toward advancing to senior highway engineer. She feels that women

Associate Highway Engineer Marilyn Reece, who supervised design of 3-level San Diego-Santa Monica Freeway Interchange in Los Angeles, has on-site discussion with Assistant Resident Engineer Thomas McKinley.

have a definite advantage in the field of engineering, and, says she, "if there's any prejudice toward women, I've not encountered it. Men have always been very helpful; and being a woman has never hampered me in my career."

Then there's Carol Schumaker, slender, brunette, and 32 years old. She, too, is an associate highway engineer; has been with the division for eight years, and is eligible for appointment to the position of senior highway engineer by virtue of having passed the required civil service examination. Via night classes, she's working on her master of science degree which she expects to receive by June of 1964.

Her desire to become an engineer had already formed in high school, because of her liking for math, physics, and the sciences. Following her course at Purdue University, she graduated of study at Purdue University, she graduated in 1952, with the degree of B.S.C.E. About half way through her senior year she married Bernard Schumaker—also a Purdue graduate, and also an engineer.

Husband a Teacher

Bernard has recently taken leave of active engineering to become a high school math teacher at Garden Grove. But Carol remains in highway work. At the present time her main project is working out plans for another segment (she's just completed work on one segment) of the San Diego Freeway. This is a 4.8-mile section near the San Gabriel River which will incorporate several important interchanges. The biggest thing she's been involved in is the interchange of the San Gabriel, Garden Grove, and San Diego Freeways—a really big interchange near the Los Angeles-Orange county line. Although only two levels, it has many complicated connections.

Outsiders who make appointments with an engineer by the name of Schumaker invariably do a "double take" when they find themselves face to face with a 5-foot-2 miss who weighs scarcely more than 100 pounds.

The Schumakers take son Paul (age 9) on carefully planned vacation trips

Noting District VII's freeway progress, Associate Highway Engineer Carol Schumaker indicates one of the project locations in Los Angeles County. Design is Carol's present assignment, following several years each in Advance Planning and Drainage Departments.

each year. Last year, of course, it was the Seattle World's Fair.

12 Female Assistant Engineers

There are still other lady engineers in District VII. Six hold the rating of assistant highway engineer, only one civil service class below Marilyn and Carol. Other districts, too, have women in this classification—making a total of 12 women assistants throughout the State.

In San Francisco, Ann Hansen has recently returned from a leave of absence for a European tour, to reoccupy her post as associate highway engineer in District IV. She believes Italy to be doing most in multilane highways—all toll—and mainly around Milano, which has become quite an industrial center. While in London, Ann visited the Road Research Laboratory, which is part of Britain's Department of Scientific and Industrial Research. With their staff she discussed their studies covering many phases of accidents, traffic, and safety.

Being in District IV's traffic department, Ann writes technical reports, conducts research, and analyzes data. She, too, has passed the exam for senior highway engineer, having started as junior civil engineer in 1951, just after graduation from University of Utah. Following experience in planning and design, Ann spent 3½ years on two important construction projects: the Waldo approach to the Golden Gate Bridge, and the Marin approach to the San Rafael-Richmond Bridge. In addition to inspecting all fencing and curb work, electrical items and all utility relocation and installation, she co-ordinated work among the various utility companies, subcontractors, and prime contractor.

Skiing, Cooking, Dogs

Ann's outside interests reach in many directions, among them skiing, swimming, cooking, interior decorating . . . and dog training! She regularly gives much time to work at San Rafael General Hospital. Ann has also done a good bit of modeling—now shelved, as she prefers to concentrate her energies on her job. In connection with her interests she served as president of the Marin chapter of the National Society of Professional Engineers; and she's just applied for membership in the Society of Women Engineers—also a national organization. Also, she's applying for a higher grade in the Institute of Traffic Engineers.

Further demonstrating the effectiveness of women "in high places" is Marian Smith, personnel officer for California's Division of Highways. Having begun in highways personnel on a two-week emergency basis after her graduation from Stanford in 1941, she stayed for about a year and a half, at which time she felt her country's call to duty. For four years she served in the WAVES, attaining the rank of lieutenant. Returning to civilian status, she again found her niche in the personnel department, as personnel analyst. In 1955 she became personnel officer, and as such she supervises the personnel program for the division's 16,000 employees in 348 different classifications in 27 locations.

Busy Job

The duties of a personnel officer sound overwhelming, and almost are to the layman. Just a half-hour in Marian's office, punctuated with phone calls, gives one an idea of what comes across her desk. People call in from everywhere: throughout the

State, other state agencies, and throughout the building. There are questions involving union labor. There's the problem of a state-employed mother who would like to relocate for reasons of her children's health. There are deliberations on sick-leave interpretation. On occasion, she is a "convenient shoulder to cry on," for both supervisors and employees.

A great deal of Marian's time goes into analyzing positions, classifications, and salaries, and keeping tab on the "changing scene" to meet current personnel needs. For example, she's currently involved with the reorganization of the division's accounting department on a statewide basis, and thus dealing with both administrators and employees as to duties, workflow, and similar matters. Last year a new series of classifications for maintenance men was established, clarifying job status, and also recognizing the changing skill requirements in this field. A similar revision is in the offing for landscape workers. In 1961 a series of engineering technician classes was established.

Must Predetermine Needs

Marian must predetermine employment needs of all sections within the division, seeing that adequate eligibility lists exist, and requesting civil service exams to be scheduled as required. To keep personnel activities running smoothly throughout the State, Marian visits each of the 11 districts and the toll bridge headquarters approximately twice each year. She was 1961 chairman of the State Personnel Officers Council, which comprises personnel officers of all state agencies and meets once each month to discuss various phases of the state personnel picture.

Among Marian's many continuing responsibilities are performance appraisal programs, along with development of improved work standards and methods. There's many a discussion with employees regarding opportunities to advance. All get genuine consideration from Marian whatever their problem: funny, trying, or challenging.

Slim, Alert, Friendly

Handling all of this, and still more, the slim, alert, and friendly Miss Smith still finds time for outside activity. She's active as a Sunday School superintendent, and active also in the American Association of University Women. During vacation she travels; and has already been to the Orient, to Europe, and Central America. In 1951 Marian spent six months at Mexico City College, studying international relations and Spanish.

Of the staff of personnel analysts who aid Marian in reviewing classifications and salaries, and in similar duties, several are women. Women also hold jobs in such responsible classifications as accounting officers, professional accountants, research statisticians, delineators, and in other specialized division functions, as well as in clerical posts. All told, California's Division of Highways employs well over 2,000 women, and offers great professional opportunity.

Department Awards Big U.S. 99 Contract

The State Department of Public Works has awarded a $4,331,722 contract to Fredrickson & Watson Construction Co., Oakland, for grading and paving 6.8 miles of four-lane freeway on U.S. 99 (Interstate 5) between 4.6 miles south and 1.5 miles north of Mount Shasta city limits, Siskiyou County. The freeway will be generally west of the city. Included in the project is construction of overcrossings at Azalea Road, South Mount Shasta, Ream Avenue, Lake Street, Lassen Lane, and North Mount Shasta; a pioneer overhead taking the highway over the Southern Pacific Railroad tracks; and an interchange at the junction of U.S. 99 and State Sign Route 89. Other structural work has been under way since October on a separate contract.

Personnel Officer Marian Smith examines the latest Division of Highways staffing pattern, with Personnel Analysts Laura Cameron (left) and Joan Meckfessel. Charted statistics help Marian and her aides recommend proportionate staffing in various districts.

Fossil Find

Contractor's Crew and Division of Highways Men Work Together and Conserve Ancient Relics

Martha Laird, Division of Highways employee, poses holding fossilized section of Hipparion jawbone and teeth, in order to show size of piece.

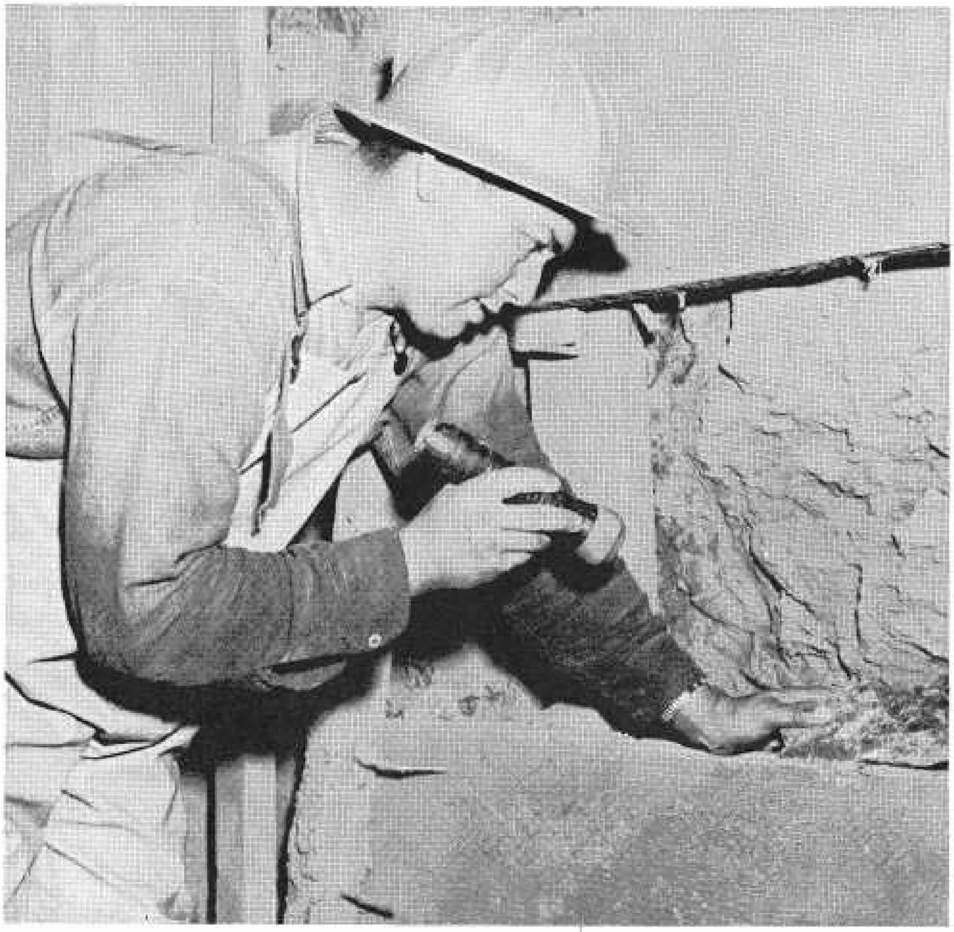
Workers in the contractor's force and two members of the Division of Highways resident engineer staff were commended by University of California scientists recently for their alertness when they preserved valuable fossils found in the bore of the new Caldecott Tunnel east of Oakland. Paleontologists from the University of California were called to the scene in a matter of hours, and expressed considerable gratitude over the find.

Dr. Donald E. Savage, Curator of Higher Vertebrates in the Museum of Paleontology at the university, said, "The really interesting thing is that these workmen, without any special knowledge and working in semidarkness, were able to recognize these fossils as something other than ordinary rocks."

The tunnel, passing through the base of the Berkeley Hills, transects strata of geological ages from recent to as far back as Jurassic, but it was the Orinda formation in which the fossils were found. This is a stream floodplain deposit of early Pliocene age, about 10 to 12 million years old, laid down at a time just preceding the eruption of a few small volcanos in the Berkeley Hills area.

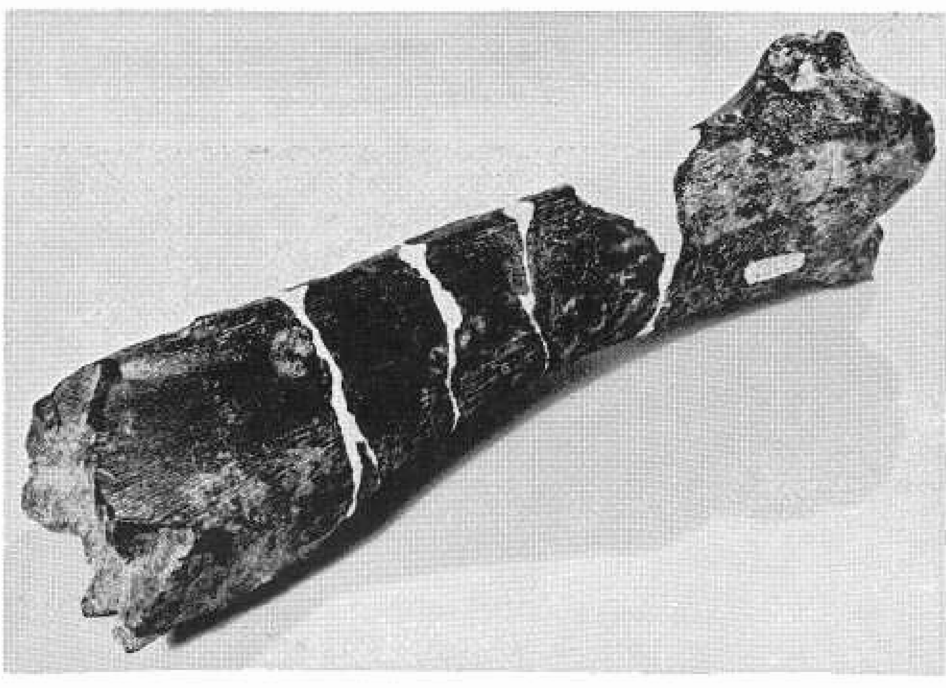
One group of fossils, after being cleaned and fitted together by the university paleontologists, was tentatively identified as the tibia from the legbone of an extinct rhinoceros. This rhinoceros, called *Aphelops*, was more slender limbed and possibly fleeter of foot than its modern counterpart. Although extinct for about 4 million years, it was fairly common in the vicinity at that time, but there was no "Bay area" as we know it today. The Berkeley Hills probably were only low islands or a northward-projecting peninsula in a shallow sea extending toward the base of the Sierra Nevada.

Found in company with the *Aphelops* fossils were two sections of jawbone from a primitive member of the



Above: John S. Maestas, employee of Connolly Pacific, one of joint venture firms doing tunnel job, shows place fossils were found. Division of Highways employees Charles Yakabe, junior civil engineer, and Paul Carnahan, engineering aide, assisted in find.

Below: Pieces of leg bone of long extinct rhinoceros, Aphelops, after being joined together by University of California paleontologists.



Hipparion group, an early species of the three-toed horse. This find was termed "tremendously important . . . from the scientific viewpoint" by Dr. Savage, as it fortified other fragmentary evidence of a hitherto unknown species in the development of the horse. A later species of *Hipparion*, somewhat heavier than, but about the size of a mule deer, is known to have once been present in California in great numbers.

The fossils will eventually become the permanent property of the University of California. Since the find was made on the preliminary bore of the new tunnel, there is hope that more fossils will be found at the same point when the tunnel is increased to its full size.

Since new construction of bridges, tunnels, and highways quite often turns up materials of paleontological or anthropological value, such discoveries are not new to Division of Highways and contractors' personnel. All resident engineers are instructed as to procedure in such cases, and whenever possible work is held up until scientists can get to the scene.

Close liaison is also maintained with Division of Beaches and Parks specialists, who often advise or take over conservation of sites. Under a joint agreement with this agency, the Division of Highways contributes an average of $15,000 each year for excavation and salvage at these sites.

Below: Two small pieces of Hipparion jawbone, not exceeding three inches in length, support identification of new species.

Highway Exhibits

Information Displays Draw More Viewers

By BARRY COHON, Assistant Information Officer

Visual information exhibits, long used to good advantage in connection with local freeway route hearings, are now finding increasing acceptance as general public information. These exhibits, designed to promote understanding of the highway program and safety on the road, reached an estimated 200,000 people in the Los Angeles area during October and November 1962.

Largest Exhibit

District VII placed its largest public exhibit to date on two floors of the Los Angeles Public Library, from September 27 to November 13. Some 140,000 library visitors saw this exhibit, which covered various aspects of the California highway program, its history, procedures, and scope (accenting Southern California), in maps, charts, and photographs especially assembled in a display designed to fit the library's scattered exhibit areas.

Literature Distributed

An estimated 18,000 pieces of literature were distributed at the library during the six weeks of the exhibit.

A delegation from Taft (Kern County), visited the Highways exhibit at the Los Angeles Home Show last July, which featured the scale model of the Santa Monica-San Diego Freeway interchange. The Taft people requested a similar exhibit for their own home show in October.

Scale Model Included

Accordingly, by co-operation between District VII and District VI, Fresno, the exhibit was assembled to include the same scale model, since many citizens of Taft use the Los

This exhibit was set up on the second-floor lobby of the Division of Highways district headquarters building at 120 South Spring Street in Los Angeles.

An exhibit on the Los Angeles Regional Transportation Survey was set up for the American Institute of Planners at the Statler Hilton Hotel in Los Angeles.

The exhibit in the second-floor rotunda of the Los Angeles Public Library. The model in the case in the foreground is of the East Los Angeles Interchange.

Angeles freeways weekly, plus a photographic display of highway activities in District VI, and general information literature. At the close of the Taft Home Show, District VI displayed the exhibit at its home office.

This exhibit, also at the Los Angeles Public Library, is in the second-floor elevator area. The wall cases hold photo blowups of highway construction in Southern California.

The District VII information section also exhibited October 11 through 14, at the Los Angeles Mobile Home and Trailer Show, which attracted an estimated 40,000 people. This exhibit, featuring specially prepared charts, maps and photographs, was reassembled and is now installed on the second floor of the Highways Building in the right-of-way section lobby.

Special Exhibit

The American Institute of Planners convention at the Statler Hilton Hotel was the setting for a special exhibit demonstrating the work of the division's advance planning section in connection with the Los Angeles regional transportation study. Approximately 1,500 people visited this display. Dick Withers of advance planning designed this exhibit and attended it throughout the convention, October 15-17.

Public Response

Public response indicates that even casual visitors to these exhibits find quick answers to their questions about the highway program, expressed in graphic form there and supplemented by take-home reading matter.

More Routes

Freeway Mileage Adopted By Commission Now 6,358

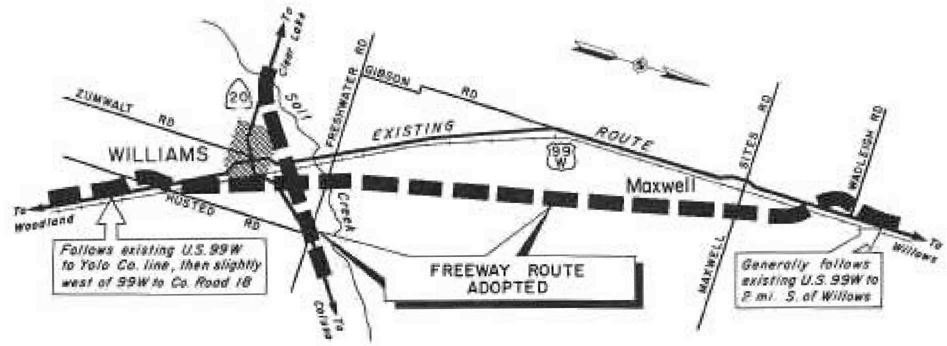
At its last four monthly meetings of 1962 the California Highway Commission adopted 20 routings for a total of 154.3 miles of freeway and declared another 9.3 miles of existing highway to be a freeway. This brought the mileage of adopted freeway routes in the State to 6,358.2 miles. The commission also adopted routings for 5.5 miles of conventional highway.

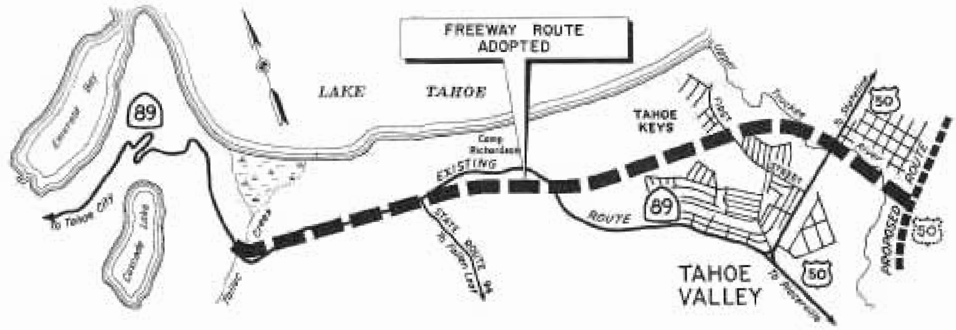
Three of the freeway route adoptions involved public hearings by the commission. These routings are for 2.6 miles of U.S. 101 in the Novato area of Marin County, for 6.9 miles of Sign Route 23 (Moorpark Road) in Ventura County and for 5.8 miles of the San Gabriel River Freeway in Los Angeles County and the Cities of Baldwin Park and Irwindale. Cities and counties affected waived commission hearings in the 17 other adoptions.

The longest freeway route adoption was for 39.7 miles of U.S. 99W in Yolo, Colusa and Glenn Counties and the shortest 0.3 mile to bring Sign Route 120 in Tuolumne County to the Yosemite National Park boundary.

The September, October, November and December freeway route adoptions:

Colusa County—3.8 miles of Sign Route 20 in the Williams area.



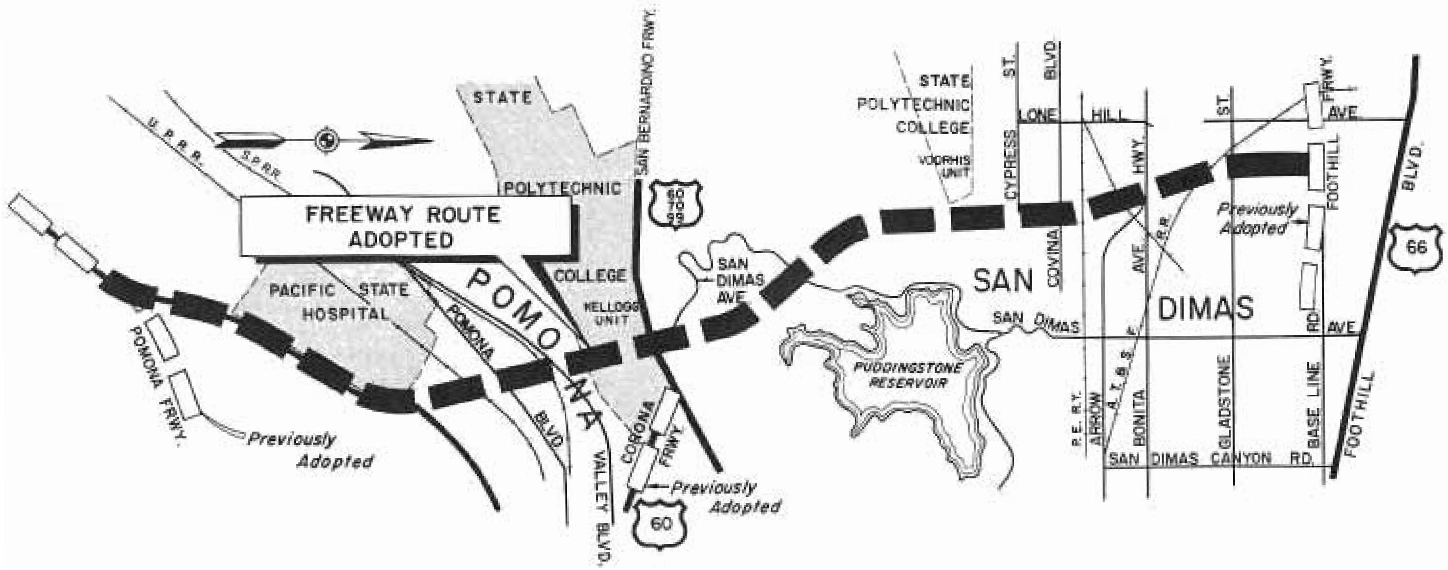


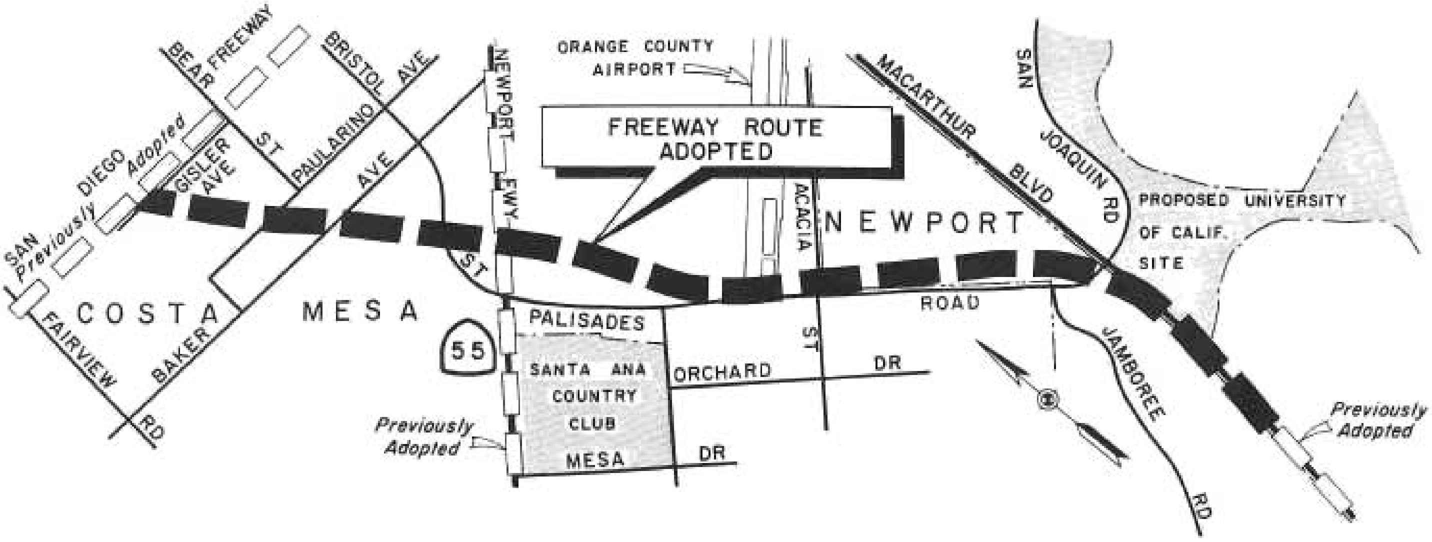
El Dorado County—4.6 miles of U.S. 50, revising previous routing to accommodate extension of Lake Tahoe Airport.

El Dorado County—5.8 miles of Sign Route 89 between Tallac Creek and the adopted route for U.S. 50.

Los Angeles County—8.7 miles of the Route 240/272 Freeway in the county and the Cities of Pomona, San Dimas and Glendora.

Los Angeles County—5.4 miles of the San Gabriel River Freeway in the county and the Cities of Baldwin Park and Irwindale between the San Ber-





nardino Freeway and the adopted route for the Foothill Freeway.

Marin County—2.6 miles of U.S. 101 in the Novato area of Marin County.

Mendocino County—5.1 miles of Sign Route 1 between Russian Gulch State Park and 1.6 miles north of Jughandle Creek. Initial construction as modern two-lane highway.

Modoc County—26.2 miles of Sign Route 139 between U.S. 299 near Canby and 1.5 miles south of Perez. Planned as initial two-lane expressway.

Mono County—10 miles of U.S. 395 on the Sherwin Grade section between the Inyo county line and Whisky Canyon. Route mostly follows the existing highway.

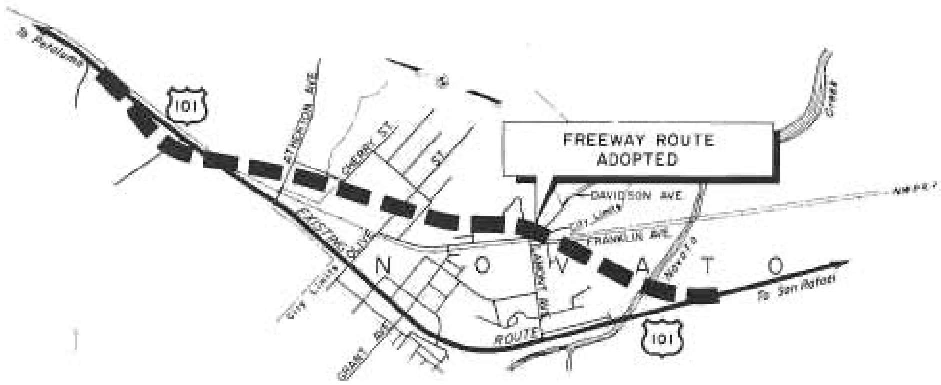
San Mateo County—1.9 miles of State Highway Route 105 between Skyline Boulevard at Cahill Ridge near the intersection of Half Moon Bay Road and the adopted route for the Junipero Serra Freeway in the vicinity of Ralston Avenue.

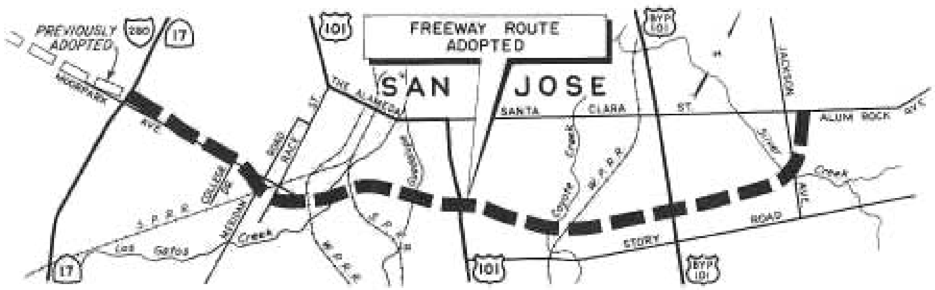
Santa Barbara County—Freeway bypass of Orcutt on State Highway Route 2. Length 1.7 miles, running to the south of Orcutt.

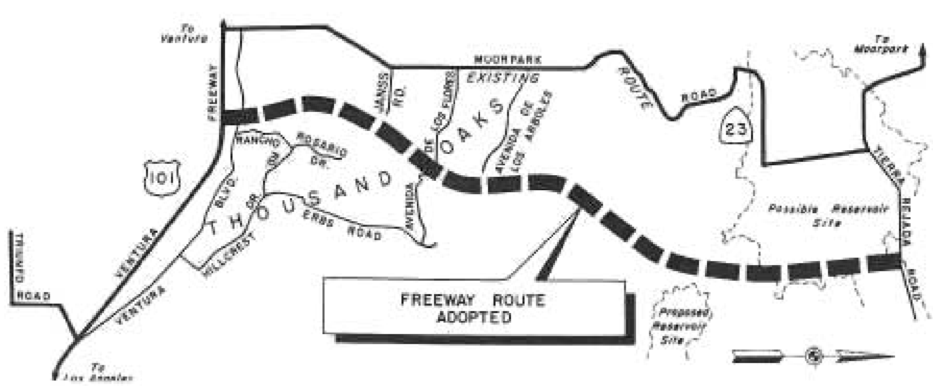
Santa Barbara County—13.2 miles of Sign Route 1 between two miles north of the Santa Ynez River and 1.4 miles west of Orcutt.

Santa Clara County—7.4 miles of State Highway Route 5 in the San Jose area between Sign Route 17 and Alum Rock Avenue.

(Continued on page 56)







STATE'S RELOCATION, COMPENSATION POLICY PRAISED

(Reprinted from Los Angeles *Times*, December 6, 1962)

California got a pat on the back Wednesday from Senator Williams (D–N.J.) for its program of compensating and relocating persons, especially the elderly, whose properties are purchased for freeway rights-of-way and other public uses.

After hearing testimony that the California Department of Public Works' Highway Right-of-way Division has relocated 115,000 persons in the last 10 years with a minimum of discomfort, Senator Williams, Chairman of the Relocation Subcommittee of the Senate Special Committee on Aging, said:

"California is to be complimented for acting on such eminently sound and humane principles. Such a program certainly reduces the inevitable traumas encountered by the elderly displaced by public progress."

Daylong Hearing

Dexter MacBride, Division of Highways engineer, appearing as the first witness at the subcommittee's daylong hearing on relocation problems in Room 1138, New State Building, testified:

1. The State is buying about 10,000 parcels and spending $200 million annually in acquiring private property for public use.

2. Of those 10,000 parcels, 5,000 are in residential use and 60 percent (3,400 last year) were owner-occupied. The average dwelling acquired by the State through condemnation or negotiation was 27 years old, was valued at $11,200, and was the residence of two persons.

3. Of the dispossessed owners, 61 percent bought replacement housing with State assistance. Replacement dwelling averaged 10.6 years old, were valued at $14,412.

Moving Costs Low

"Thus you can see the dynamic impulse of these dispossessed elderly persons to upgrade their housing when they have the right opportunity and assistance," MacBride testified. "The average moving cost was only $36.

"The magic which California has applied to these serious relocation and land acquisition problems is simply this: allow enough 'lead' time to meet all the hardships involved.

"We find that the elderly citizen usually is more self-reliant and does a better job of taking care of his relocation problems than the younger people."

Also testifying before the Williams subcommittee were:

Joan Flor, Redevelopment Agency of Santa Monica; Margaret Watkins, Los Angeles Community Redevelopment Agency; Mrs. Benjamin Borchardt, President of Allies Senior Clubs, Inc.; and George McLain, Chairman, California League of Senior Citizens.

MORE ROUTES

(Continued from page 56)

Santa Clara County—2.7 miles Sign Rte. 292 (Guadalupe Freeway) in San Jose between Coleman Street and U.S. 101 Bypass (Bayshore Freeway).

Siskiyou County—3.2 miles of U.S. 99 in the vicinity of Weed.

Tuolumne County—0.3 mile of Sign Route 120 (Big Oak Flat Road) between one mile west of Carl Inn and the Yosemite National Park boundary.

Orange County—3.9 miles of State Highway Route 184 (MacArthur Boulevard) in the county and Cities of Newport Beach and Costa Mesa.

Ventura and Santa Barbara Counties—1.2 miles of U.S. 101 between a quarter of a mile east of the Ventura-Santa Barbara county line and 0.2 mile north of Sign Route 150.

Ventura County—Relocation of 6.9 miles of Sign Route 23 (Moorpark Road) between the Ventura Freeway and Tierra Rejada Road.

Yolo, Colusa and Glenn Counties—39.7 miles of U.S. 99W (Interstate 5). In Yolo County, between the Dunnigan cutoff and Colusa county line, 6.3 miles. In Colusa County, between the Yolo county line and Sign Route 20, near Williams. In Colusa and Glenn Counties, between Maxwell-Colusa Road and two miles south of Willows, 14.6 miles.

District I Office Loses Rudy Bergroth

Rudolph Bergroth, office engineer for the District I office of the Division of Highways in Eureka, retired on February 1 after 35 years with the State.


RUDOLPH BERGROTH

Bergroth joined the District I office in Willits as a civil engineering draftsman in 1928. Later he served on survey parties as construction inspector, and then as assistant resident and resident engineer on several highway construction projects.

From 1935 to 1936 he was assigned as cable wire and concrete plant inspector on the San Francisco-Oakland Bay Bridge construction after which he returned to District I. His assignments from 1936 to 1943 included chief of party on preliminary route surveys, resident engineer of resurfacing projects and chief draftsman for the district.

He later served as district traffic and safety engineer, city co-operative engineer and permit engineer. He was appointed district office engineer in 1953.

Born in San Francisco, Bergroth completed grade and high school there and went on to study at the Polytechnic College of Engineering.

Bergroth and his wife, Lorene, who is a teacher, plan to spend some time traveling after his retirement. They will maintain their home in Eureka.

OOPS!

In spite of normal precautions, gremlins managed to gain access to the September-October copy of the magazine and transfer the name of Robert N. Smith, District III highway engineering associate, from the retirement list to the obituary column.

The editor is happy to say that Mr. Smith is alive and well and that, in line with the classic statement of Mark Twain, the report of his death was greatly exaggerated.

EARL E. SORENSON RETIRES; JOHN BEATON IS NAMED

Retirement of Earl E. Sorenson as equipment engineer for the California Division of Highways and the promotion of John L. Beaton to succeed him has been announced by State Highway Engineer J. C. Womack. Beaton is chief of the structural materials section of the division's materials and research department.

Earl E. Sorenson is presented with a certificate of appreciation from the Division's Safety Committee by C. E. Waite, Deputy State Highway Engineer. Sorenson is a charter member of the committee.

For the past 14 years of his 34-year state career, Sorenson has been in charge of the trucks, automobiles and specialized maintenance and construction equipment operated by the Division of Highways, now totalling about 9,400 units and an investment of more than $33,000,000. This equipment is serviced and repaired at 12 major shops and 14 sub-shops throughout the State.

The equipment department is also responsible for procuring automotive and maintenance equipment, and, in many cases, for designing and constructing specialized vehicles and machines for highway work.

Sorenson is a native of Harlan, Iowa. In World War I he served with the 20th Infantry on the Mexican border and then as a pilot in France with the 263d Air Service.

After the war he worked as a construction superintendent in his home city of Harlan. He graduated from the University of Nebraska in 1925 with a B.S. degree in civil engineering.

In the same year he went to Venezuela, where he was in charge of the hydrographic and topographic surveys for a petroleum firm and made the surveys and base map for the present city of Maracaibo.

In 1926 he returned to the United States to become senior projects engineer for the Nebraska Department of Public Works, then moved to California in 1928 and joined the Division of Highways as resident engineer on construction jobs in the San Francisco Bay area.

He was appointed maintenance engineer for District XI, San Diego, in 1933, and from 1935 to 1947 supervised the construction contracts for that district. In 1948 he was advanced to his present position as equipment engineer and transferred to division headquarters in Sacramento.

Sorenson is married to the former Rose Mae Heyden. They have two sons, Charles, a California Highway Patrol officer, and Ronald, a mechanical engineer.

JOHN L. BEATON

Sorenson is a member of the American Society of Civil Engineers, the American Public Works Association, the Ambassadors and Commonwealth Clubs and the Masonic order. He is a past president of Chapter 17, California State Employees' Association in San Diego, and a past regional director.

Beaton, Sorenson's successor, is a veteran of more than 25 years service with the State of California.

He joined the Division of Highways as a rodman and axeman on the Kings River Canyon project in 1930 and worked for the division during summer vacations while he was attending the University of California. Upon graduation in 1937 he was assigned to the division's bridge department.

In 1945 he joined the State Personnel Board as senior engineer examiner.

In 1949 Beaton returned to the Division of Highways as a senior highway engineer and in 1950 became personnel management assistant for the division.

Since November 1951 he has served as supervising highway engineer for the materials and research department in charge of the structural materials section. In Janury 1962 he was elected president of the Sacramento Section, American Society of Civil Engineers.

Beaton is the author of professional papers which appeared in the proceedings of the Highway Research Board and covered such subjects as testing of concrete bridge rails, extensive full scale tests of median barrier designs, causes and repair of bridge deterioration due to corrosion, radiographic inspection of welded highway bridges, and corrosion of metal culverts. He has also had papers published in the ASCE transactions covering structural welding inspection and inspection and testing of welding on highway bridges.

Beaton and his wife, Rosina, have two children: Richard, 19, and Judy, 14.

E. F. Carter Retires, Ends 44-year Career

After 44 years of service with the Division of Highways, Assistant Maintenance Engineer Edward F. Carter retired from state service on December 1.

Carter began his state highway career as a teamster in Inyo and Mono Counties in 1918, and became a survey crew member in 1921. He later advanced to survey party chief and resident engineer. In 1926 he became assistant maintenance engineer in District V, San Luis Obispo.

In 1941 Carter was transferred to division headquarters in Sacramento. For the past 15 years he has been in charge of the budget section of the division's maintenance department, where he has achieved extensive improvement of maintenance cost accounting procedures.

Recent Department Retirements Listed

Headquarters Office

Frank M. Reynolds, principal highway engineer, 33 years; Hazeldean M. Snedden, senior information clerk, 20 years.

Bridge Department

Lelia W. Houde, supervising stenographer I, 15 years; George L. Laird, supervising bridge engineer, 24 years.

District I

Charles Cuff, highway foreman, 43 years; Otto W. Heinrich, senior highway foreman, 26 years; Archie R. Mitchell, highway foreman, 29 years; * Howard E. Raymond, highway maintenance man II, 27 years; Charles W. Travis, highway maintenance man II, 29 years.

District II

Richard S. Juvet, highway field office assistant, 25 years.

District III

Martin H. Barner, highway maintenance man II, 31 years; Robert Edwards, highway field office assistant, 12 years; Raymond Hardy, janitor, 9 years; Robert M. Luck, highway maintenance man III, 33 years; Daniel M. Vierra, highway maintenance man I, 29 years.

District IV

Horace M. Hair, supervising groundsman I, 15 years; Jesse Miller, highway maintenance man I, 11 years; Thomas J. Murray, highway maintenance man I, 29 years; George L. Richardson, supervising traffic signal technician, 25 years.

District V

Eugene C. VanSchaick, highway foreman, 31 years.

District VI

Edward R. Obrikat, assistant highway engineer, 15 years.

District VII

Wilbur W. Feineman, associate right-of-way agent, 13 years; Stillman A. Gates, highway maintenance man II, 30 years; Lawernce W. Larson, assistant highway Engineer, 27 years.

District VIII

Roscoe Webb, highway maintenance man II, 24 years.

District X

Alex F. Petzinger, ferryboat captain, 5 years.

District XI

Carson McNamee, highway field office assistant, 27 years.

State-owned Toll Bridges

Joseph Rapisarda, highway maintenance man I, 4 years.

Shop 1

Martin Bredehoft, automobile mechanic, 36 years.

Shop 3

Marion L. Blackwell, senior machine parts storekeeper, 38 years.

Shop 10

Helen Parnau, accounting technician III, 30 years.

* Disability.

Assistant Comptroller W. S. Cully Retires

William S. Cully, assistant comptroller for the Department of Public Works has retired after 33 years of state service.

A native of Leadville, Colorado, Cully attended business school in Denver and began his career as a bookkeeper in a mine commissary at Climax.

He came to Sacramento in 1928 and went to work in 1930 as a junior bookkeeper for the Division of Highways. He was named assistant comptroller in July 1949.

WILLIAM S. CULLY

His special responsibilities have included the preparation of accounting manuals for the Division of Highways, Division of Architecture and the former Division of Water Resources in the Department of Public Works. He also set up the accounting procedures for state-owned toll bridges, supervised the budgets and accounts operation for the Division of Highways, and wrote the procedures for cities and counties to follow in filing claims for storm damage to roads, streets and bridges.

Cully and his wife, Agnes, have three children: Mrs. Alice Lera of Sacramento, Alan W. Cully of the merchant marine, and Dennis, a student at C. K. McClatchy High School.

L. A. Weymouth

L. A. Weymouth, district engineer in charge of operations for District IV, San Francisco, died December 4 after a long illness.

A native Californian, Weymouth was born in Pacific Grove and attended grade and high school in Madera and Fresno. He continued his studies at Fresno State College and received his B.S. degree from the University of California at Berkeley.

Weymouth's career with the Division of Highways started in 1928 when he went to work for District VI as a rodman. He was assigned to District V in 1931 as a highway draftsman computer and office man on a location survey south of Big Sur in Monterey County. He continued in District V until 1939, working on surveys, construction and design.

In 1939 Weymouth was assigned to surveys and plans department in headquarters office. Among other duties he reviewed plans in the field and office and assisted in developing the State's position on AASHO design policies.

During 1943 he was assigned to District I as resident engineer on an access road to an airbase southwest of Arcata.

Weymouth transferred to District IV in 1945 as freeway and advance planning engineer. He was promoted to district engineer in 1947, in charge of planning and design for District IV. He took over the operations function for District IV in 1952.

Weymouth was a member of the American Society of Civil Engineers and the Institute of Traffic Engineers.

He is survived by his wife, Margaret, and a son and daughter.

Greene, Ayanian Reassigned in S.F.

Clifton F. Greene has been appointed district engineer — planning, for the San Francisco Bay area district of the California Division of Highways, a position which has been filled since early this year by Haig Ayanian. Ayanian is being shifted to the post of district engineer—operations, succeeding the late L. A. Weymouth.

CLIFTON F. GREENE

For the past 13 years Greene has been assistant district engineer in charge of advance planning and route location studies for the San Francisco Bay area.

In his new assignment he will not only be responsible for these functions but also for programing and budgets and for administrative services.

A native of Waitsfield, Vermont, Greene attended high school in Petaluma, and received his B.S. degree from the University of California at Berkeley.

He joined the Division of Highways in 1931. His first three years were spent on construction and materials testing in the San Luis Obispo and Los Angeles districts, followed by eight years in design work in the San Diego district. He moved to District IV, San Francisco, in 1942.

He was promoted to district project and budget engineer in November 1947. He advanced to assistant district engineer in charge of planning in December 1949, and has since played a major staff role in the planning and design of the major freeways in the San Francisco Bay area.

Greene and his wife, Bonnie, have a son, Charles, and a daughter, Janet.

HAIG AYANIAN

Ayanian, in taking over the operations assignment for District IV, will have responsibility for the construction, maintenance and traffic functions and for engineering services.

Most of his 25 years of experience with the Division of Highways have been in the field of construction. After service with the Seabees in World War II, Ayanian was resident engineer on major freeway contracts in the Los Angeles area, and moved to San Francisco in 1956 as assistant district engineer in charge of construction. Early in 1962 he was promoted to district engineer—planning.

Ayanian is a native of Niagara Falls, N.Y. He attended the University of California at Los Angeles.

Equipment Super Mendenhall Retires

After 43 years of service with the equipment department of the Division of Highways, Thomas A. Mendenhall, highway equipment superintendent I at headquarters shop, Sacramento, retired on January 1.

Mendenhall started his career with the State in August 1920, as an automobile mechanic in headquarters shop.

With the exception of less than a year's separation, Mendenhall's career has been with the equipment department. In 1931 he was promoted to highway mechanic foreman.

In May 1955, he was promoted to highway equipment superintendent and given charge of the development of the special equipment designed and constructed in the headquarters shop.

Mendenhall was born in Salesville, Ohio, and attended grade and high school in Sacramento.

Mendenhall is a member of the Elks Lodge. He and his wife, Maude, have one son, a superintendent with a local heavy construction firm.

SLIDES CLOSE HIGHWAYS

In the Sierra Nevada, mud and rock slides closed the Emerald Bay section of State Sign Route 89 for 42 hours beginning the afternoon of December 15, and for more than 35 hours beginning the night of December 17. State Sign Routes 88 and 4 over Carson and Ebbetts Passes respectively were closed for the winter the first week of December.

Bridge Engineer G. L. Laird Retires

George L. Laird, supervising bridge engineer for the California Division of Highways, retired on October 1 after 24 years of state service.

For the past nine years, Laird has been assigned as bridge construction engineer (south) in charge of bridge construction in the four southern highway districts. During this period he has been responsible for the supervision of construction of well over $300,000,000 worth of highway structures.

G. L. LAIRD

Laird was born in Wisconsin but moved at an early age with his family to Oregon where where attended elementary and high schools. He is a graduate of Oregon State University, where he received his BS degree in 1924.

In 1925, after a brief period as assistant to the city engineer in Bandon, Oregon, Laird moved to Southern California and went to work for the City of Los Angeles.

Laird left the city in 1932 and joined the staff of the E. F. Knapp Construction Company as a project engineer. Among the many projects completed under his supervision were the Sixth Street Viaduct in Los Angeles, the Mt. Vernon Viaduct in San Bernardino, the Tuolumne River Bridge at Modesto and the approach structures to the San Francisco Bay Bridge.

Laird began his career with the Division of Highways in 1938, and his first assignment was as resident engineer on the Alhambra Overhead in the City of Los Angeles. During the next 12 years he was resident engineer on major bridge projects of increasing complexity throughout Southern California. In 1950 he was promoted to senior bridge engineer and in 1953 to supervising bridge engineer assigned as bridge construction engineer (south), a position he held until his retirement.

Planning Survey Engineer Retires

Frank M. Reynolds, who has been in charge of long-range California highway planning studies requested by the State Legislature for the last 11 years, retired on November 1 after 29 years with the State Division of Highways.


FRANK REYNOLDS

As principal highway engineer heading the California highway planning survey unit of the division, Reynolds was responsible for coordinating such major studies as the freeway system report of 1958, the city-county road needs of 1960 and the current scenic highways study.

His responsibilities also included supervision of numerous special highway routing reports requested by the Legislature; the statewide county road inventory of 1955; motor vehicle use studies in several major California cities, culminating in the current Los Angeles regional transportation study; and the division's extensive machine tabulation and electronic data processing system used in many aspects of state highway planning and operations.

Succeeding Reynolds in charge of the planning survey work will be C. G. Beer, who was appointed last July to the newly established position of urban planner for the Division of Highways.

Reynolds' wife, Frances, who has been an employee of the Division of Highways for the past 19 years and is currently secretary to State Highway Engineer J. C. Womack, will also leave state service on November 1.

Reynolds was born near Spokane, Washington, and attended school there. He served in the U.S. Army in World War I, then studied engineering at Washington State College at Pullman.

From 1922 to 1928 he worked on highway projects in the Northwest for the Washington State Highway Department and the U.S. Bureau of Public Roads.

In 1929 he moved to California and for the next seven years worked on highway location and construction in the San Joaquin Valley area. He was resident engineer on a 12-mile construction project on the Grapevine Grade on U.S. 99 during this period.

Reynolds was transferred to division headquarters in Sacramento in 1936. In 1940 he was appointed district traffic engineer at San Francisco, and the following year returned to Sacramento as assistant to the state traffic and safety engineer.

In 1942 he became highway engineer for the U.S. military mission in Iraq and Iran, with responsibility for developing a supply route between the Persian Gulf and Russia. Later he served as captain, then as major in the Army Engineers and later the Transportation Corps, with duty in both Washington, D.C., and Europe.

He returned to Division of Highways Headquarters in 1945 as assistant planning engineer. In 1951 he was promoted to his present position.

The Reynolds have two sons and a daughter.

James B. Woodson

James B. Woodson, who spent 29 years with the Division of Highways, first as a district engineer in District VI, and later as right-of-way agent in three other districts, died November 21. He was 83 years of age.

From 1933 until his retirement in 1945, Woodson had been right-of-way agent in charge of District IV.

His state career began in 1912 as division (district) engineer in District VI. He left the division in 1926 to enter private engineering practice in Los Angeles. In 1930 he re-entered state employment as right-of-way agent in District IX.

Woodson was born in Columbia, Missouri. Following his education at the University Academy in Columbia and at the University of Minnesota, he engaged in engineering in Washington, Colorado, Mexico and California for 10 years. He was a member of the American Society of Civil Engineers.

At the time of his death he resided at the Hotel Cecil in San Francisco.

Information Clerk Dean Snedden Retires

Mrs. Hazeldean Snedden, who in 18 years has served countless persons at the second floor information desk of the Public Works Building, retired November 30, after 20 years of service with the personnel section of the Division of Highways.


HAZELDEAN SNEDDEN

Having begun as junior clerk on a temporary basis in January 1943, she in turn worked up to the intermediate classification, and then to senior information clerk. During this time she has held preliminary interviews with thousands of job applicants, and answered the widely diversified questions of employees and visitors alike.

Born in Gladstone, Michigan, she spent her childhood and received her education in Manitoba, Canada. As a primary school teacher, she taught in Manitoba, Minnesota, Wyoming, and Nevada, before coming to California in 1926, when she began work with a San Francisco travel bureau. She came to Sacramento in 1933, where she married A. F. Snedden, a commercial agent for the Denver & Rio Grande Railroad, who died in 1942.

Mrs. Snedden is a member of the Moccasin Flower Chapter of Eastern Star in Mahomen, Minnesota, and has also been associated with other chapters. She is also a member of Kilwinning Lodge, the local chapter of Daughters of Scotia.

A daughter, Mrs. R. J. Hackbarth, also lives in Sacramento; and a son, Tom W. Snedden, lives in San Leandro. Mrs. Snedden also has two grandchildren and two great grandchildren.

Index to California Highways and Public Works

JANUARY TO DECEMBER 1962

SUBJECT INDEX

> The "Annual Report Issue"—November-December of each year—is devoted to budget information and general summaries of activity carried on by the various departments within the Division of Highways.

AUTHOR INDEX

C.H.C. Authorizes 'Mission Bell' Funds

Expenditure of $19,000 for installation of mission bell replicas in conjunction with new "El Camino Real" signs at 81 locations along U.S. 101 between San Francisco and Los Angeles has been authorized by the California Highway Commission.

The bells are being furnished to the Division of Highways by the Committee for El Camino Real, comprising several interested organizations. They are similar to the bells which were formerly in place along U.S. 101 but which disappeared as the highway was converted to multilane freeway and expressway, frequently in a different location from the original route.

The Legislature, in 1959, authorized the Division of Highways to install the bells as furnished. The division plans to erect the bells near major junctions, at the entrances and exits of communities along the route, and at approximately 10-mile intervals on long open stretches.

State Highway Engineer J. C. Womack explained that no bells are being installed between Los Angeles and San Diego because that portion of U.S. 101 is on the national interstate highway system and federal rules prohibit nonregulation signs.

It will take a few months to install the bells in conjunction with the signs, Womack said.

The organizations sponsoring the mission bell effort include the California Mission Trails Association, the Native Sons and Native Daughters of the Golden West, the California Historical Society, and the Colonial Dames of the Seventeenth Century.

49 CONTRACTS COMPLETED

During December the Department of Public Works advertised for bids on 24 projects with an estimated value of $16,159,800, and awarded 31 contracts for $29,622,700. Contracts were completed for 49 projects at a cost of $21,151,800.

STATE OF CALIFORNIA

EDMUND G. BROWN, *Governor*

HIGHWAY TRANSPORTATION AGENCY

ROBERT B. BRADFORD . . . Administrator

DEPARTMENT OF PUBLIC WORKS . . . ROBERT B. BRADFORD, Director

FRANK A. CHAMBERS . . . . Chief Deputy Director
RUSSELL J. COONEY . . Deputy Director (Management)
HARRY D. FREEMAN . . Deputy Director (Planning)
T. F. BAGSHAW . . . . Assistant Director
JOHN H. STANFORD . . . . . . Assistant Director
JUSTIN DuCRAY . Departmental Management Analyst
S. ALAN WHITE . . Departmental Personnel Officer

DIVISION OF HIGHWAYS

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

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

Right-of-Way

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

District I, Eureka

SAM HELWER . . . . District Engineer

District II, Redding

H. S. MILES . . . . District Engineer

District III, Marysville

ALAN S. HART . . Assistant State Highway Engineer

District IV, San Francisco

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

District V, San Luis Obispo

E. R. FOLEY . . . . District Engineer

District VI, Fresno

W. L. WELCH . . . . District Engineer

District VII, Los Angeles

E. T. TELFORD . . . Metropolitan District Engineer
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The Drinking Driver and Traffic Accidents

CHP Commissioner Comments on the Problem

January 30, 1963

W. Clifford Harvey
Automobile Editor
The Christian Science Monitor
One Norway Street
Boston 15, Massachusetts

Dear Mr. Harvey: At Mr. Womack's request, I am replying to your letter to him as State Highway Engineer in which you posed several questions regarding the role of the drinking driver in traffic accidents in California.

Inasmuch as our tabulation of 1962 statistics is not complete I will use 1961 figures in commenting upon California's experience. Our records for 1961 (and the figures do not change much from year to year) show that 20.7 percent of all fatal and injury accidents in California involved the "had been drinking" factor. Fatal and injury accidents that year totalled 108,999, of which 22,568 involved drinking. It is possible, as you said, that this figure might be higher if the liquor factor could be more easily detected.

I certainly concur with the thought that the average drinking driver thinks his ability to drive safely has not been affected.

California law enforcement agencies, in my opinion, recognize their responsibility in this problem. We attempt to meet it with vigorous enforcement and continuing educational activity.

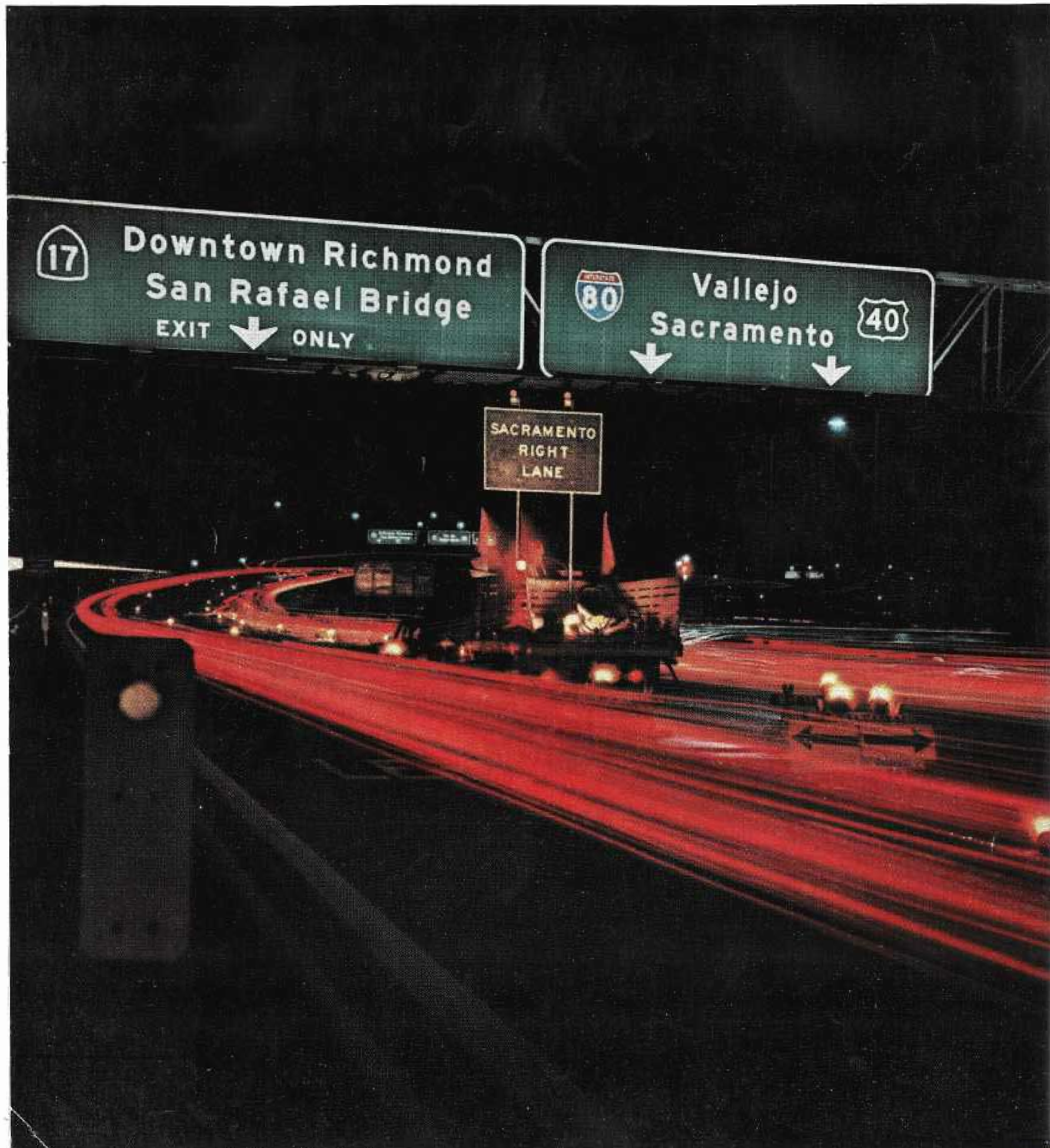
I cannot agree that in California we charge accidents to other violations when, in fact, drinking is the underlying cause. In our investigation of accidents we state the violation that was the proximate cause and record, in addition, whether the driver or drivers involved had been drinking. Of course, if a driver is deemed by the investigating officer to be under the influence of alcohol this is recorded as the primary cause of the accident. Of the 2,813 drivers deemed to have violated the Vehicle Code and thus caused a fatal accident, 122 were charged with being under the influence of alcohol. Speeding violations were charged in 1,251 fatal accidents.

I do not believe that the drinking driver problem is generally out of hand. Neither do I believe we are very near to its solution. As long as drinking of alcoholic beverages is an accepted social behavior we will continue to have the problem of the drinking driver. I see no prospect of the American people adopting a different attitude toward drinking, but I hope some day they will demand that the person who takes a life or causes serious injury because he was involved in an accident while under the influence of alcohol pay a penalty that is appropriate to the crime.

Cordially,

Bradford M. Crittenden

Bradford M. Crittenden
Commissioner
California Highway Patrol


17
Downtown Richmond
San Rafael Bridge
EXIT ONLY
80
Vallejo
Sacramento
40
SACRAMENTO
RIGHT
LANE