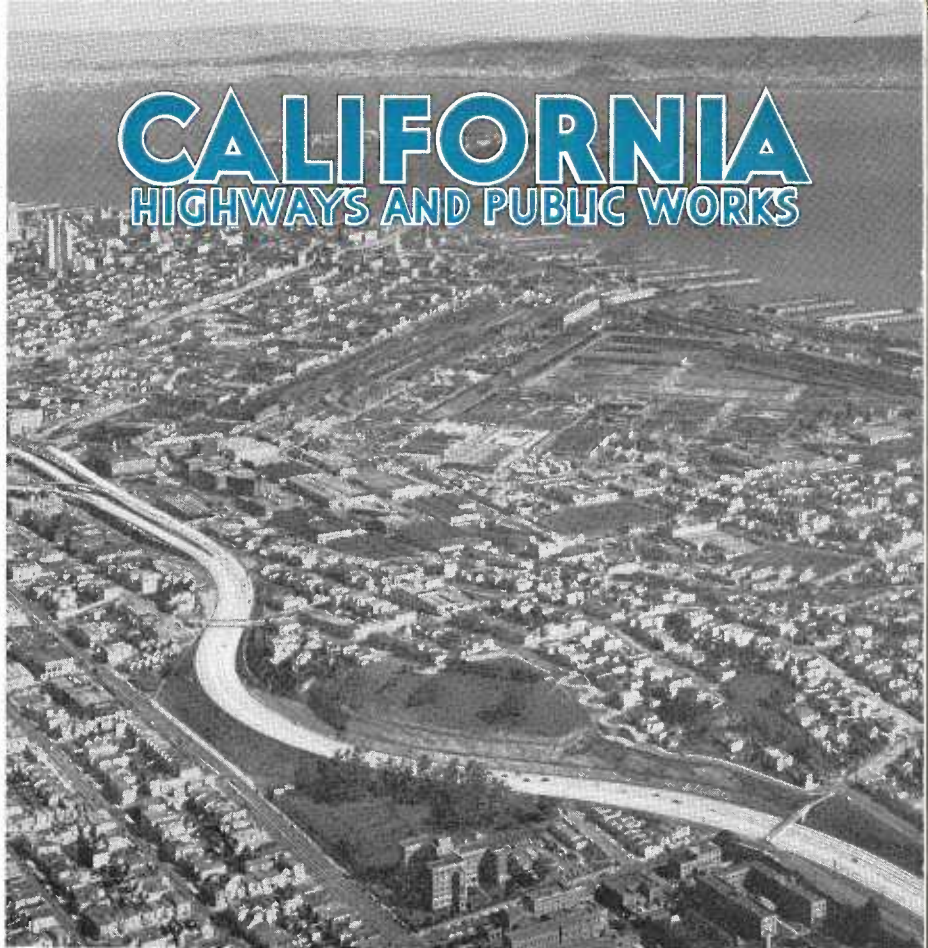




JULY-AUGUST
1954

CALIFORNIA

HIGHWAYS AND PUBLIC WORKS



California Highways and Public Works

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

KENNETH C. ADAMS, *Editor*

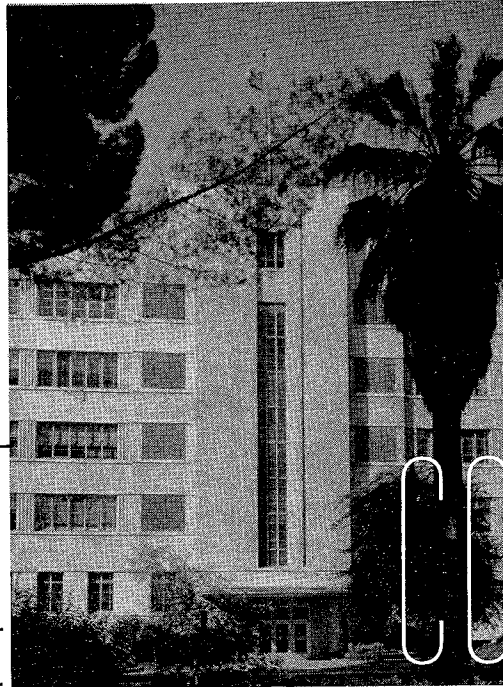
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Sacramento, California

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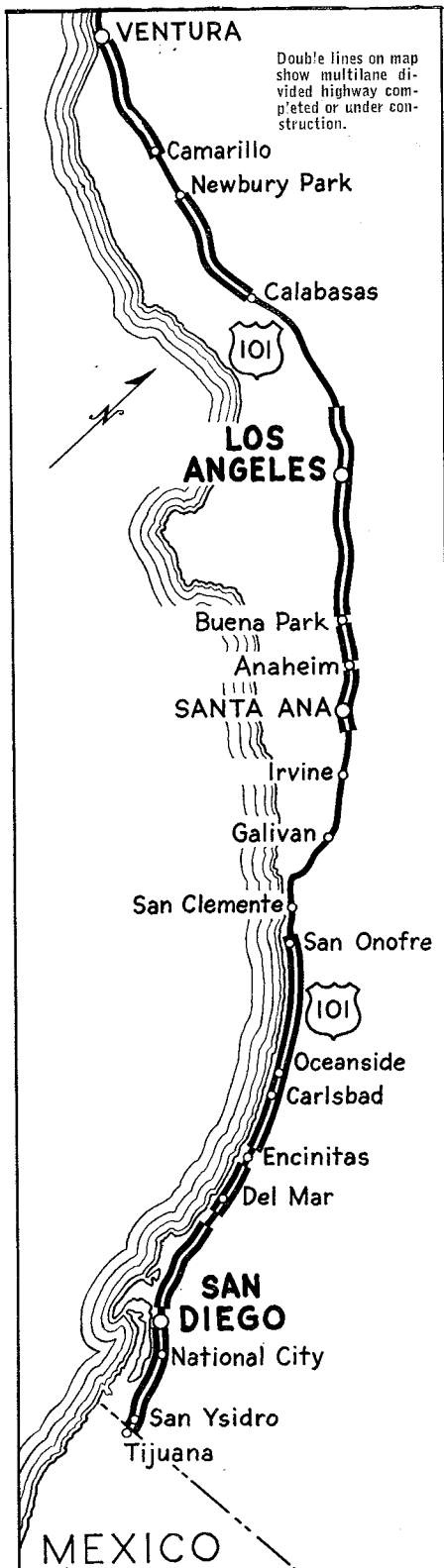
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Multilane Sections

Report of Progress . . .
Mexican Border to San Francisco

On US 101



US 101 from the Mexican border to San Francisco—California's most history-laden highway—is now within sight of a complete transformation from the horse and carreta road of the conquistadores and padres to a modern multilane divided highway 454 miles long.

Since World War II many miles of expressway and full freeway have been completed; during the past year alone the multilane mileage on 101 has increased 35.8 miles.

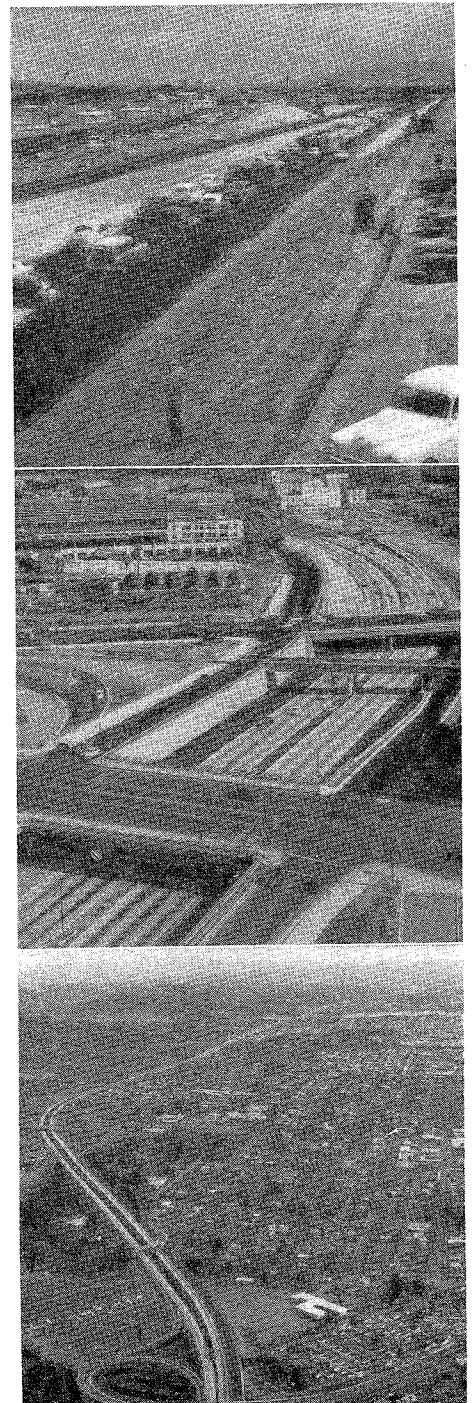
At the same time another 63 miles are currently under construction to expressway or full freeway standards, including a large proportion of freeways through major cities along the route. There still remains in the 1954-55 state highway construction budget another 10 miles of projects for which bids are to be advertised in the coming months.

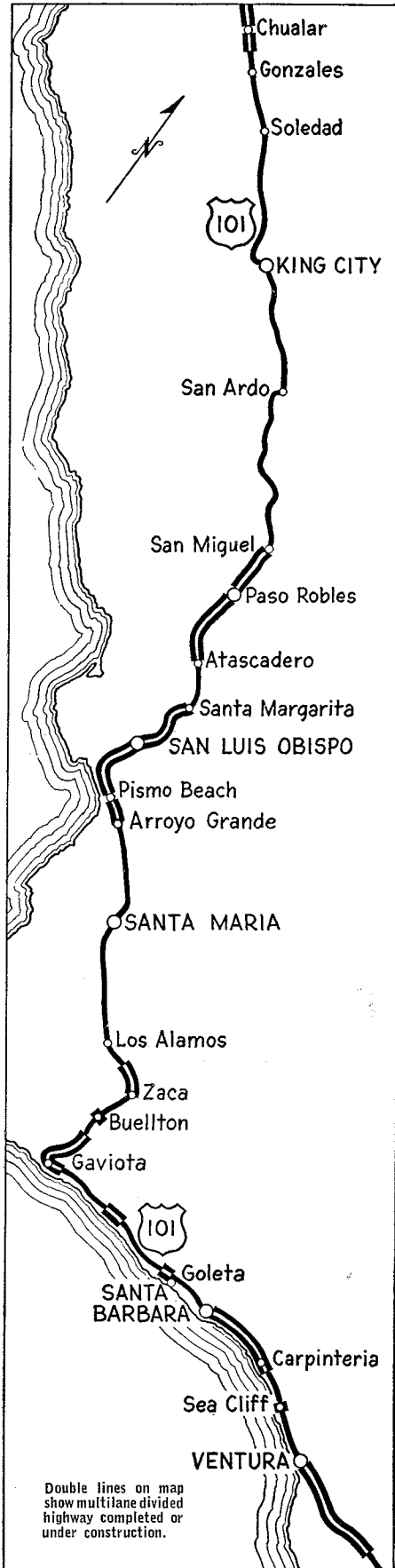
The traffic importance of US 101 between the Mexican border and San Francisco cannot be overemphasized. It connects the most populous areas in California. It has scenic as well as economic attractions. Cities are growing and spreading along its route.

Gaps Are Closing

The steady improvement of 101, which received an added shot in the arm from the 1953 legislative increase in highway users taxes, is now rapidly taking shape. The individual projects are beginning to join up, forming longer continuous stretches of multilane expressway and full freeway.

→
LOWER: Looking south along Oceanside-Carlsbad Freeway on US 101 in San Diego County. CENTER: In downtown Los Angeles traffic on Hollywood-Santa Ana Freeway passes unhindered beneath city streets. UPPER: Just prior to dedication of Camarillo Expressway in Ventura County, March, 1954.





In the rapidly growing San Diego area the last stretch of two-lane highway along US 101 between the metropolitan area and the Mexican border is being converted into a divided, four-lane expressway. This section, a four-mile project between Nestor and the border, is scheduled for completion by the end of the year at a cost of \$1,200,000.

Within the City of San Diego itself, where large portions of US 101 are already four-lane divided, another two miles of full freeway is being constructed between one mile south and one mile north of Balboa Avenue, while to the north another project was recently completed which provided extra up-hill lanes for slow moving trucks on the Torrey Pines Grade.

Accidents Decrease

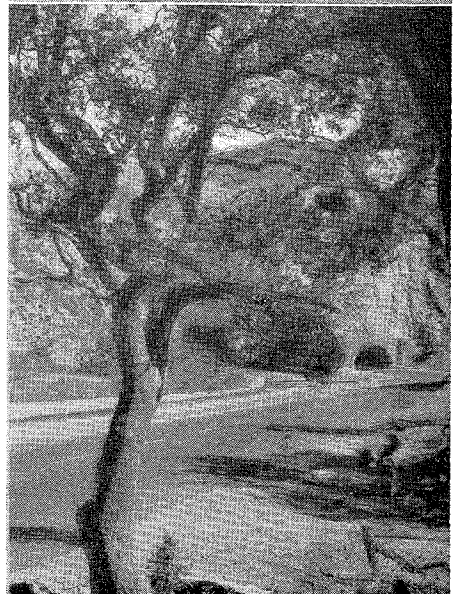
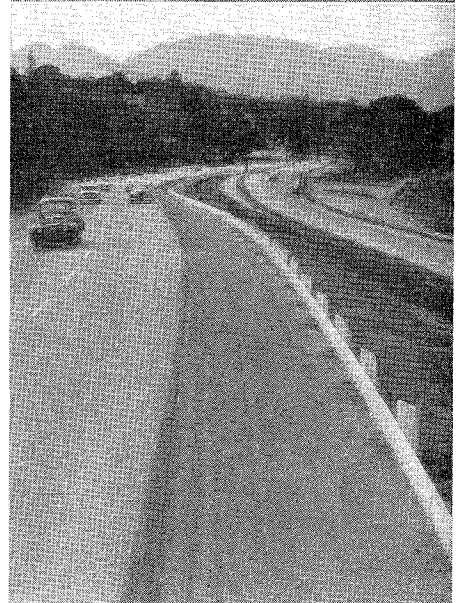
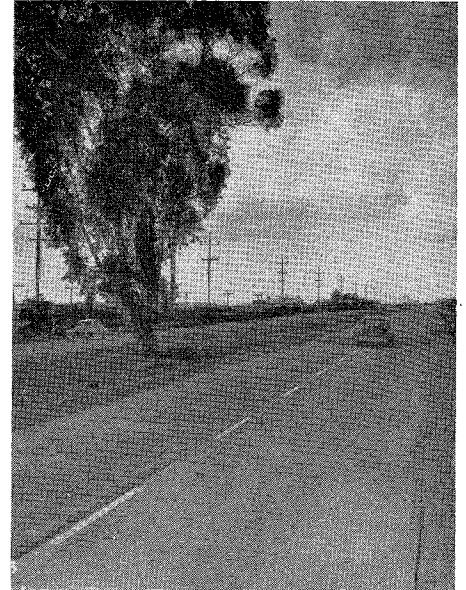
One of the most noteworthy jobs completed along US 101 during the past year was the Oceanside-Carlsbad Freeway which was formally thrown open to traffic in November. This 10½-mile project which cost more than \$11,000,000 has brought much-needed traffic relief to the area and to motorists passing the area.

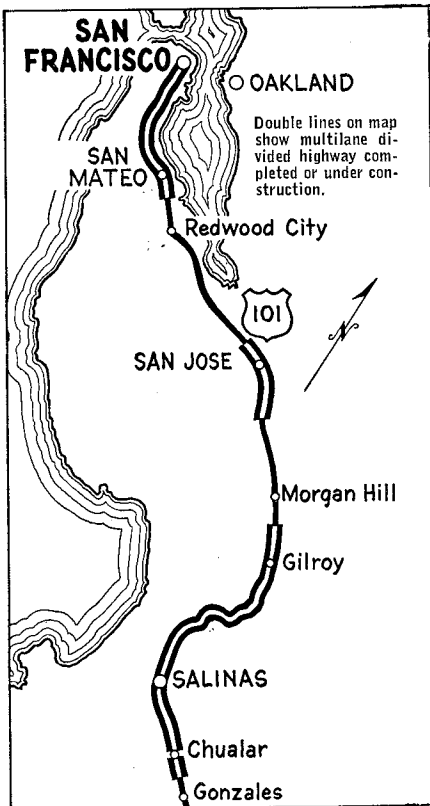
Even more important, traffic accidents and injuries along this section of highway have decreased 50 percent since the freeway was opened, a graphic demonstration of the great saving in life, limb and property built into every mile of full freeway where streams of oncoming vehicles are separated from each other and cross traffic is handled by separation structures and interchanges.

Also opened to traffic in April was the last stretch of the Hollywood Freeway between Hollywood Boulevard and Mulholland Drive, bringing to completion the 10-mile, \$55,000,000 project. This freeway, between Hollywood Boulevard and the Los Angeles Civic Center, has the distinction of being the world's most traveled highway, accommodating some 168,000 vehicles per day.

The past year has seen the completion of another four miles of the

→
 LOWER: Looking north toward new tunnel through Gaviota Gorge in Santa Barbara County. CENTER: On Cuesta Grade, just north of San Luis Obispo. UPPER: Looking north on US 101 north of Chualar in Monterey County.





Santa Ana Freeway, bringing the total completed mileage to 28. Another five miles are under construction.

No Stop Lights

Completion of the going jobs along the Santa Ana Freeway will mean that, except for two short sections through Anaheim and Buena Park, a motorist will be able to drive for 45 miles along the Santa Ana and Hollywood Freeways through the heart of the Los Angeles metropolitan area without encountering a single stop light.

Heavy construction has also been going on along US 101 north of the Los Angeles area in Ventura and Santa Barbara Counties.

West of the junction with State Sign Route 23 in Ventura County the US 101 expressway is being extended another four miles through Newbury Park to the Conejo Grade summit.

Last March saw the formal opening of the 5½-mile, \$3,000,000 Camarillo Expressway which will be extended another five miles to the Santa Clara River under a recently awarded \$2,000,000 contract.

Another going job is converting three miles of two-lane highway along the ocean into four-lane divided expressway between Punta Gorda, and the Santa Barbara County line at a cost of more than \$2,600,000.

In Santa Barbara County the final work has begun on surfacing a new section of expressway which passes to the north of Carpinteria and extends nearly to Arroyo Parida Creek, a distance of 3½ miles. Cost of this project will be close to \$2,000,000.

Gaviota Gorge

Santa Barbara County can also claim one of the more spectacular of the recently completed jobs, the expressway and tunnel through the Gaviota Gorge, opened to traffic last November.

Scheduled for placing under contract later this year is a \$2,500,000 job to construct four miles of divided expressway one mile north of Las Cruces to one-half mile south of the Santa Ynez River. Another \$1,000,000 project now under construction between Zaca and Wigmore is replacing the present curving, two-lane highway with six miles of divided, four-lane expressway.

In San Luis Obispo County work totaling \$4,100,000 on three major expressway and full freeway projects is now under way.

A 3½-mile divided highway is being built to freeway standards from Arroyo Grande to Pismo Beach. Just north of Pismo Beach the existing highway has been constructed to expressway standards to San Luis Obispo.

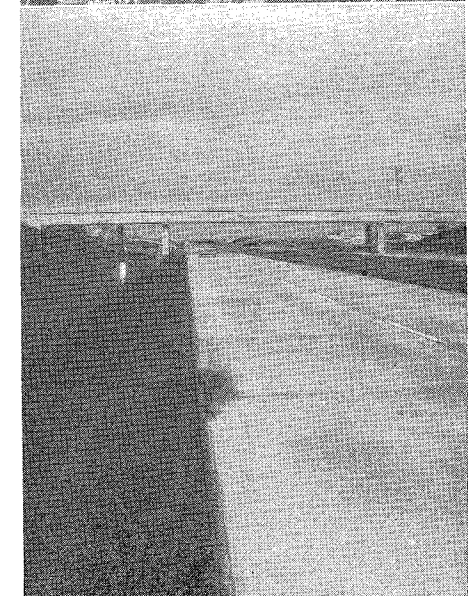
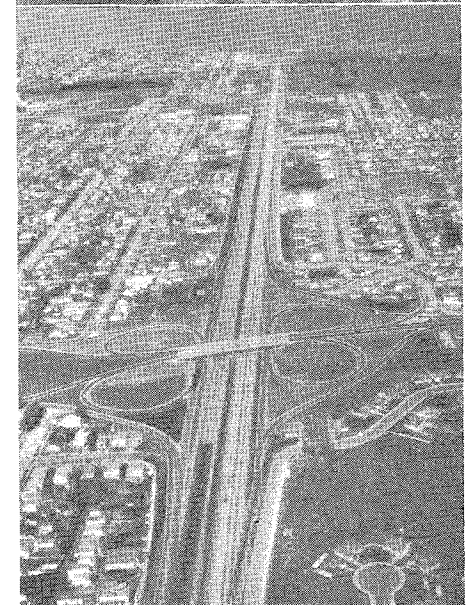
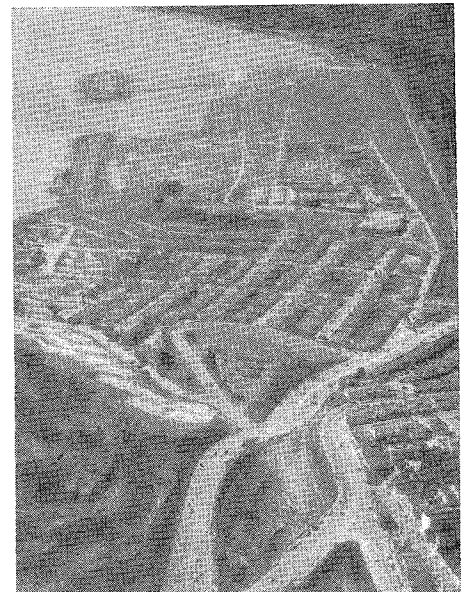
Through the City of San Luis Obispo final work is being completed on a freeway which will greatly facilitate traffic flow through that city.

Paso Robles Improvements

Just north of Paso Robles work is proceeding along another stretch of expressway which extends north to



LOWER: Looking north along completed portion of Salinas Freeway. CENTER: North along Bayshore Freeway in San Mateo County; Third Avenue interchange in foreground. UPPER: Looking south from near San Francisco-San Mateo county line, showing Bayshore Highway curving to right and two sections of fill in place for future overwater section across Candlestick Cove.



San Miguel, a distance of 6½ miles. The south end of this project will tie into a future freeway route through Paso Robles.

In Monterey County, four miles of new expressway were completed in May between two miles north of Gonzales and Chualar.

Biggest going job in Monterey County is the bypass of the City of Salinas. To date, some \$3,000,000 worth of work has been completed. Other projects, totaling \$2,000,000, are now under construction.

A recently awarded contract for 1.6 miles through Gilroy will provide a wider, safer facility with a median strip separating opposing traffic.

North of San Jose is one of the heaviest traveled sections of US 101 in the State, the Bayshore Highway.

The Bayshore during the past year has seen the completion of two freeway projects, the 2½-mile section through San Mateo completed in January for \$1,780,000, and the Army Street to Bryant at 9th and 10th Streets section in San Francisco completed last October at a cost of \$5,000,000.

Bayshore Projects Under Way

Current construction is extending the full freeway south of San Mateo for another five miles to San Carlos, is building a 1.7-mile section from Alemany Street to Third Street in San Francisco, and is extending the elevated freeway in San Francisco from the Division Street Wye east to Fourth Street and west to Mission Street via 13th Street.

Work also is under way which will connect the Bayshore to the San Francisco-Oakland Bay Bridge including structures to provide a take-off for the future Embarcadero Freeway.

One of the most interesting features of the Bayshore work has been the construction of an open water fill between Sierra Point and Candlestick Point just south of the San Francisco county line.

With two sections of the fill totaling two-thirds of a mile already constructed, the California Highway Commission recently voted an additional \$1,500,000 to continue the con-

HIGHWAY PROGRESS

By FRANK B. DURKEE, Director of Public Works

The year 1954 may well go down in highway transportation history as the year in which the struggle to overcome congestion, traffic accidents and other highway deficiencies finally turned in favor of the people of California.

No time has been lost in converting the increased revenues made available by the Legislature in 1953 into mile after mile of urban freeways, other wider and straighter highways, and new bridges. The accelerated highway construction program which has been under way since last summer is now reaching a new peak; it is adding to the capacity of California's highways in a manner that will save time, money and lives for those who drive and ride in our 6,000,000 motor vehicles.

Governor Goodwin J. Knight, Members of the Legislature, and the people of California have indicated their desire for, and great interest in, a program to speed up the improvement of the State Highway System.

We have been building good highways in California, but we have not been building them fast enough. We are behind traffic needs. However, on July 1st, we had completed 1,164 miles of multilane divided highways, and we had another 237 miles of that type under construction. This is a greater mileage of multilane divided

construction of another 0.9 of a mile. The fill will eventually carry a 3½-mile section of the Bayshore Freeway over the water between the two points.

Expenditures Over \$65,000,000

Estimated total cost of the completed Bayshore Freeway, which will extend for nearly 49 miles from San Jose to San Francisco, will be around \$110,000,000. Expenditures on the Bayshore to date now total more than \$65,000,000 including rights of way.

The development of US 101 between the Mexican border and San Francisco is typical of the accelerated

highway than is available to motorists in any other state. More than 10 percent of the 14,000 miles on the State Highway System has now been constructed or is under construction to these standards.

Included in the completed multilane mileage are 135 miles of full freeways with all turning movements and cross traffic at separated grades and with completely controlled access. Another 120 miles of full freeway are under construction. The worth of this highest type of highway, in safety and convenience, has been conclusively demonstrated in the past decade in California.

Progress on the rebuilding of the State Highway System is illustrated in the articles on U. S. 40 and U. S. 101 which appear in this issue. With more than 400 highway contracts now under way throughout the State having a construction value in excess of \$210,000,000, visible improvement is apparent on all sides. Some of the projects nearing completion and many that are in advanced stages of construction could not have been undertaken for several years if the augmented revenues had not been provided by the Legislature.

But with all of this progress, there still remain many miles of state highway inadequate for the traffic which

... Continued on page 61

highway construction program now under way throughout the State.

However, with all this progress there are still many serious deficiencies on US 101 between San Diego and San Francisco. Studies and plans are in various stages of completion to correct these conditions. There are still 200 miles which are inadequate and which must be multilaned in the near future. The remaining gaps in the multilane construction through the Santa Maria and King City areas and in Santa Clara County are conclusive evidence of the need for a continued accelerated state highway improvement program in California.

Development of In California—Freeway Sections Being Extended

Historic US 40

EDITOR'S NOTE: The series of articles, of which the first two on US 40 and US 101 are in this issue, will be continued in the next number with progress reports on US 50 and US 99.

MORE nation-wide attention has been focused on US Highway 40 in the past two or three years than any other major route. US 40 has been the subject of a widely read book, the scene of a dramatic rescue when a train was trapped by snow west of Donner Summit, and an officially designated Trans-Sierra route of primary importance to the civilian economy and military requirements of the Nation.

The California portion of US 40, 213 miles long from San Francisco to the Nevada state line, includes some of the most modern mileage of the entire transcontinental route, with approximately 65 miles multilaned and divided and another 27½ miles under construction or budgeted as multilane expressway or full freeway.

In addition, surveys and plans are in various stages of completion for further development of this highway to adequate standards all the way from San Francisco to a few miles west of Gold Run, above the 3,000-foot elevation on the west slope of the Sierra Nevada. Studies are in progress for the ultimate development of the route as a multilane highway from Gold Run all the way to the Nevada state line.

Projects Under Way

The section of US 40 between San Francisco and the Carquinez Bridge is now the scene of much heavy and expensive freeway construction. Sev-

eral multimillion-dollar projects are now under way, exemplifying the determined effort of the State to bring this important artery up to a standard adequate for the large volumes of passenger and commercial traffic which it carries.

In San Francisco—near the western terminus of US 40—two contracts are under way which will connect the San Francisco-Oakland Bay Bridge to the Bayshore Freeway, providing five blocks of viaduct with a construction cost estimated at \$4,800,000.

In addition, to improve traffic conditions a series of contracts to be let soon will construct new ramps to the San Francisco-Oakland Bay Bridge at Yerba Buena Island and widen and improve the Toll Plaza.

In Alameda County at the East Bay Distribution Structure (US 40-US 50) a third level and new ramps which will eliminate all cross-weaving traffic movements are being constructed at a cost of \$4,194,000.

Between the East Bay Distribution Structure and the El Cerrito Overhead two contracts are under way and a third will begin in the autumn of 1954 which will convert the existing six-lane highway to 4½ miles of eight-lane full freeway almost as far north as the Contra Costa county line. Estimated total construction cost is \$14,000,000.

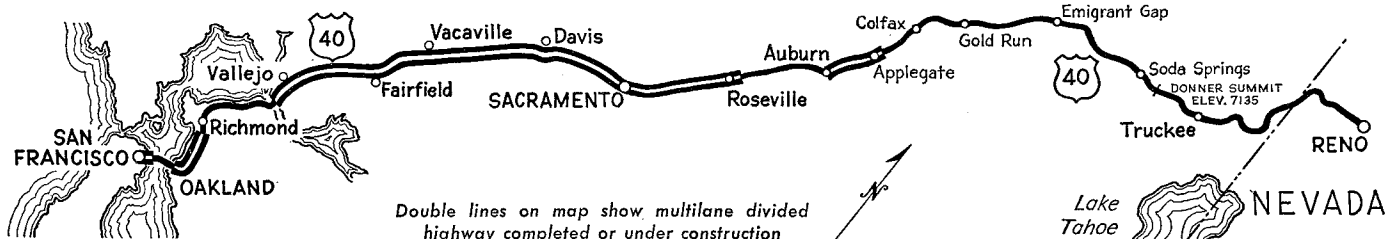
In Contra Costa County—between Richmond and east of San Pablo—

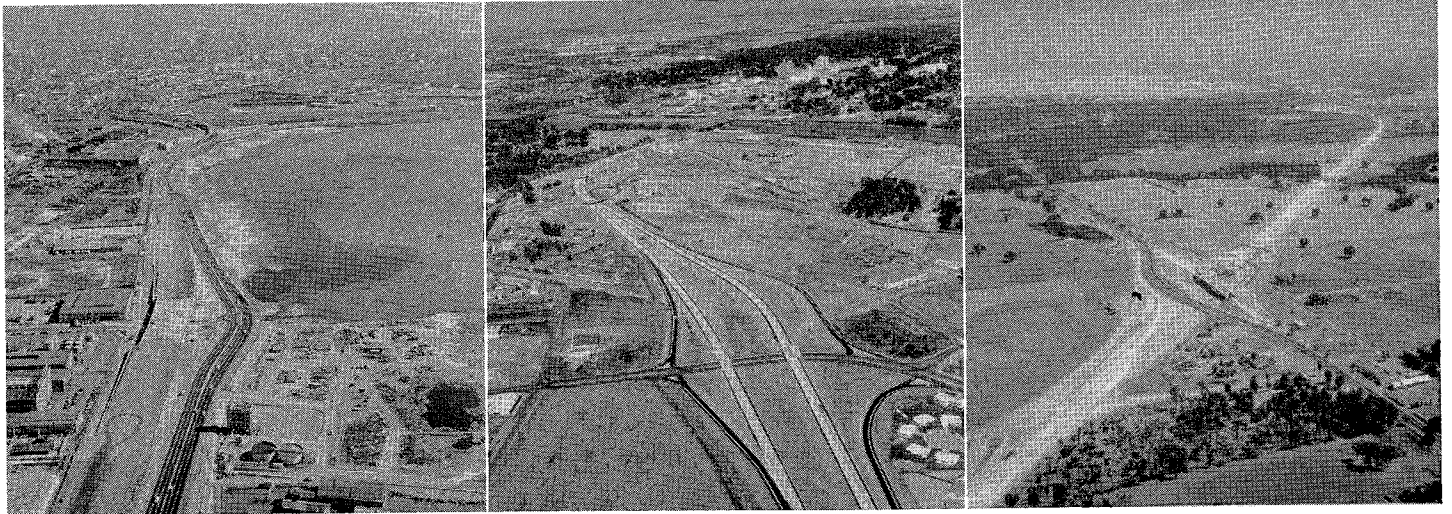
bids will be opened this fall on grading, paving and structures for 4.7 miles of full freeway on a new route for the Contra Costa portion of US 40. The State Highway Budget allocation for this project is \$6,000,000. A \$390,000 contract for an overpass of the Santa Fe Railway tracks in Richmond and a bridge across San Pablo Creek near the north city limits of San Pablo is already under way.

New Alignment a Freeway

The entire new route of US 40 in Contra Costa County, northeast from Richmond cutting through the hills to the Carquinez Bridge, has been adopted by the California Highway Commission and declared a freeway. Right-of-way acquisition has begun between San Pablo and Hercules. This section of freeway, which will replace the tortuous and congested four-lane undivided highway presently following the south shore of San Pablo Bay, will be so located as to connect with a future additional bridge across Carquinez Strait. Plans for this bridge are well advanced.

To the motorist, the most gratifying evident progress on US 40 since World War II is the unbroken stretch of four-lane highway which runs from the Carquinez Bridge to Sacramento, a distance of 60 miles. Four-laning of this section actually began as far back as 1933, but most of the expressway and freeway portions date from 1945 and later.





LEFT: Eastshore Freeway, US 40, looking south toward downtown Oakland, showing construction under way on Powell Street separation structure. CENTER: Looking west along the recently opened West Sacramento Freeway. RIGHT: Near Sacramento-Placer county line traffic on existing US 40 crosses construction zone along new freeway route. View is east toward Roseville.

The sections completed to expressway standards in the past several years include:

Vallejo Wye to south of Cordelia, 10 miles, completed in 1950 for \$2,200,000.

Cordelia Underpass to Fairfield, 6 miles, completed in 1952 for \$1,250,000.

Fairfield Bypass, 4.7 miles, completed in 1949 for \$1,300,000.

Vacaville Bypass, 1.7 miles, completed in 1952 for \$1,000,000.

A new \$700,000 US 40-99W connection west of Davis has just been completed.

Comparable in size to the multi-million-dollar freeway projects in the Bay area is the West Sacramento Freeway, opened to traffic on June 15, 1954. This \$4,500,000 full freeway extends from the east end of the Yolo Causeway to the Tower Bridge across the Sacramento River, a distance of four miles, and provides the State Capital with a freeway approach from the west. The design of this project includes provision for a connection to a future bridge across the Sacramento River, necessary to provide a fully adequate western approach to Sacramento.

The section of US 40 between Sacramento and the high Sierra country has also come in for its share of improvement.

Northeast of Sacramento between the present eastern terminus of the North Sacramento Freeway and Roseville, three contracts aggregating \$2,813,000 worth of construction are

now under way for 13 miles of full freeway. The surfacing contract is still to be let. It is proposed to have this freeway open to traffic late in 1955.

Two New Freeways

In Placer County, where US 40 leaves the Sacramento Valley and begins its long climb toward 7,135-foot Donner Summit, two new freeway routings have been adopted last year along the west approach to Auburn and from Colfax to near Gold Run.

Illustrative of the steady and continued progress in improving US 40 is the four-lane divided expressway beginning at Auburn, where the formerly congested business district is bypassed, and continuing eight miles through the Sierra foothills to Applegate. This multilane divided section will be extended another 2.6 miles east of Applegate by a project on which bids were scheduled to be opened on August 18th.

The speed with which surveys and plans along the not-yet-modernized sections of US 40 are translated into actual construction to provide a continuous stretch of divided highway extending perhaps 150 miles depends, of course, on the availability of future highway funds.

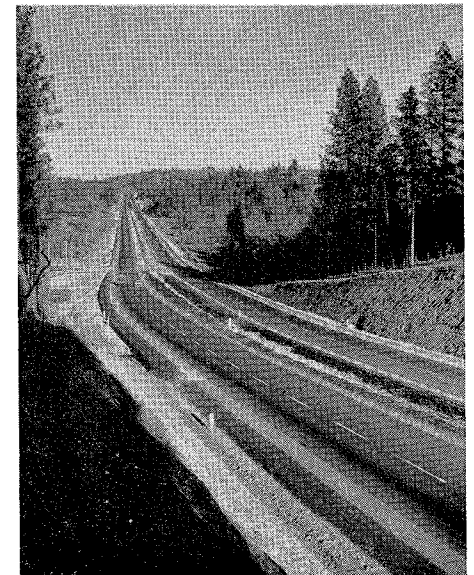
Steady Progress

Nevertheless, progress thus far in bringing US 40 up to modern standards has been steady and substantial

since World War II, and particularly accelerated since last year when the Legislature increased highway user taxes. Undoubtedly, many of the projects now under way or budgeted on this route would have had to wait several years if the additional revenues provided by the 1953 legislation had not been available.

The continuous improvement of US 40 is one of the outstanding examples of the benefits of long-range planning for development of the through routes which are so important to a vast and growing state like California.

US 40 expressway through Sierra Nevada foothills east of Auburn



Skyline

San Francisco Freeways
Provide Panoramic Views

By HERBERT S. MILES, Assistant District Engineer

THE WORLD FAMOUS skyline of San Francisco is a heritage of which the city by the Golden Gate has long been proud. Less than two decades ago many of the travelers destined for this city completed the last lap of their trip on a ferry, which afforded them an excellent opportunity to view this scenic splendor.

With the loss of the ferry boats, this beautiful approach to the city is all but vanished. The evolution of transportation shaped the portal picture into long lines of automobiles and busses traversing heavily-burdened roads and bridges. While passengers in vehicles entering from the north and east caught glimpses of the San Francisco skyline from the bridges, those approaching from the south were confined to a view of the immediate roadside development.

We are now in a transition to a new phase of transportation in this region, the Bay area freeways. As these are developed, the beauty which has long been San Francisco's fame will not only be restored to view, but will be unfolded to motorists entering from all directions. The recently completed section of the Bayshore Freeway between Army and Bryant Streets has opened an entirely new vista. Motorists skirt Potrero Hill on wide curves, and as they approach the elevated portion of the facility, a panorama of the imposing city skyscrapers develops with breathtaking suddenness.

Contracts Underway

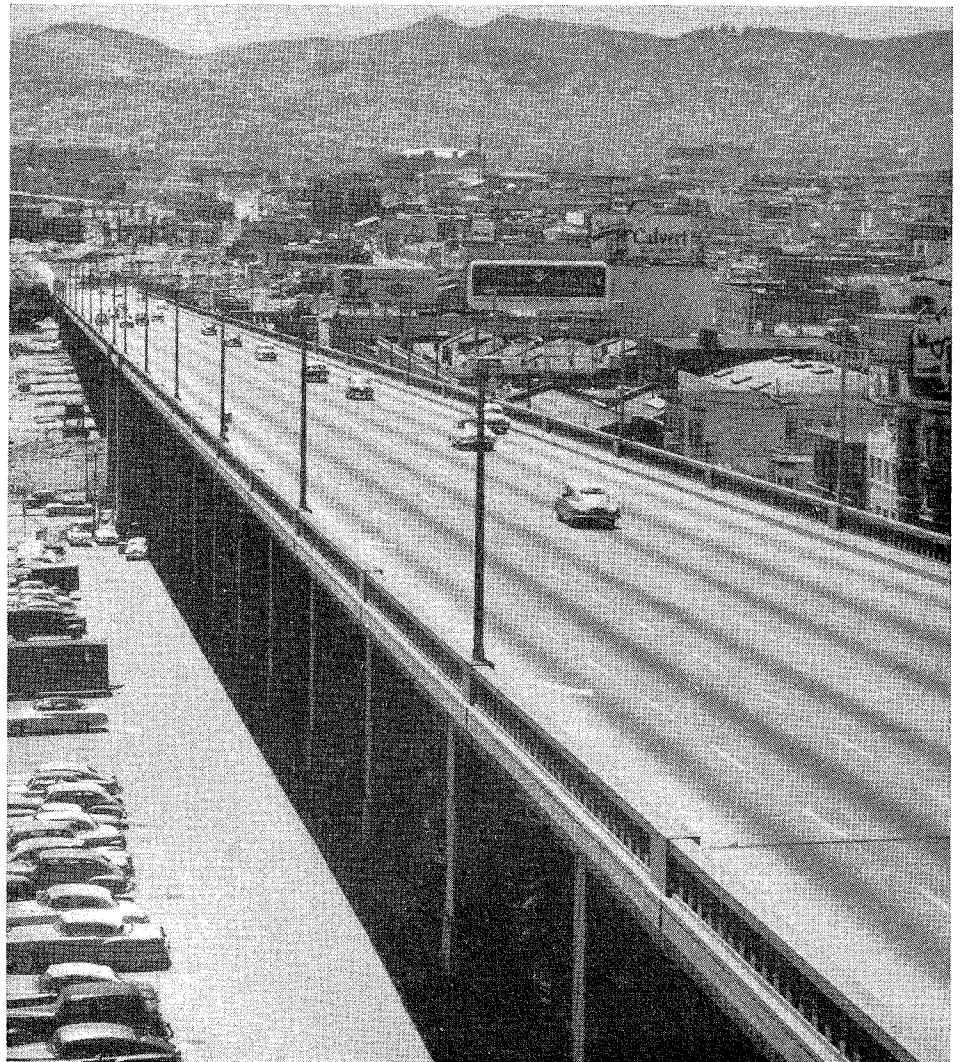
This structure is the first link in a system of skyways which will provide a circumferential route around the central downtown district. The completed unit is a portion of the Bayshore Freeway which extends northerly from 17th Street to Bryant Street. This summer another section will be opened which will continue the roadway easterly to Seventh

Street. Construction is also progressing on two additional contracts which, when completed next year, will extend to Third Street and also provide a connecting link to the San Francisco-Oakland Bay Bridge. Later this year, a call for bids will be made for the building of a subsequent unit with ramps which will reach to Main and Beale Streets at Mission Street. This latter project, the first section of the Embarcadero Freeway, will be ex-

tended northeasterly in the future to the waterfront, and thence will continue along the Embarcadero. Plans now on the drafting board reach north to the foot of Broadway. Studies to be made in the future will have as their objective the further development of this route toward the Golden Gate Bridge.

The present Bryant Street terminus of the Bayshore Freeway will soon take the form of a wye. From this lo-

Looking westerly toward Twin Peaks from the Bay Bridge Fifth Street ramp. The elevated connection to the Bayshore Freeway now under construction is shown in the distance.





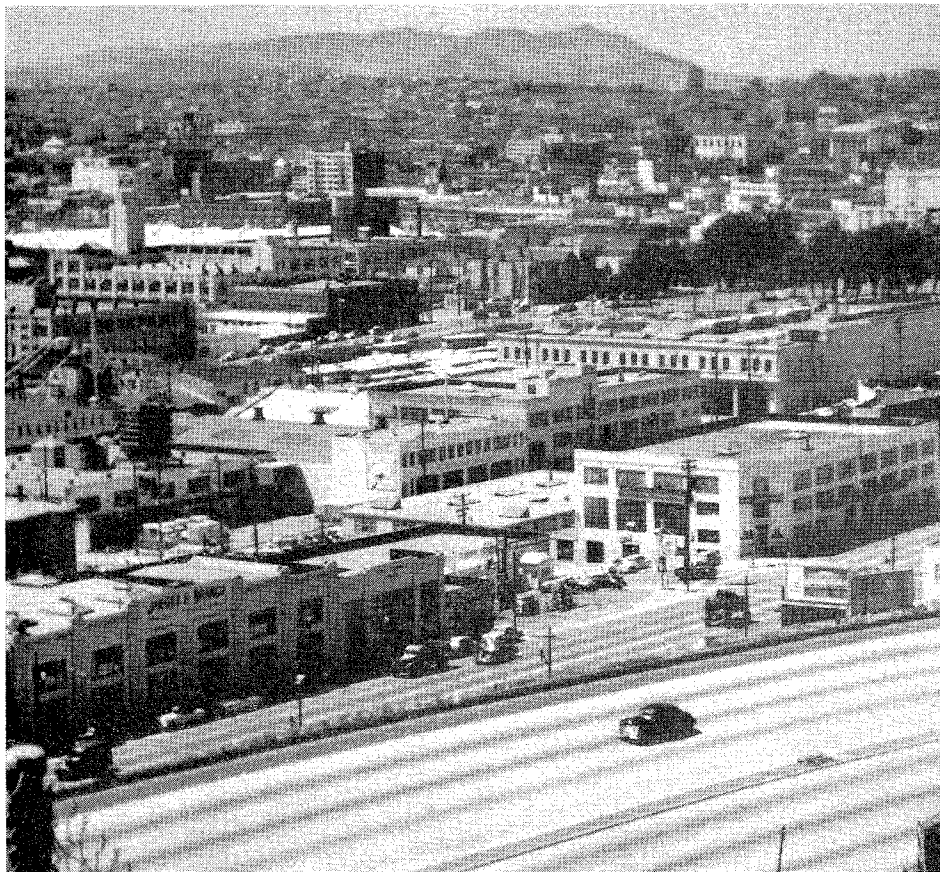
Entering the city from the south the elevated structures

cation a skyway unit is rapidly taking shape which extends northwesterly along Thirteenth Street to Mission Street. Also on the drafting board are additions which will continue northerly to Turk and Franklin Streets. These additions as well as the units of the Embarcadero Freeway

which are now being planned will be constructed with a two-level structure design with their dual roadways separated vertically. This type of construction will make it possible to provide for eight lanes of traffic with a minimum taking of property and with the least interference with traffic on

cross streets during the construction period. Thus progress is being made on an ultramodern highway facility fully separated from city traffic, which ultimately will provide a connection between the main traffic arteries of San Francisco, the Bayshore Freeway and the two bridges.

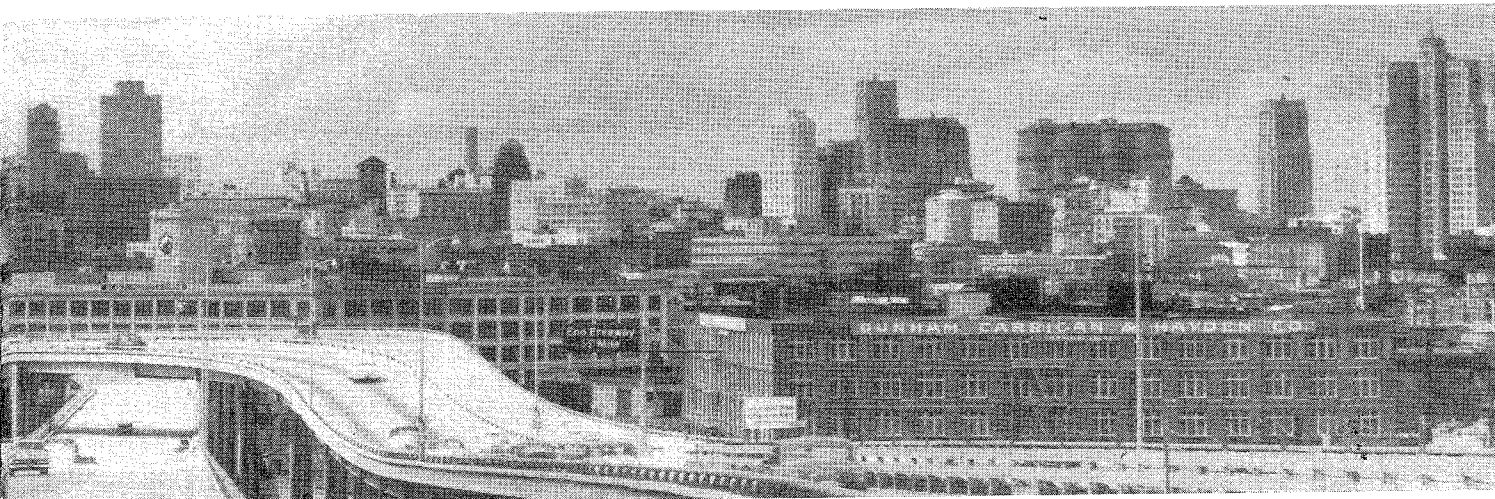
Bayshore Freeway overlooking Potrero Avenue. Golden Gate Bridge and Marin Hills in distance.



Ultramodern Design

The section now in service and adjoining units in the construction stage are also ultramodern in design from a structural and architectural standpoint. The superstructure is fashioned with streamlined supports and girders of all-welded steel construction. This is the longest bridge project yet undertaken with a framework that has been assembled without the customary clatter of riveting hammers.

New features have also been incorporated into the deck of the structure. Curbs are of a unique design which includes a continuous recess at the lower part of the curb face. This development is the result of extensive field tests which revealed that the type chosen deflected vehicles which contacted the curb with more safety than types previously used. The rails are also in keeping with the other features of the structure. While they are simple in appearance, they are substantially stronger than former types. Yet they are low enough so as not to obscure the view, thus affording motorists an exceptional vantage point from which to see the great panorama of metropolitan San Francisco.



of the freeway merge with the San Francisco skyline

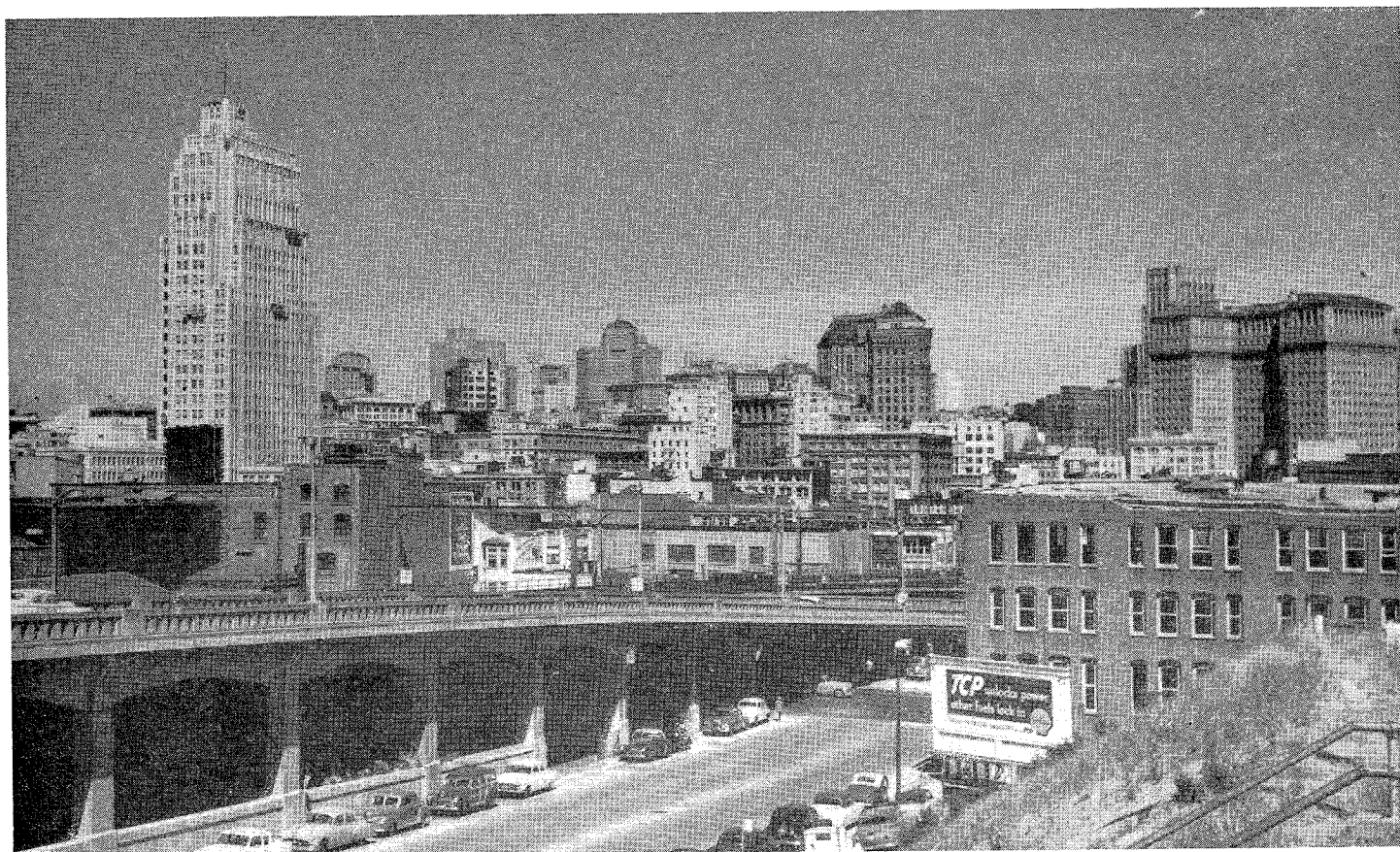
While the primary purpose of this forward step in urban transportation is the expeditious movement of motor vehicles, the importance of aesthetic values involved is fully appreciated. The elevated roadways will form companion structures to the existing elements of the skyline which were

themselves constructed to enhance the beauty of the city. These skyways are been designed with the view to pleasantly blend with their surroundings, and to complement the massive core of this progressive metropolis.

Created to relieve surface congestion, and a part of this metropolitan

plan to solve the strangling traffic problem, this type of construction will become synonymous with the City of San Francisco, restoring to its people and to their visitors the opportunities of viewing the city which were lost with the departure of the ferries.

First Street off-ramp for dispersal of Bay Bridge traffic into commercial and financial districts



Eastshore Highway

Now Being Reconstructed
To Modern Freeway

By J. F. O'BRIEN, Resident Engineer

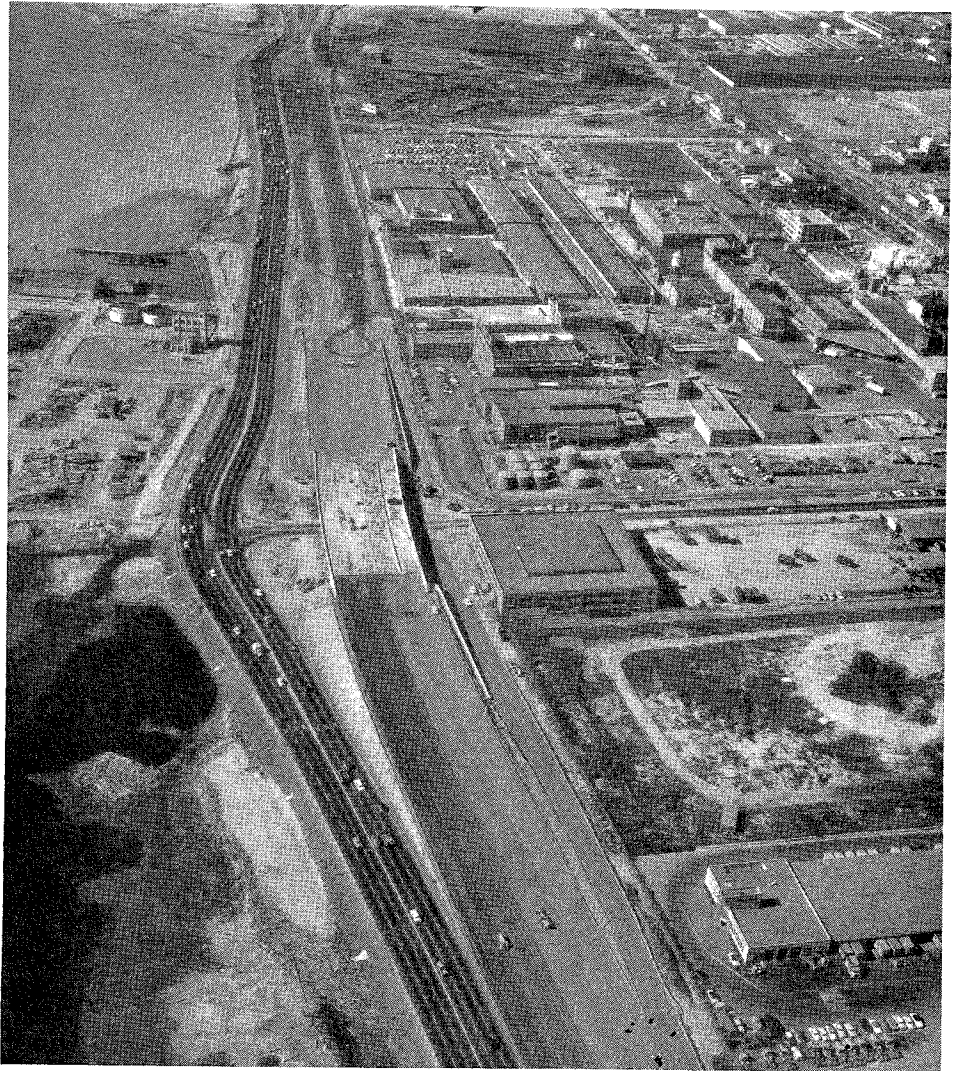
THE EASTSHORE HIGHWAY in Alameda County from the San Francisco-Oakland Bay Bridge northerly to the El Cerrito overhead is rapidly being reconstructed to modern freeway standards. This is being accomplished at a cost of 12½ million dollars under three separate construction contracts, the first of which is nearing completion, the second of which is well under way and a third and final contract now being readied for advertising.

The four-mile stretch of highway serves through traffic as a portion of US 40 and is the principal commuter route for residents of the Cities of Richmond, Albany, Berkeley and northern Oakland. The present highway is a six-lane divided facility the traffic capacity of which is greatly curtailed by four signalized grade intersections which serve to bring traffic to and from the highway from the east. Approximately 70,000 cars daily traverse this four-mile section and the resultant traffic congestion makes reconstruction to freeway standards an immediate necessity.

Will Be Freeway

The highway will be reconstructed as an eight-lane divided freeway with full traffic interchanges replacing the present overloaded signals. The first contract, covering the first mile northerly of the San Francisco-Oakland Bay Bridge distribution structure, is now nearing completion and will eliminate the Powell Street signals, the first of four signalized intersections, and provide in its place a traffic interchange of the diamond type. Freeway traffic will be carried over Powell Street on twin reinforced concrete structures of box girder design over 300 feet in length. Connecting ramps will provide uninterrupted flow of traffic to and from the freeway.

The second contract, now well under way and scheduled for completion in June of 1955, extends the new free-

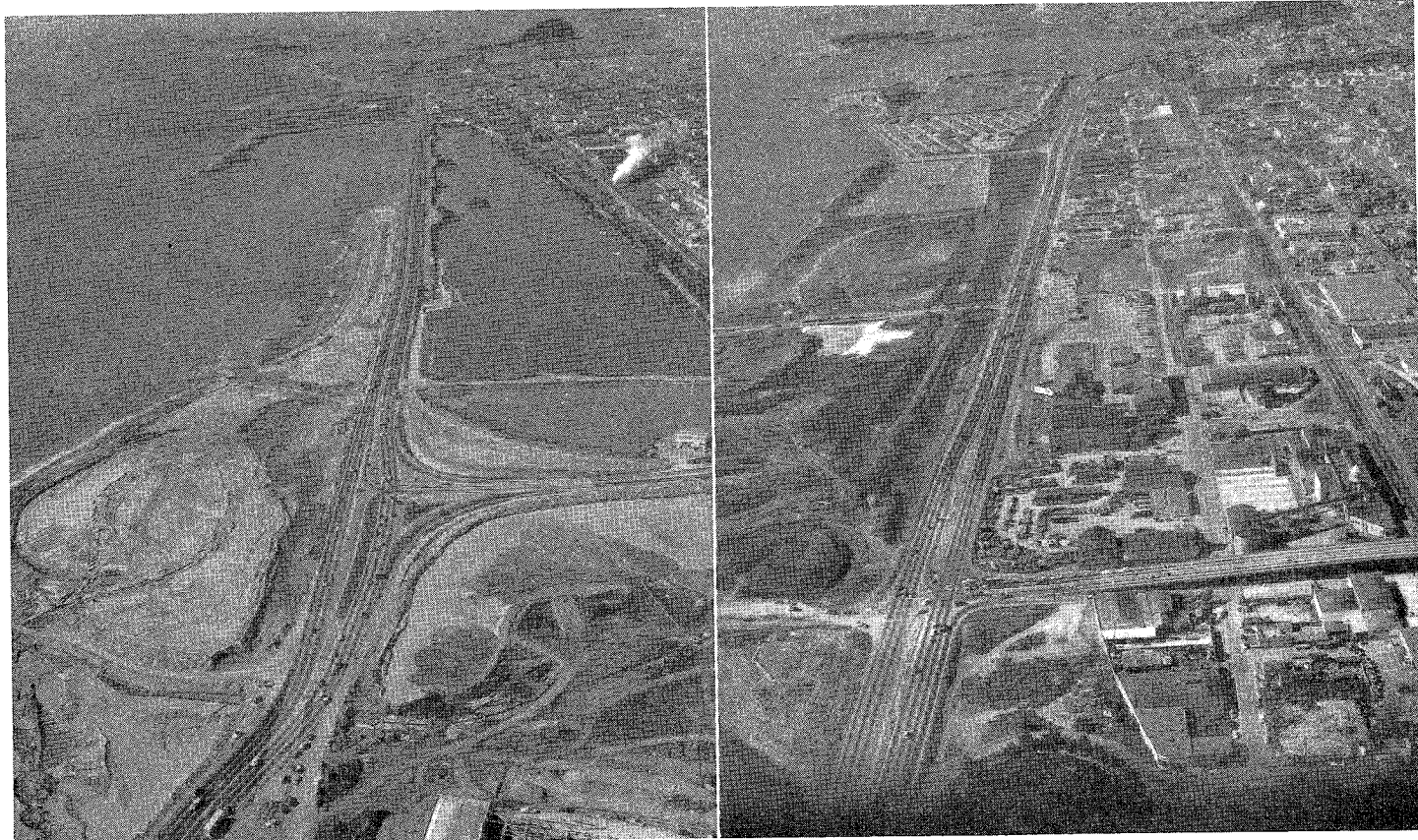


View during construction on Powell Street interchange, which is now nearing completion. Traffic has been routed over a six-lane detour complete with temporary traffic signals during the construction period. Portions of this detour will be retained as a frontage road upon completion of the project.

way beyond the second signalized intersection at Ashby Avenue, and provides for construction of a directional interchange at Ashby Avenue. Ashby Avenue traffic will be carried over the freeway on two reinforced concrete box girder structures the longer of which will be 460 feet. This second contract also provides for rough grading the balance of the four-mile stretch as far as the El Cerrito overhead.

The final contract soon to be advertised will provide full traffic interchanges at the University Avenue signals and at the Gilman Street signals and will include the balance of the new eight-lane pavement. Completion of the entire project is scheduled for the end of 1956.

Prior to construction of new embankments, over 1,000,000 cubic yards of soft bay mud has been removed to provide suitable fill foundations.



LEFT: Some idea of amount of dredger fill required for new Ashby Avenue interchange may be gleaned from this picture. Hydraulic fill will be shaped to provide roadways for trumpet loop of new interchange. Hydraulic fill is being placed at lower right of picture from a pipe line, visible in foreground, passing under existing highway. RIGHT: View of northerly portion of project with University Avenue intersection in foreground and El Cerrito overhead, northerly terminus of project, in background. Excavation to left of existing highway results from removal of some 400,000 cubic yards of unsuitable material prior to placement of hydraulic sand fill.

The new embankment was then placed hydraulically, utilizing sand obtained from a source in San Francisco Bay. The sand deposit is located approximately two miles from the job. The sand is overlaid with approximately nine feet of bay mud which was stripped from the site and pumped to disposal. The exposed sand was then dredged to an elevation 45 feet below mean sea level and pumped directly to embankment through a subaqueous pipe line. The embankment was placed in successive lifts of four feet at a rate of approximately 1,000 cubic yards per hour on a six-day, three-shift basis. The resultant high quality embankment will minimize differential settlement under the new Portland Cement Concrete pavement.

The work is under the supervision of B. W. Booker, Assistant State Highway Engineer, District IV, and both going contracts are held by Peter Kiewit Sons' Company.

Warm Springs to San Jose Section Open

An important link in the Bay area freeway system, the section of the Eastshore Freeway from Warm Springs to San Jose, was opened to traffic on July 2d.

This 9.3-mile unit will afford an important measure of relief to traffic on Sign Route 17 between San Jose and Oakland. Constructed to full freeway standards this modern, divided four-lane facility includes traffic interchanges at Brokaw Road, Trimble Road, and Alviso Road. Other structures on the project are bridges across Coyote River, Penetencia Creek, and underpasses at the crossing of the Southern Pacific and Western Pacific tracks at Warm Springs.

The project was constructed in two units. The first contract, 1.1 mile in length from Brokaw Road to Trimble Road, was completed last year by Fredrickson & Watson Construction

Company and M & K Corporation at a cost of \$1,235,000. It included the interchanges at each end as well as the bridge across Coyote River.

The work on the second contract which has just been completed was done by the Granite Construction Company at a cost of \$2,758,000 for the 8.2-mile distance.

The cost of right of way for the entire project amounted to \$849,000, thus making a total cost of \$4,843,000 for the completed facility.

The southerly terminus of this section is temporarily connected to the Bayshore Highway with a signalized intersection near Gish Road. A future cloverleaf at this location will provide for the interchange of traffic between the Bayshore and the Eastshore Freeway and the proposed connection to the Los Gatos to Santa Cruz Freeway.

Laguna Creek

Improvement Is State and
Joint Highway District No. 9 Project

By R. J. NORRIS, Resident Engineer

THE LAGUNA CREEK project on Sign Route 1 is one of a series of projects jointly financed by the State and Joint Highway District No. 9.

Joint Highway District No. 9, comprising San Francisco, San Mateo and Santa Cruz Counties, was formed in 1928 in recognition of the necessity for improving the Coast Highway between San Francisco and Santa Cruz because of its importance as a means of communication between coastal communities and because of its recreational, scenic, and defense values. Since the inclusion of this highway in the State Highway System in 1933, the joint highway district has continued to cooperate with the State in the financing of many improvements. The Half Moon Bay Bypass recently let to contract is the latest of these projects. Upon completion of this project, a high standard road will extend from San Francisco to Lake Lucerne, a distance of approximately 40 miles. From this point to the Santa Cruz county line plans are being prepared to realign some 10 miles of narrow, tortuous, substandard highway.

Immediately to the south, past Waddell Bluffs and Davenport, lie 10 miles of modern high-speed highway which terminated abruptly just beyond Respini Creek, where it reverted to 1.7 miles of narrow, winding, accident-ridden road which it was the purpose of the current Laguna Creek project to rectify. Now is gone the sight of the cement-laden trucks and trailers as they accelerated down the narrow, crooked, 7.1 percent grade, past historic Laguna Inn and across the 18-foot-wide Laguna Creek bridge, in a fruitless effort to postpone the shifting of all the gears on the trip up the grade to the southern rim of the canyon.

Curvature Reduced

Replacing the 18-foot, shoulderless roadbed which aggregated one com-

plete circle of curvature with a minimum radius of 145 feet, there is a modern 22-foot plant mix surfacing on six inches of untreated rock base with 7-foot shoulders, with long, sweeping, horizontal and vertical curves. The curvature is equal to one-eighth circle with a minimum radius of 1,500 feet and a maximum grade of 5 percent. Traffic crosses Laguna Canyon on a fill having a maximum height of 45 feet. There is a saving of 7 percent in distance between the project termini.

The contractor began clearing work on this project on July 20, 1953. An HD-5 loader was successfully utilized to overturn the heavy growths of laurels and willows in Laguna Canyon by pushing with its bucket fully raised to create sufficient leverage. Excavation was then started for the 180-foot-long, 13-foot-square reinforced concrete box which was subsequently erected at a cost of \$53,000 upon a 10-foot-deep beach-sand pad in Laguna Creek. This box, especially designed by the Bridge Department with a 2-foot-thick floor and deck and

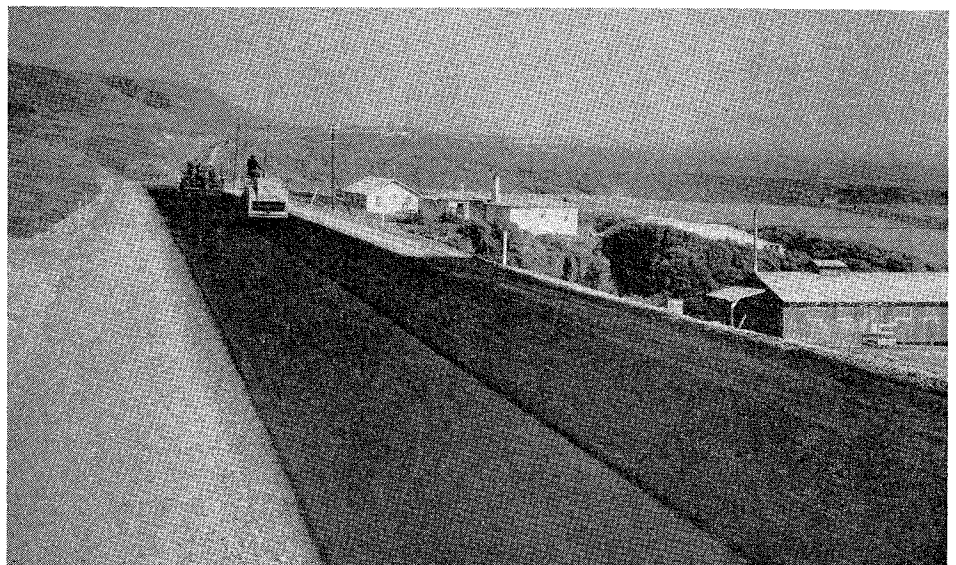
a 1.5-foot-thick sidewall to support 45 feet of fill, was connected to the existing solid rock tunnel under the Southern Pacific Railroad.

While this work was being done, the three-foot sand cushion upon which the major fill rests was being placed. Meanwhile, excavation work for a private road connection was being done as required in the contract as the first order of grading work. This was for the purpose of enabling the City of Santa Cruz Water Department to install a new 14-inch aerial pipeline across the approach cut. Practically the only blasting on the project was necessary here because of the hardness of the rock and because a thick layer of natural rock asphalt was encountered. Great care was exercised to make sure that the asphalt was not on fire from springing of the holes before attempting to place the main charges.

Fill Settlement Timed

As soon as sufficient sand blanket was in place to allow room to work, a ramp was cut in the existing steep

Looking south from north end of job, showing new shoulder, first course of plant-mix surfacing, and second course being placed and rolled





Looking south toward Laguna Creek fill

slope of the southern edge of Laguna canyon. After installing three settlement platforms to assist in control of embankment construction, the material from the ramp was distributed and compacted in the main fill using three DW-20 carryalls and two D-8 tractors and sheepfoot tampers. From this point on the contractor was restricted to five feet per week on the fill to avoid failure in the unstable basement soils.

In the weeks that this limit was reached, he moved back and graded the southern end of the project, building the fills part width on the southerly 1,500 feet where they ultimately would overlay the existing pavement. Alternating his work in this manner, it was possible to excavate almost all of the 110-foot-deep cut immediately south of the major fill during the open winter, meanwhile carrying traffic on the existing pavement.

Eventually, it was necessary to carry traffic over the new grade while completing the excavation in half-width lifts.

After the major fill had been brought to grade, an additional two feet of earth was placed as a surcharge for the purpose of accelerating settlement. This material was left in place for one month, during the latter two weeks of which there was negligible settlement. The surcharge was then removed and used to complete the geometrical section of fills which had been built part width.

Although the weather had proven extremely favorable all winter, there occurred two heavy spring rains which caused much damage and delay because of the large area of subgrade being utilized to carry traffic. During the current dry interval this damage has been repaired and placing of untreated rock base has begun.

Drainage Problems

Among the most interesting features of the project have been the employment of s2g pipes and velocity dissipators to reduce outlet velocities

on the necessarily steep transverse drainage installations.

In another instance, excavation below grade in a persistently soft area near the northerly terminus of the project disclosed an underground stream flowing at the rate of 2,000 gallons per hour. This area and many others, particularly in the shale cuts, required much unanticipated additional subdrainage.

Material to balance the job was obtained by daylighting several cut sections which, in turn, provided increased sight distances and greatly improved the scenic features of the project.

The work was nearing completion last month at a total construction cost of \$337,000.

Construction was under the supervision of Assistant State Highway Engineer B. W. Booker and Assistant District Engineer R. P. Duffy. Edward Keeble was the general contractor and Dan Caputo was the subcontractor for the structures.

Bridge Innovations

*New Operation Facilities
On Richmond-San Rafael Span*

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

IN THE PLANNING for the Richmond-San Rafael Bridge, a toll structure across the northern part of San Francisco Bay, careful consideration has been given to maintenance and operational features. These considerations resulted primarily from the stipulation contained in the bond resolution authorizing the sale of \$62,000,000 of revenue bonds, i.e., that the maintenance and operation expenses are to be paid from bridge revenues.

Some of the features of this planning have resulted from the operational experiences of other toll bridges and improvements which have been made in facilities since the opening of the San Francisco-Oakland Bay Bridge.

Careful study was given to the detailing of all structural members to provide proper access to all parts for ease in cleaning and painting during the life of the structure. Consideration was also given to the cleaning of the deck and the approach roads within the limits of the project. In order to facilitate the maintenance and expedite the handling of the various cleaning and painting operations, the following facilities are being placed on the structure.

Air Compressors

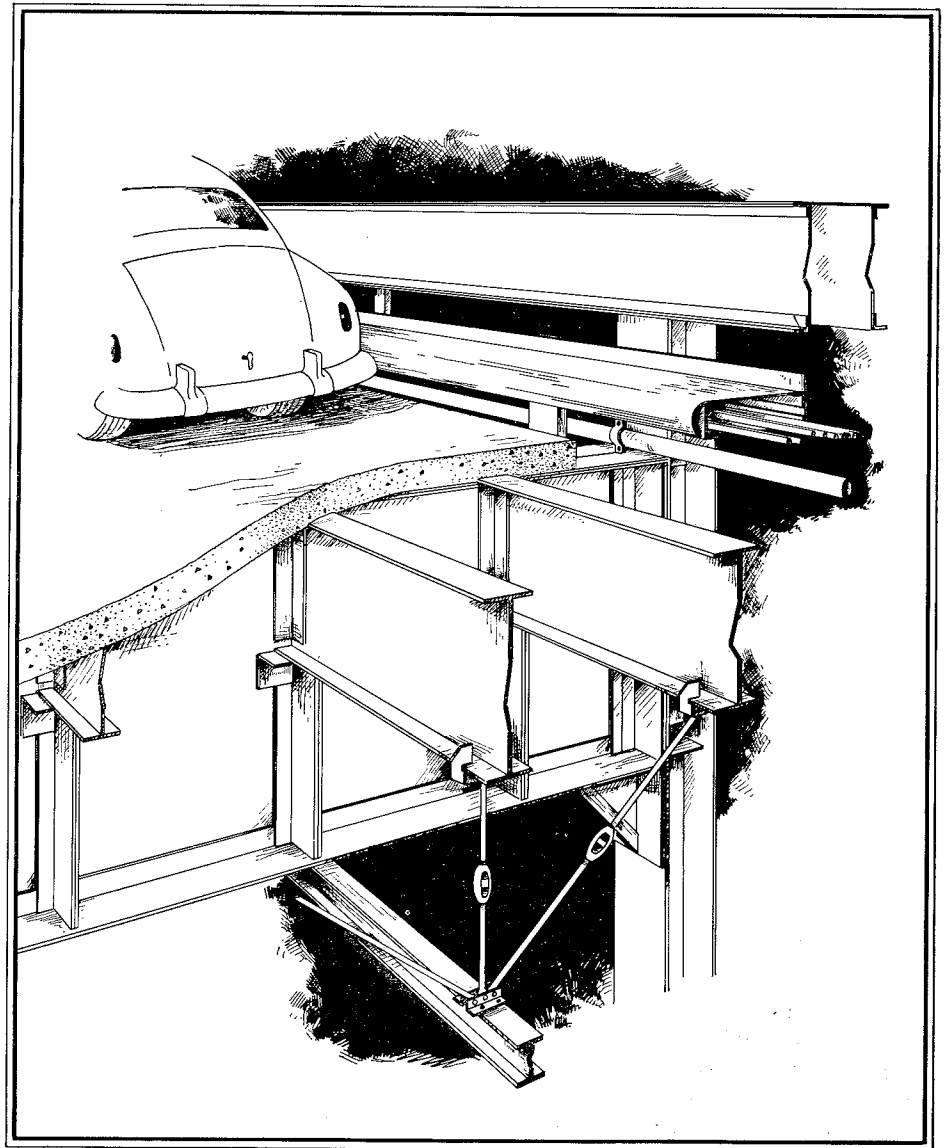
A 2½-inch steel pipe will extend across the bridge from the maintenance building on the Richmond side to another maintenance building on the Marin County side of the bay, a distance of 4¼ miles. Electrically operated compressors with air receiver tanks are located in each building. Either or both compressors automatically cut in when the pressure in the system falls below certain pressure limits and cut out when the pressure exceeds the upper limit. This air will be used for cleaning structural members by sandblasting, for spray painting, and for operating the foghorns at the navigation channels.

Another 2½-inch pipe extends between these two maintenance build-

ings, supplying water on the Marin County side for sanitary and drinking purposes, and for cleaning structural members by washing, and for nominal fire protection on the bridge. A 15-horsepower electric motor, operating a multistage pump, boosts the water along the roadway level to a maximum height of 220 feet over the main navigation channel.

Also provided are three maintenance tracks under each deck throughout the steel portion of this structure. From these tracks will be suspended traveling maintenance gantries, or platforms, for use by the painters and for their supplies.

It is contemplated that the maintenance truck will transport the various crews with supplies to their respective



Maintenance tracks to carry traveling gantries

stations in the morning and return for them in the evening. This should keep all vehicular traffic lanes on the bridge free of maintenance vehicles during the day. In case of emergency, or need of supplies, workers can contact the toll sergeant in the administration building at the Richmond end of the bridge by means of the bridge telephone system. There are numerous call boxes, at various locations, where portable dial-type handsets can be plugged in by the maintenance men for communication with the toll sergeant.

Electrical Energy for Span

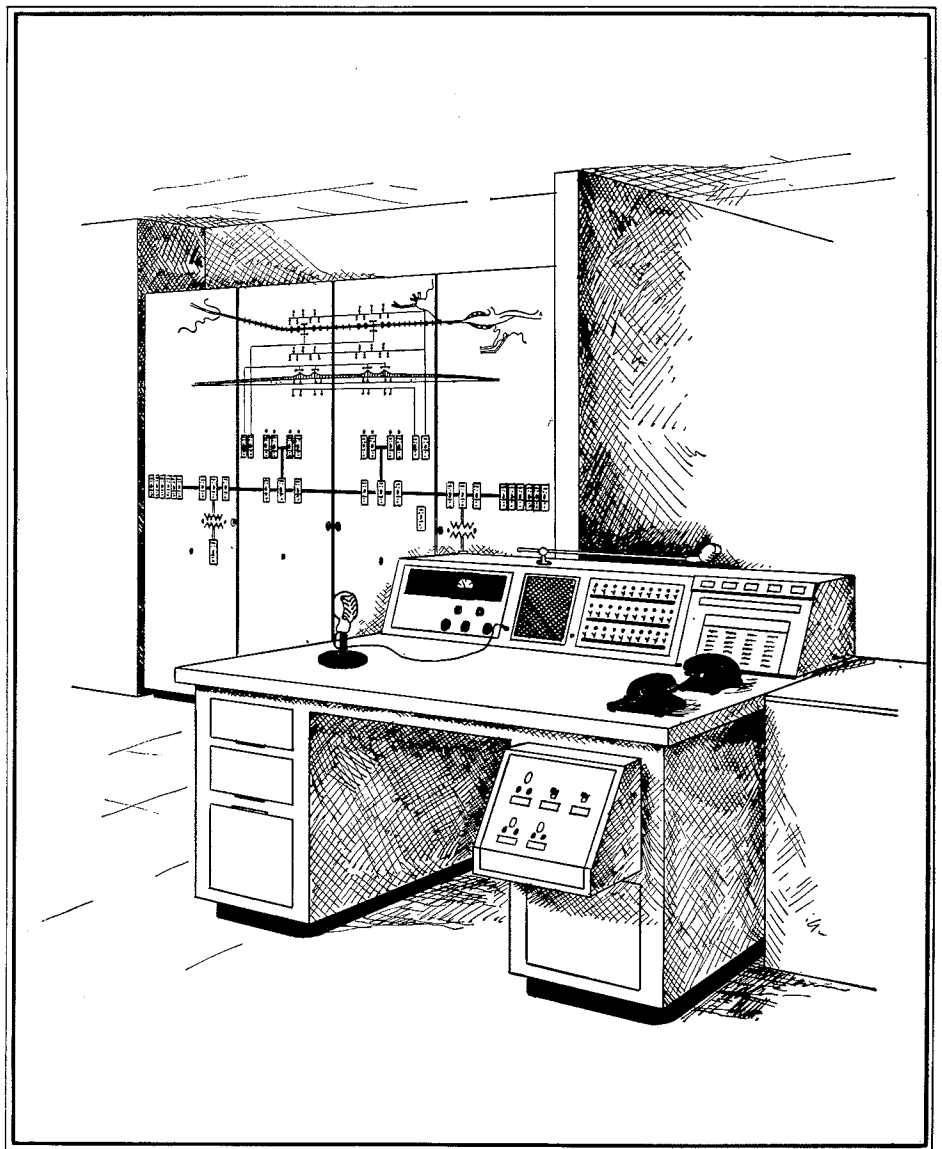
In order to facilitate not only initial placing of the various electric circuits but also the maintenance of such circuits, the power, control, and communication cables are laid in a steel trough under the curbs. There are four troughs sufficient for all of the bridge wiring; supplying, in addition, space for any public utility needs. These troughs will not only protect the maintenance workers from the wiring but will also provide space for new cables if and when needed.

Electrical energy for bridge operation is metered from both sides of the bay and in the event of a failure in power service from either Contra Costa County or Marin County automatic switching permits the power to be transmitted to the entire structure from the other source.

The roadway lighting, aviation beacons, and navigation signals are photoelectrically controlled and are so grouped that the units are controlled by the light intensity. In case of fog on one end of the 5½-mile project, the lighting would be affected only in this area. The same would be true for the aviation and navigation aids.

Removable Curb Plates

The curb plates are removable throughout the length of the bridge to facilitate any repairs or the addition of new facilities. The steel curbs on either side of the 36-foot roadway have a half-round contact surface. This type of curve has been widely used on state highway bridges and has been found to be very efficient in preventing the wheels of vehicles from climbing when hit with a glancing



Toll sergeant's desk from which all operations of the bridge can be directed

blow. Additional space is also available between the curb and floor beams for utilities.

A six-inch continuous clear opening between the under portion of the curb and the concrete slab affords a free passage of deck water in wet weather. Most of the road grime will be swept off the deck by the passage of wind through the opening. In the event that the roadway is periodically swept by mechanical means, the roadway dirt is brushed through the opening over the side of the structure.

Long-range Planning

Long-range planning was considered in the design of the superstructure of this bridge in the event of

increased loads from any causes unknown at this time.

The floor system was designed with stringers, spaced at 4 feet 3 inches, on which was placed a 6-inch roadway slab consisting of 5½ inches of lightweight concrete and a ½-inch mortar wearing surface. The concrete deck is estimated to weigh 60 pounds per square foot, including the reinforcing steel.

The stringers, as spaced, can accommodate other lighter slabs, some of which weigh as little as 20 pounds per square foot. The replacement can be accomplished without change to the floor system and with a dead load reduction of as much as 2,900 pounds

... Continued on page 32

Bay Barrier

*Eminent Engineers Are
Conducting Investigations*

THE ABSSHIRE-KELLY Salinity Control Barrier Act of 1953 (Chapter 1104, Statutes of 1953), appropriated the sum of \$250,000 and allocated an additional equal sum to the Water Project Authority of the State of California for making a study of barriers in San Francisco Bay. The act requested an investigation and study of the feasibility and economic value of construction by the State of a suitable barrier and public works incidental thereto at several alternative locations across San Francisco Bay, San Pablo Bay, Suisun Bay and at the outlet of the Sacramento-San Joaquin Delta. The purposes for which the barriers are to be investigated include reclamation of lands, salinity control, flood control and creation of a supply of fresh water for irrigation, domestic uses and related purposes. The act further requests that the Water Project Authority in making the investigation and study consider the physical and economic effects of barriers on navigation, transportation, levees, industries and agriculture adjacent to the bays, national defense, silting of the bays and channels, and fish life.

The investigation and study are being carried on for the Water Project Authority by the staff of its executive officer, State Engineer A. D. Edmonston. At the meeting of the authority held on July 3, 1953, the executive officer presented a program for the investigation, the procedure to be followed and a recommendation with regard to the employment of a board of eminent consulting engineers to advise on the investigation and study. It was recommended that this board include specialists in the fields of water supply and hydraulic structures, foundation and soils, geology, subaqueous structures, waste disposal and pollution, and transportation.

A committee of the authority composed of Attorney General Edmund G. Brown; State Controller Robert C. Kirkwood; and Director of Public Works Frank B. Durkee, was named to advise with the executive officer and select the five members of the Board of Consultants. The committee first selected Raymond A. Hill, consulting engineer of Los Angeles, as chairman and with his advice selected

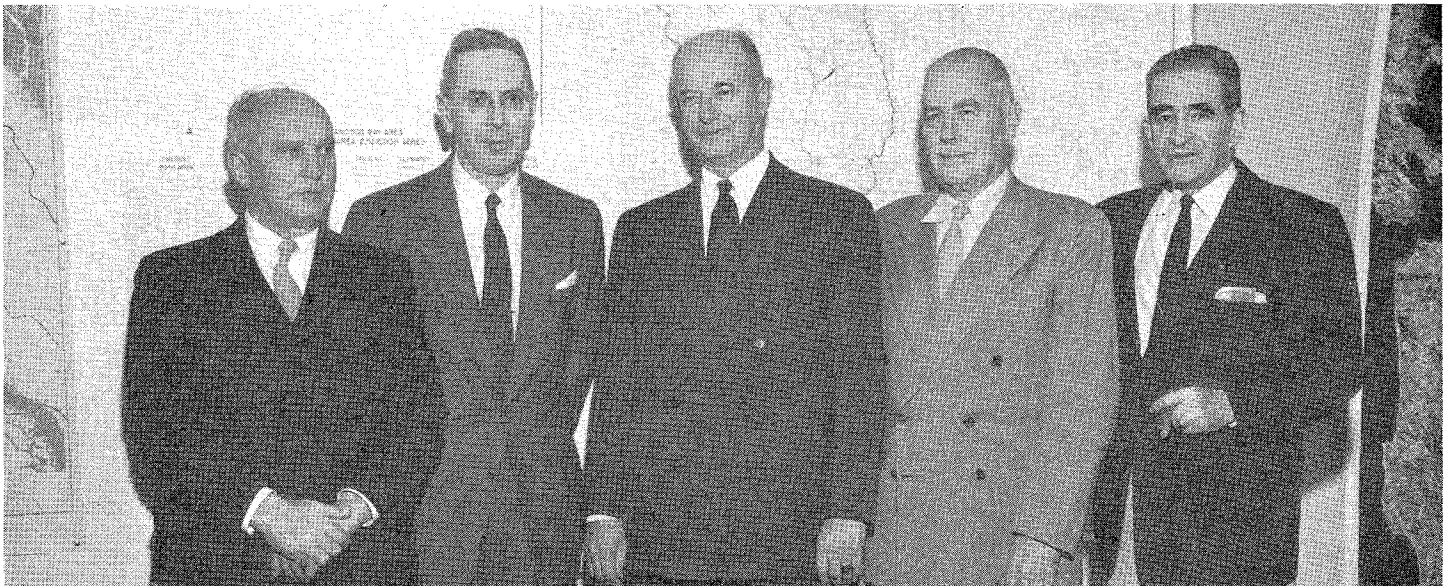
the other four members, Philip C. Rutledge of New York; Brigadier General Hans Kramer of San Francisco; Malcolm Pirnie of New York; and Charles E. DeLeuw of Chicago.

Hill Is Chairman

Hill is a member of the firm of Leeds, Hill and Jewett. He has had wide experience in water supply studies, the design of hydraulic structures throughout the West, and geology as applied to the design of such structures. He has assisted the State Engineer's Office and the Water Project Authority as a consultant on the Feather River Project and supervision of safety of dams.

Rutledge is a member of the firm of Moran, Proctor, Muesser & Rutledge, New York. This firm assisted in the foundation work on both the Golden Gate Bridge and the San Francisco-Oakland Bay Bridge. Rutledge is a former dean of the School of Engineering, Northwestern University. Both he and his firm are outstanding in the field of soil mechanics, underwater foundations and earth dams.

Board of Consultants composed of nationally known engineers. LEFT TO RIGHT: Charles E. DeLeuw, Chicago; Philip C. Rutledge, New York; Raymond A. Hill, Chairman, Los Angeles; Malcolm Pirnie, New York; Brigadier General Hans Kramer, San Francisco.





Governor Goodwin J. Knight meets C. Biemond, noted Dutch engineer, in his office in Sacramento. LEFT TO RIGHT: Director of Public Works Frank B. Durkee, Governor Knight (seated), State Engineer A. D. Edmonston, Raymond A. Hill, and Biemond.

General Kramer, a retired officer of the Corps of Engineers, U. S. Army, has had extensive experience in river, navigation and flood control projects. He was in charge of design and construction of the Conchas Dam and Reservoir Project and other flood control works in New Mexico and Colorado. He was also in charge of design and construction of a section of the Panama Canal.

Pirnie is the senior member of the firm of Malcolm Pirnie Engineers. He has an international reputation in the fields of water supply, sanitation and stream pollution. He is a trustee of the Harvard School of Engineering and is a past president of the American Society of Civil Engineers.

DeLeuw is president of the firm of DeLeuw, Cather and Company of Chi-

cago. He has had more than 30 years' experience in the field of transportation, including investigations and reports to many public bodies and railroads, and the design and supervision of construction of railroad and highway facilities.

Following considerable discussion with regard to the employment of an engineer from The Netherlands familiar with the reclamation of submerged lands in that country, and the problems related thereto which would be similar to those encountered in the San Francisco Bay Barrier investigation, the authority authorized Hill while on a trip to Europe on other matters to interview engineers in Holland with the objective of recommending the employment of one of them as a consultant. Based upon his

findings of qualifications of the men interviewed, Hill recommended to the executive officer that Ir. C. Biemond be retained by the authority for a period of approximately two months.

Biemond is an outstanding engineer of long and broad experience in The Netherlands in the reclamation of lands, the conservation of water and the prevention of pollution of fresh water lakes by salinity intrusion, all of which matters are pertinent in the San Francisco Bay Barrier investigation. He arrived in California on June 14, 1954, and is presently working with the staff of the State Engineer's Office in the solution of the many problems involved in the determinations to be made in connection with a report on San Francisco Bay barriers.

In Memoriam

EDWARD HYATT

Death on June 17th deprived California of its most outstanding authority on water conservation and resources. Edward Hyatt, 65, who retired as State Engineer in February, 1950, after 36 years of service with the State, died in Sacramento after a long illness.

Hyatt started with the State in 1914 under Governor Hiram W. Johnson as Engineer for the State Highway Commission.

Two years later he transferred to the new State Water Commission, which was in charge of water rights in California.

In 1922 he was named Deputy Chief of the Division of Water Rights and advanced to the position of Chief in 1924 under an appointment by Governor Friend W. Richardson.

Hyatt took the job as State Engineer in October, 1927. He was appointed by the late Bert B. Meek, Director of Public Works, with the approval of Governor C. C. Young. The engineer served on many boards and commissions dealing with water problems. One of the most important posts was Executive Secretary of the California Water Project Authority.

In the 1920s Hyatt directed the surveys which led to the development of the State Water Plan and the CVP.

The engineer was born July 21, 1888, in San Jacinto, Riverside County. He received his engineering education at Stanford University.

His first job was with the United States Geological Survey. Surveys were made by small parties of men with a pack train of mules. Much of his work was done with the late Colonel Robert B. Marshall, who conceived the plan for the CVP.

After his work with the Federal Government, Hyatt entered private employment between 1912 and 1914 with the San Joaquin Light and Power Corporation.

Hyatt is survived by his widow, Delta; daughters, Dolly Hyatt of Los Angeles and Mrs. Horace D. McClure of Springfield, Mass.; and sisters, Mrs. Shirley Willits of Corona, Antonia Hyatt and Mrs. Phyllis Gardiner of Sacramento.

NEW COLORADO FREEWAY IS OPENED TO TRAFFIC

By J. E. McMAHON, Bridge Engineer, Southern Area

A colorful procession of horse-drawn carriages and early model automobiles marked the opening to traffic of the westbound lanes of the Colorado Street Bridge on October 8, 1953.

On June 25, 1954, without additional ceremony, the remaining portion of the Colorado Freeway from Holly Street in Pasadena to Avenue 64 in Los Angeles was thrown open to traffic.

Eighty years before, on January 27, 1874, the founding of Pasadena took place on the east bank of the Arroyo Seco, on the plateau which rises 170 feet above the bottom of the canyon. Undoubtedly, the Pasadena pioneers gave some thought to the problem of crossing this deep ravine which separated them from the growing communities to the west and south. The crossing was first made on relatively small bridges in the bottom of the canyon, with narrow, winding approach roads in and out of the arroyo. With the growth of the city, and with increasing developments in transportation, these low-level crossings soon proved inadequate.

The city fathers met this challenge by authorizing a bond issue of \$100,000 which was matched by the County of Los Angeles to provide funds for a new structure. This multiple-arch bridge, which was completed in 1913, has become a familiar landmark to residents of the Pasadena area.

The Colorado Freeway, now in the process of construction, is the answer of state engineers to the problem of improving transportation facilities between Pasadena and portions of Los Angeles and Glendale. The line of the freeway will roughly parallel existing Colorado Street, which has been the main thoroughfare in this area. The portion of the freeway which is now completed, or under construction, connects Holly Street in Pasadena with the intersection of Colorado Street and Eagle Vista Drive in Los Angeles.

An important feature of the new freeway is the recently completed six-lane Colorado Street Bridge, which was built in close proximity to the original two-lane structure. One of the problems in the design of the new bridge was to provide a type and style of structure which would not conflict in appearance with the existing bridge.

The entire section of the freeway, from Holly Street in Pasadena to the intersection of Colorado Street and Eagle Vista Drive in Los Angeles, is 2½ miles in length. The estimated total cost of the construction work is \$5,500,000. The project was divided into four separate contracts.

The first three of these contracts covered the construction of 1½ miles of freeway at an estimated cost of \$4,600,000. Work under these three completed contracts was performed by the Guy F. Atkinson Company.

H. R. Lendecke represented the State Bridge Department on all structure work. L. E. Steele represented District VII in connection with highway construction work under these contracts.

The fourth and remaining contract, which includes that portion of the freeway between Avenue 64 and Vista Drive, was awarded on May 14, 1954, to Peter Kiewit Sons' Co. of Arcadia. Construction work is now in progress and is scheduled for completion in June, 1955.

The opening of the completed section of the Colorado Freeway is a great step forward in relieving traffic congestion in the Pasadena area. It is an important link in the integrated freeway system which is being pushed to completion in Southern California in an effort to keep pace with the tremendous growth of this metropolitan area.

MARGIN OF SAFETY

Nearly all motorists allow themselves enough road space to take care of normal needs. The safe driver allows extra space for emergencies.

Industry and Frontage Roads

By
JOHN F. KELLY
 Headquarters Right of Way Agent
EDWARD P. REILLY
 Right of Way Agent District VII

A frontage road is a local street or road auxiliary to and located on the side of a freeway for service to abutting property and adjacent areas, and for control of access.

Los Angeles is the fourth largest industrial center in the United States, and is more dependent upon the motor vehicle than any other major population center in the world. The great bulk of all transportation, to, from, and within the area is by motor vehicle. This includes the carrying of both passengers and freight. While the railroads still haul the bulk of interstate freight shipments, trucks handle most of the intrastate freight.*

The growth of Los Angeles in economic stature and an ever increasing number of vehicles has made the traffic situation in Los Angeles one of the foremost problems in the nation. The development of a network of freeways in metropolitan Los Angeles has been found to be the best solution toward solving this problem.

FREEWAY THROUGH INDUSTRIAL AREA

The Santa Ana Freeway, extending southeasterly from downtown Los Angeles is the first freeway in the city to be routed through a major industrial area. Beyond the built-up downtown area considerable unimproved land has become more accessible to the central section of the city by reason of this freeway. Knowledge of the route prior to construction encouraged the location of many new industries in the vicinity anticipating the freeway construction. The principal new industrial activity starts at Olympic Boulevard, a distance of 5.5 miles from the civic center, and ex-

* Data from Monthly Summary Business Conditions in Southern California by Security-First National Bank of Los Angeles.

† May-June, 1954, issue of *California Highways and Public Works* magazine.

Property owners acclaim Santa Ana Freeway an advantage to industrial business

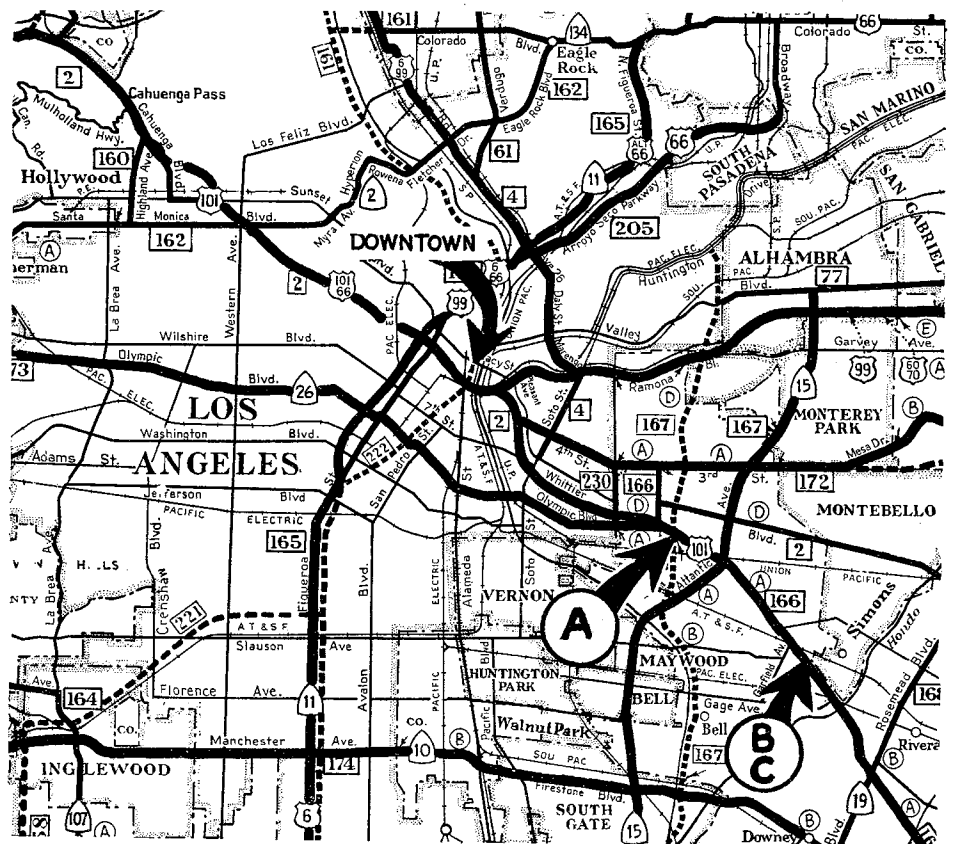
tends southeasterly approximately five miles to the Rio Hondo River. The routing of the freeway and necessary access restriction through this area resulted in a number of existing streets becoming frontage roads adjacent to the new freeway.

PREVIOUS STUDY

The recently completed economic study entitled "Industry and Freeways" † has shown that a freeway in a metropolitan area stimulates the devel-

opment of land within its zone of influence. The study firmly established that the economic effect of a freeway route upon industry is beneficial. The scope of that study, for practical reasons, did not include frontage road influence because the importance of that subject warrants a separate study.

The land abutting a frontage road is more directly affected by the freeway than any other property within the entire freeway zone of influence. The Santa Ana Freeway provides the ideal situation for determining the effect of property values on industrial land abutting a frontage road. Along this freeway there are examples of streets which were more than 50 percent improved before construction of the freeway and due to access requirements became frontage roads; there



Map of Los Angeles showing principal highway routes. Downtown Los Angeles and Test Areas "A," "B," and "C" along Santa Ana Freeway are indicated.

are examples of frontage roads in which all of the industrial sites average approximately one acre in size; and there are those frontage roads which have substantially large industrial sites to attract an altogether different type of industrial enterprise. The many variations found along this freeway have made it possible to conduct an economic study covering practically every type of industrial enterprise.

TEST AREAS

In order to find the answer as to the economic effect of a frontage road upon different types of industries on parcels of land varying in size, three different sections of frontage road along the Santa Ana Freeway have been studied as typical examples. They are referred to as Test Areas "A," "B" and "C." The map of Los Angeles shows location of these test areas on the Santa Ana Freeway.

The two principal means used to determine whether it is an advantage or a disadvantage for industrial property to be located on a frontage road have been (1) the trend in land values and (2) the statements by the property owners of how they feel about this particular type of industrial site.

The basis of the land trend analysis has been the comparison of land sales on the frontage roads with the sale of other industrial properties which are comparable in every respect except for being located on a conventional road and away from direct freeway influence.

Statements from the owners and officers of industrial plants located on the frontage roads adjacent to the Santa Ana Freeway provide the answers to the second phase of this study—the opinion of industries that have had experience in conducting business on a frontage road side.

Test Area "A"

Area "A" shown in *Diagram 1* and *photos* is a section of Telegraph Road along the northerly side of the freeway extending southeasterly from Olympic Boulevard, a distance of approximately 5,000 feet. This frontage road had previously been an arterial

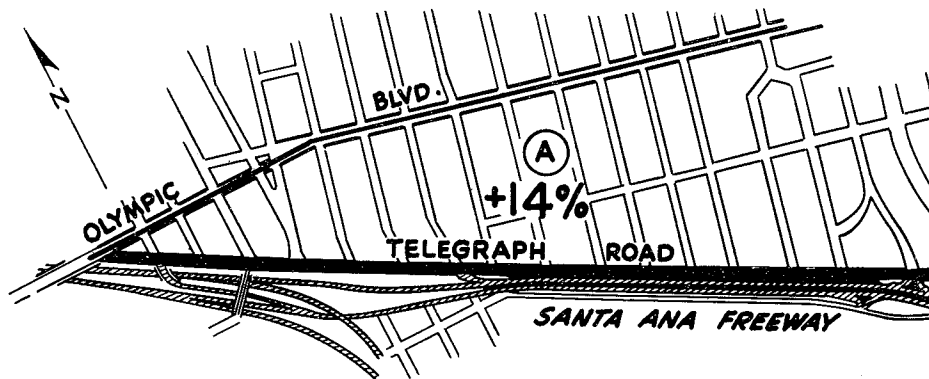


Diagram No. 1

Diagram of Test Area "A" shows frontage road (Telegraph Road) in heavy black line adjacent to freeway. Fourteen percent land value increase over Olympic Boulevard property shown.

thoroughfare with light industrial sites fronting on both sides of the street. The new freeway construction required all of the property on one side of Telegraph Road and the restriction of access rights. This transformation made Telegraph Road into a frontage road with industrial sites along only one side. In order to determine the effect of changing the character of this street, a comparison was made of the trend in land prices with an arterial street which was similarly improved, having the same zoning, and the same general economic influences; the principal difference being that the comparable street removed from the freeway continued as an arterial street and was not converted into a frontage road. Olympic Boulevard shown in *Diagram 1* is the arterial street used for the comparison.

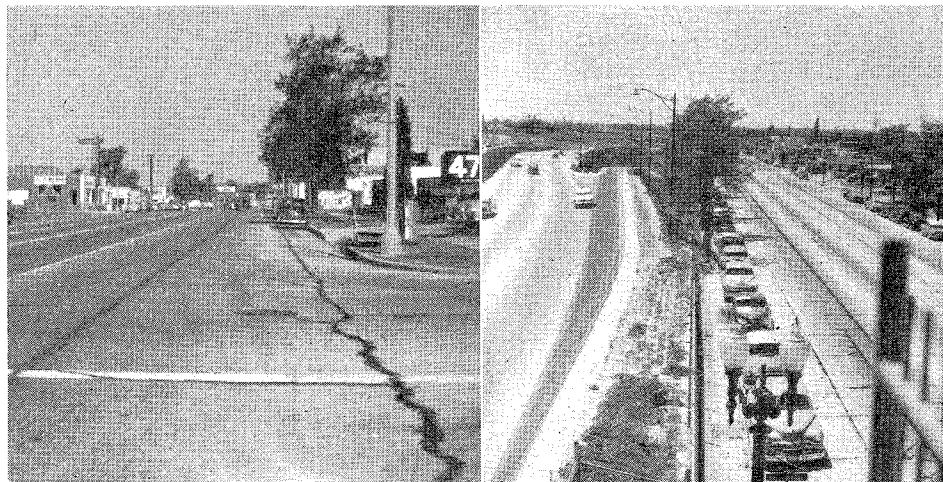
The properties in Test Area "A"

are examples of the smallest industrial sites along the freeway. These lots vary in size from 5,000 to 10,000 square feet. In 1949, land value on these two streets was approximately the same. From 1949 to 1954 the market price for industrial lots on both streets increased; however, the gain on the frontage road amounted to 68 percent whereas the arterial street showed an increase of 54 percent. The 14 percent difference in the price increase reflects the degree of enhanced land valuation along this frontage road.

Test Area "B"

The frontage road along the Santa Ana Freeway showing the greatest increase in land values between 1947 and the present time is a 2,500-foot section of Telegraph Road on the northeasterly side of the freeway near

LEFT: View of Olympic Boulevard used for comparison in Test Area "A." RIGHT: Test Area "A"—Telegraph Road—shown in right half of photo. Santa Ana Freeway on left side of picture.



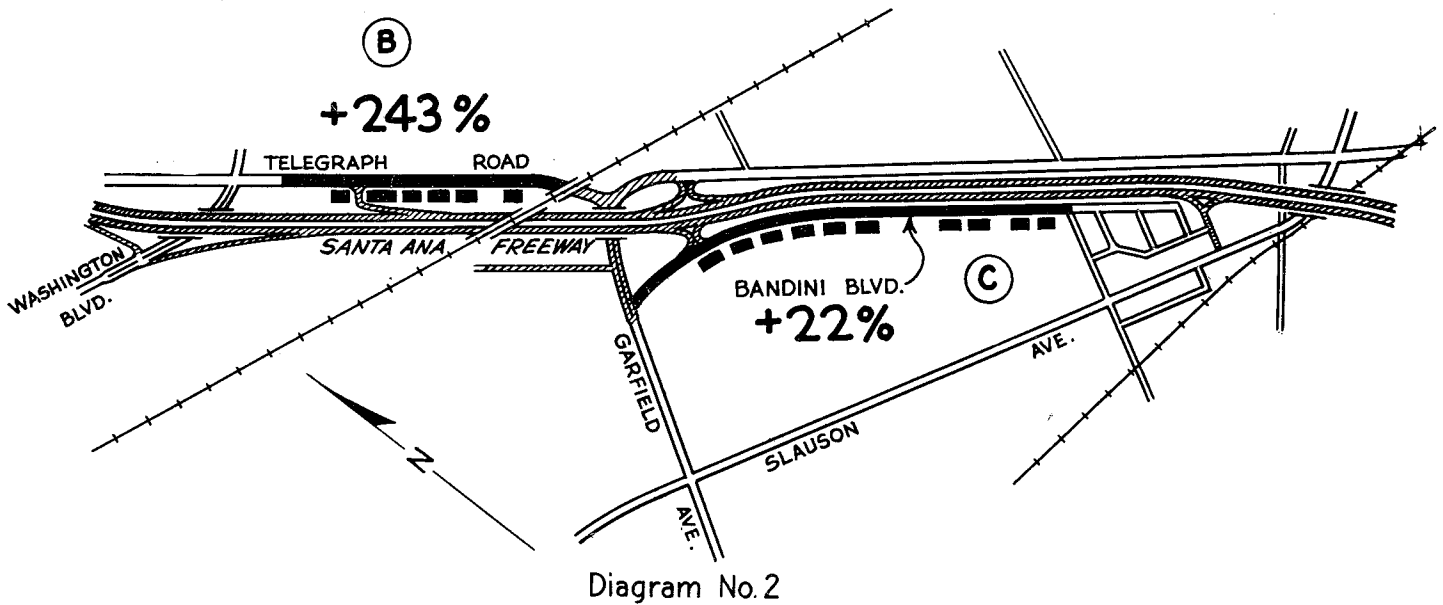


Diagram No. 2

Telegraph Road shown by heavy black line in left half of diagram shows location of Test Area "B." Black squares indicate location of industrial sites which increased in land value 243 percent over comparable sites. Test Area "C" shown in right half of diagram.

Washington Boulevard. Test Area "B" is shown in *Diagram 2* and *photos*. Industrial sites between the freeway and Telegraph Road vary in size from one-half to three acres. These properties sold in 1947 at figures averaging \$7,800 per acre. The prices increased to an average of \$25,000 per acre in 1953, and the latest sale in 1954 was \$55,000 for a one-acre industrial site. These increases represent a 605 percent change in land value for industrial sites in Test Area "B." Comparable size industrial properties having similar characteristics to those on the frontage road, except that they are located some distance from the freeway, have shown a 360 percent increase during the same period of time. The differences in the land value change between 1947 and 1954 was 243 percent greater for the properties in Area "B," as shown in *Diagram 2*.

Test Area "C"

Bandini Boulevard along the southwesterly side of the freeway extends a distance of approximately one mile south from the freeway ramps at Garfield Avenue. Investigation of nine sales of industrial properties along this frontage road between 1946 and 1954 has shown a land price increase of 312 percent. During the same period

of time there was a 290 percent increase in land value of comparable industrial property located away from the direct influence of the freeway. The parcels in Test Area "C" were substantially larger than the industrial sites in the other test areas. The size of the parcels which sold on Bandini Boulevard average 2½ acres each.

The industrial property on Bandini Boulevard has shown a 22 percent greater land value increase than the property used for comparative purposes. *Diagram 2* and *photos* show the industry on this frontage road.

LARGE INVESTMENT

The new 15-million-dollar West Coast Branch of Lever Brothers Manufacturing Company has been constructed adjacent to the Santa Ana Freeway in the vicinity of this economic study. The size of this development places it beyond the realm of the normal industrial enterprise used for comparative purposes; therefore, it has not been included in a test area. However, an economic study of industry along the Santa Ana Freeway cannot overlook such a spectacular development.

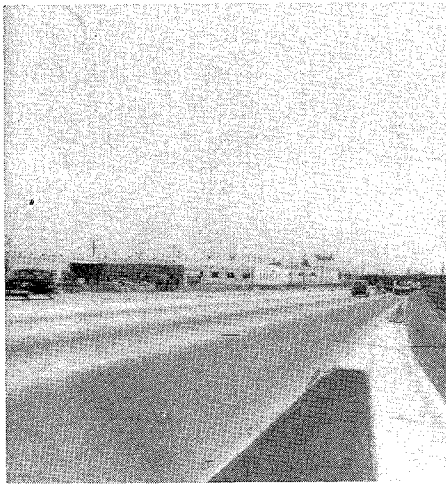
The 30½-acre site for this plant was acquired in 1949 at a price of \$9,000 per acre. The value of this land today, based upon current sales of comparable properties along the

Santa Ana Freeway, has been appraised at \$25,000 per acre. The design for the Santa Ana Freeway adjacent to this property was known at the time the land was acquired for this plant.

An investment of 15 million dollars by this world-wide organization on an industrial site located at the end of a cul de sac street adjacent to a freeway, and a distance of 2,000 feet from the nearest intersecting street, is noteworthy of everyone's attention.

OWNERS' STATEMENTS

The statements made by owners and officers of industries located adjacent to the Santa Ana Freeway in Los Angeles were confirmed through correspondence during the months of May and June, 1954. All of the industries are engaged in manufacturing, rebuilding, and servicing industrial goods. These industries reporting their opinions of the Santa Ana Freeway make commercial deliveries or pickups throughout the Los Angeles area in conducting normal business operations. The majority of these industrial plants perform their work without any railroad facility adjacent to the plant site. The industries fronting on that section of Bandini Boulevard adjacent to the freeway and the majority of the industries located between



UPPER: Test Area "B." New industrial plants adjacent to Santa Ana Freeway. LOWER: Typical industrial plant in Test Area "B." Freeway exit indicated in left section of photo.

Telegraph Road and the freeway selected their plant sites anticipating the freeway and prior to the opening of that section of the Santa Ana Freeway in the vicinity of their particular industries. The remarks have come from industries varying in size from those having as few as three employees to industries which engage as many as 300.

Excerpts from the individual letters reveal principal thoughts and remarks of the individual industries in their attitude of how a frontage road site adjacent to a freeway can affect the operation of an industrial enterprise.

Parker Engineering Co. & Parker Brothers, Inc., 7044 Bandini Boulevard

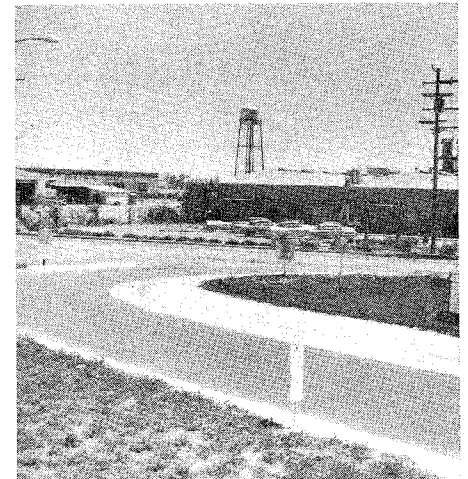
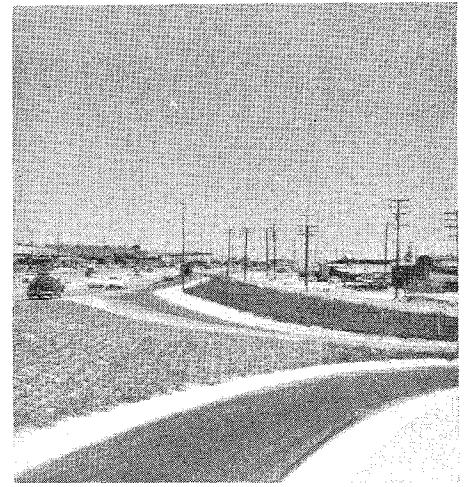
The Parker Engineering Company is engaged in applying corrosion re-

sistant coatings to metal products. The distance from this industry to the nearest exit and entrance to the freeway is approximately 350 feet. According to the vice president, this company is very enthusiastic about their location adjacent to the freeway and says "anyone in industry should find it a definite advantage." The principal influencing factors of the freeway reported by the Parker Engineering Company were as follows:

1. Freeway makes it possible to direct traffic to the plant without getting lost. If motorists read freeway directional signs there is no problem in reaching the plant site via the frontage road.
2. Very desirable advertising value on the freeway.
3. The freeway has enhanced the value of the investment by several times. Prospects for selling this property indicate a much higher figure at this location than could have been expected if the property were situated some distance away from the freeway.
4. The Parker Engineering Company is "100 percent sold" on an industrial location adjacent to a freeway. If it were necessary to move, a site would be selected adjacent to a freeway.

Challenge Manufacturing Co., 7400 Bandini Boulevard

This firm manufactures transit-mix concrete mixers. Having outgrown its plant in the Maywood area, it purchased 4.25 acres on Bandini Boulevard in 1950 in order to build a new plant which would accommodate the business expansion. The new site was acquired with full knowledge of the proposed freeway and the fact that Bandini Boulevard in front of the new industrial plant would assume the characteristics of a frontage road. The distance from this industrial site to the Garfield Avenue entrance and exit to the freeway is approximately 2,300 feet. Since the opening of the freeway to traffic in front of this property in the early summer of 1953, this industry finds the new freeway a "tremendous asset" in the operation of their plant. The president of this firm



UPPER: Test Area "C"—Bandini Boulevard—shown in right half of photo. Garfield Avenue exit and entrance to freeway shown in foreground. LOWER: One of the industries in Test Area "C" shown opposite freeway ramp into Bandini Boulevard.

further stated specific advantages brought about by the new freeway:

1. Better employee commuting.
2. Customers and business associates can more easily locate their business adjacent to the freeway.
3. Better circulation and distribution of goods. Travel time to the San Fernando Valley is now approximately one-half hour, whereas it had been nearly 1½ hours before the freeways were constructed.
4. Enhanced property values by freeway location.
5. It is our opinion that the industrial sites adjacent to the freeway (on the frontage road) in the vicinity of our plant are

... Continued on page 52

Long Beach Freeway

What Is Happening
On This Huge Project

By E. T. TELFORD, District Engineer

TELEVISION and radio newscasts have accustomed us to getting quick information from reporters on the spot who, being at the scene of action, can give us a firsthand graphic picture of what is happening. In presenting this progress report of the Long Beach Freeway, a similar procedure is being followed of having write-ups from several of the State Division of Highways representatives, each about his own particular job, the resident engineers, the supervising designer, and the senior right-of-way agent—all of whom are in direct responsible charge of various activities on the six-lane Long Beach Freeway. There is also included a write-up by the city engineer of Long Beach covering construction by the City of Long Beach on the Long Beach Freeway southerly of the south terminus of this freeway for the portion where it is not on the State Highway System.

This freeway for many years was called the "Los Angeles River Freeway," taking this name from the fact

that the major portion of its 16-mile length from the southerly terminus at Pacific Coast Highway to junction with the Santa Ana Freeway follows along the banks of the Los Angeles River. By official action some time ago the Los Angeles County Board of Supervisors changed the name of this freeway to the *Long Beach Freeway*. If one considers the time of first inception, the early planning, the setting aside of vacant lands for freeway right of way years ago by the City of Long Beach and the County of Los Angeles, then the Long Beach Freeway is as old as, if not older than, any of the freeways in the Los Angeles metropolitan area.

Up-to-Date Report

This progress report that is now being made is from the standpoint of describing and discussing current happenings. To those who may wish detailed information concerning what has been done on the Long Beach Freeway in past years, reference can

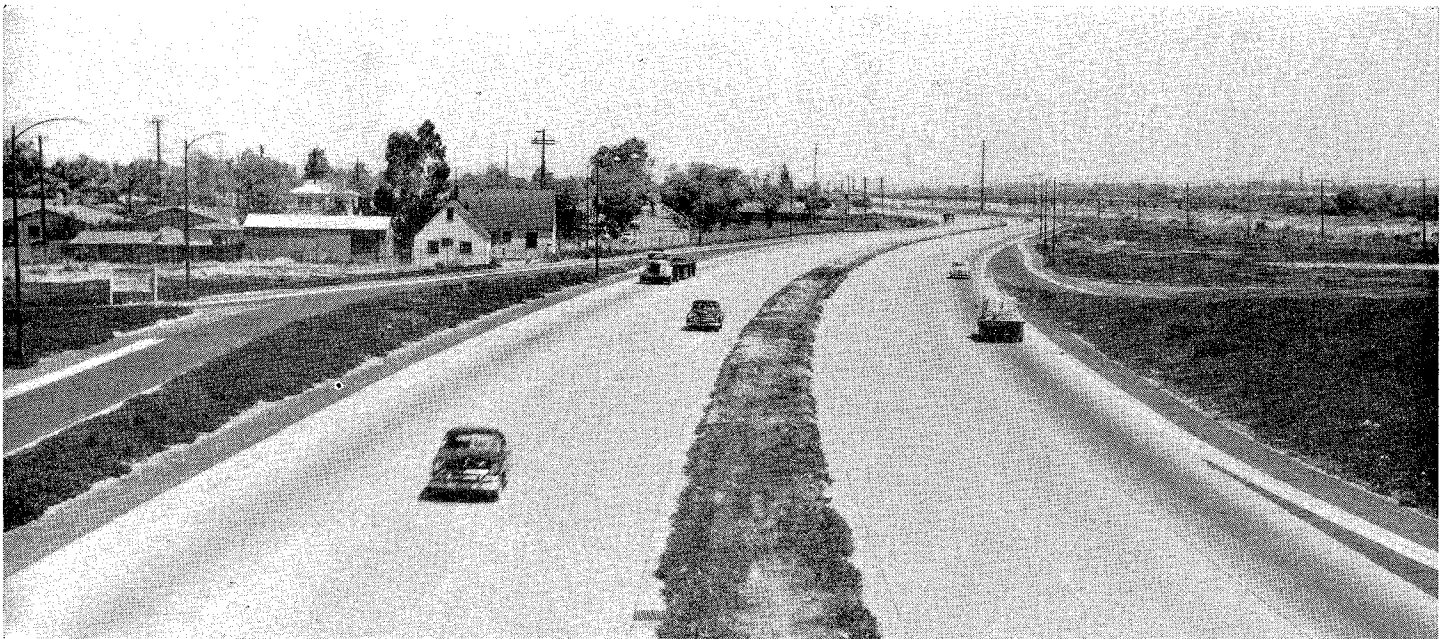
be made to the bibliography at the end of this report.

A full and complete, up-to-date report is now very much in order on this freeway because of the present intensive right-of-way acquisition and construction program that is in progress. The State Division of Highways has spent or obligated for rights of way and for construction a total of \$30,000,000 on this freeway.

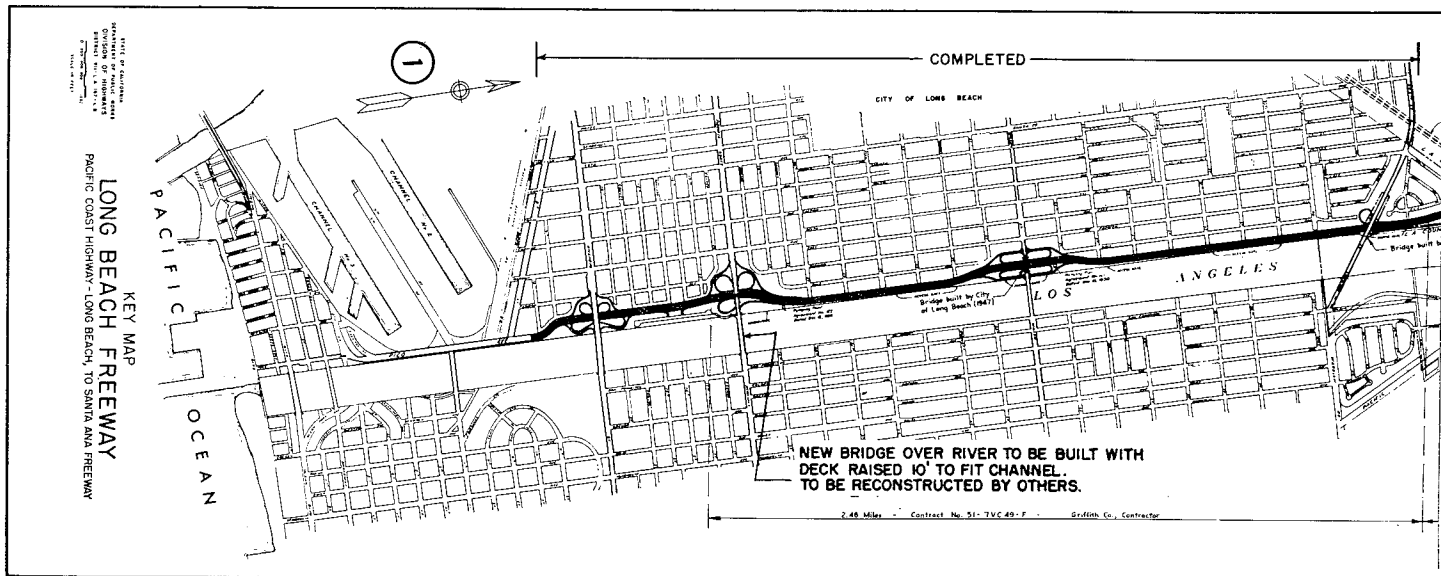
Outlook for Future

We are well justified in having an optimistic outlook regarding the Long Beach Freeway and looking forward to completion of the entire 16 miles between Pacific Coast Highway and the Santa Ana Freeway in the not-too-far-distant future. Completed construction amounts to \$2,500,000 and the total of contracts now under way is \$10,500,000.

While some advantage is being obtained from the completed 2½-mile section of the Long Beach Freeway at the southerly end which is now opened to traffic, full benefit to the



Looking northerly from Pacific Coast Highway along completed section of Long Beach Freeway. Two and one-half miles of this completed construction extends to 223d Street.



plete; however, this is not quite the picture, as there still remain 14 traffic interchange ramps on which curbs, gutters and plant-mixed surfacing must be placed, in addition to numerous other minor but time-consuming items of work to be completed.

However, barring any unforeseen delays, the people in the Long Beach area should be able to visit their friends and relatives to the north on Christmas of this year via the Long Beach Freeway, being able to travel eight miles of completed freeway from Anaheim Street on the south to the south junction of Atlantic Avenue in Compton on the north.

Dominguez Street Underpass

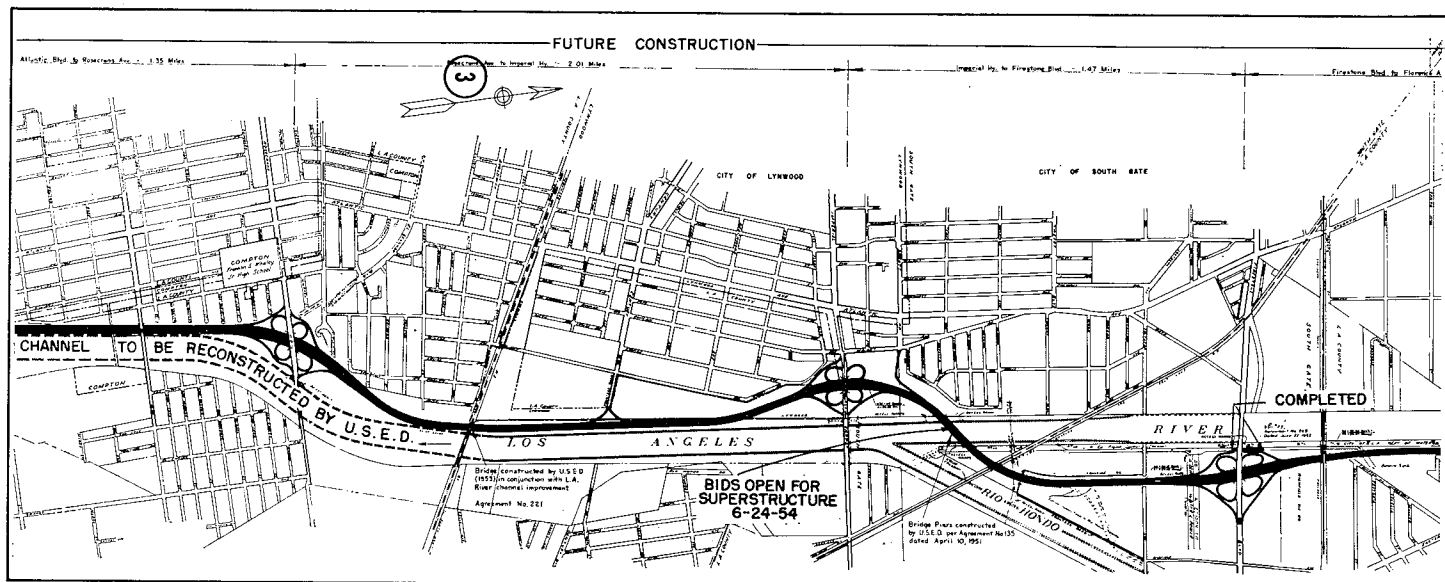
By FRED H. BUCK, Resident Engineer

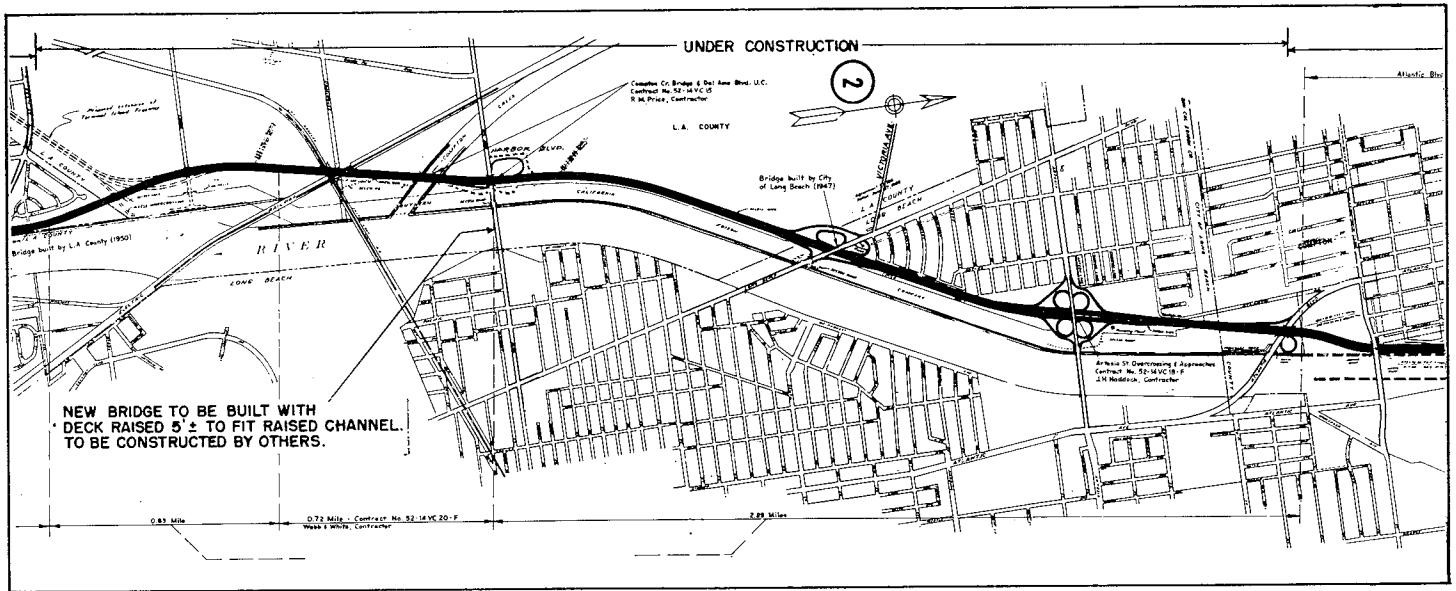
One of the interesting and difficult problems faced by Contractors Webb and White, during the construction of the Dominguez Street Underpass on the Long Beach Freeway was the fabrication, shipment and erection of the large steel plate girders which carry the double tracks of the Pacific Electric Railway over the freeway in the North Long Beach area.

These girders are among the largest of this type ever fabricated and erected in the Southern California area. As delivered in the field, each of the

girders had a weight of 117 tons, a length of 128 feet and a depth of 13 feet. Fabrication was in the Baldwin Park plant of the steel division of the Vinnell Company, Inc. Because of the difficulty of obtaining plate in large enough sizes for the web, a continuous, automatic, longitudinal weld was placed in each girder for the full length. During fabrication in the shop the work was subjected to continuous inspection by the Material and Research Laboratory of the California Division of Highways, under the supervision of Ross Clinton of the Los Angeles office.

When ready for shipment, each girder was lifted upright from the flat position of the portable cars used dur-





ing assembly in the shop and set on trucking equipment furnished by the Belyea Truck Company. The transport had double dollies between the prime mover and the front of the girder to aid in making turns, and a single dolly at the rear. A total of 58 wheels carried the load. When loaded on the transport, the over-all dimensions were 175 feet in length and 16 feet in height. The move to the job site was made during the early morning hours over a carefully selected route and went off without difficulty.

At the erection site, each girder was moved into position as closely as possible, then lifted with four 35-ton cranes, two on each end working through equalizer bars. Before picking

up the load, the cranes were spotted so that walking would not be necessary after the girder was taken from the transport. Actual erection went very smoothly, a little over two hours being required to set each girder after it had been spotted in place between the piers. Transportation and erection of the girders was under the supervision of Neil Lang of the Vinnell Company.

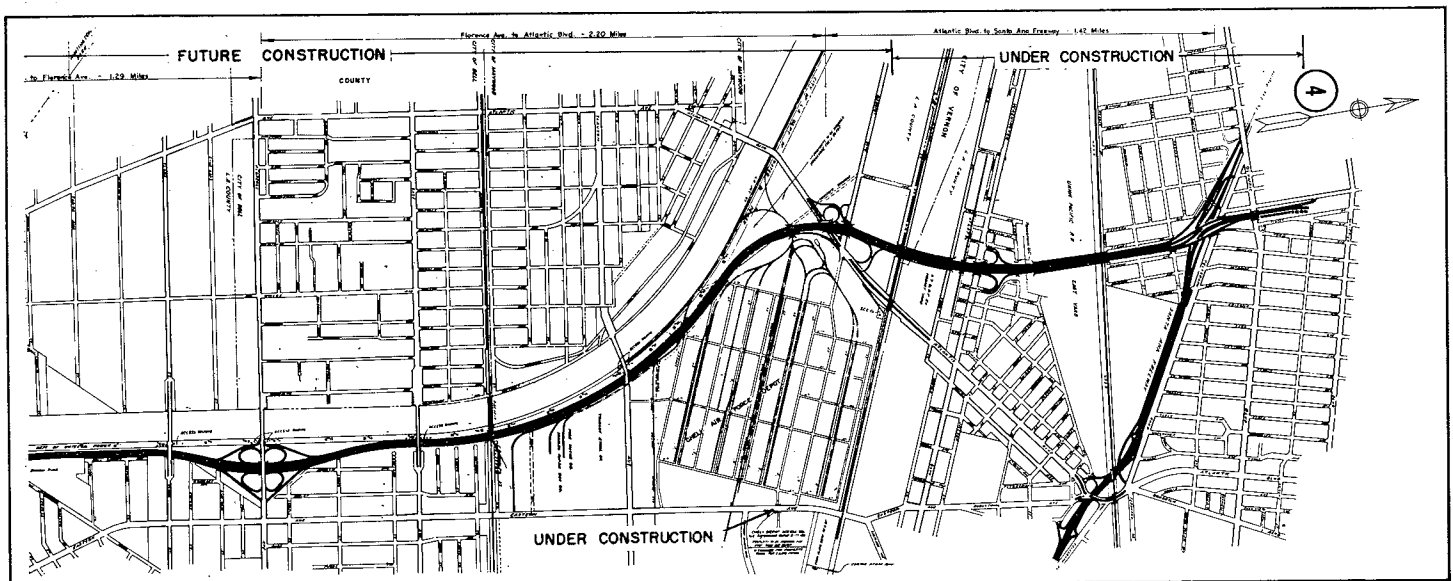
Grade Separations

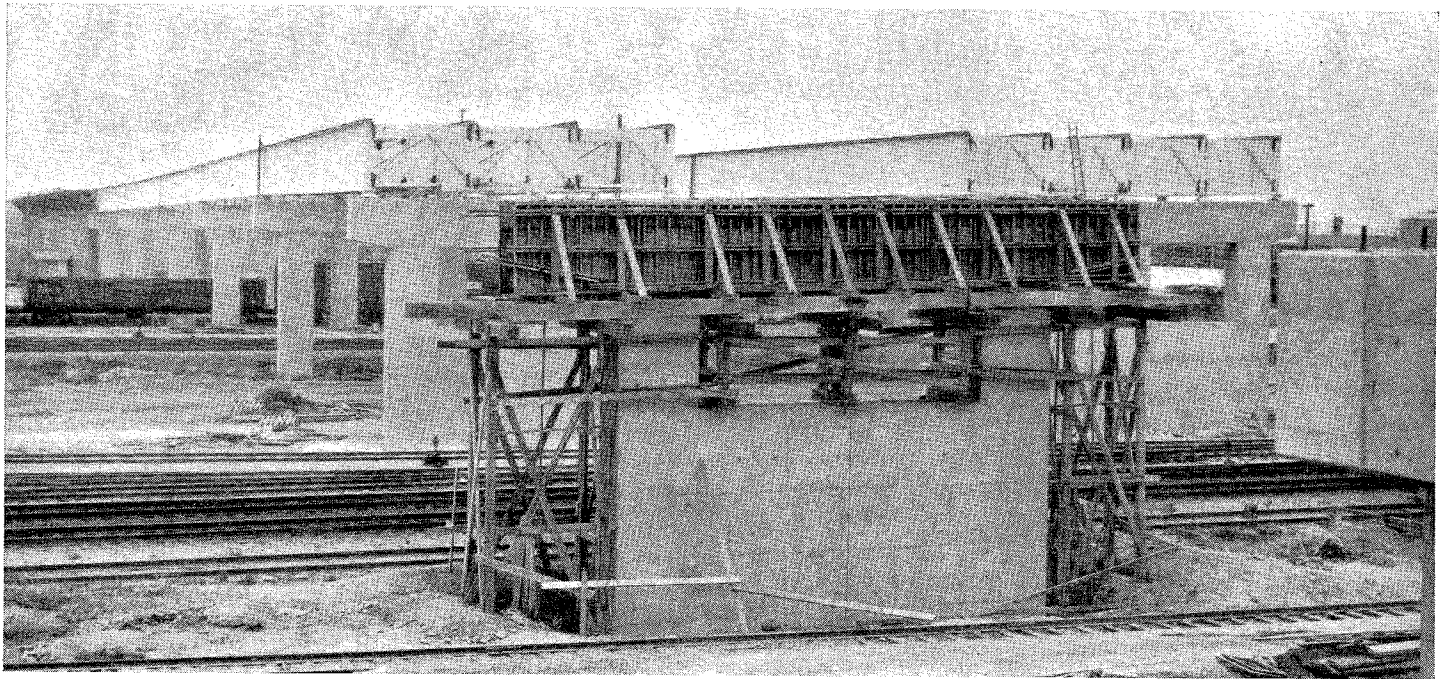
By A. K. GILBERT, Resident Engineer

Construction under this contract covers two railroad grade separation bridges to carry the Long Beach Freeway over railroad tracks. The smaller

structure is called the Pacific Way Overhead and provides a single 20-foot span over Santa Fe Railroad track No. 35. The Pacific Way Overhead, a reinforced concrete rigid frame bridge on concrete drilled piles 30 feet in length, has been completed.

The larger structure is called the Hobart Yard Overhead carrying the freeway over mainline and freight yard tracks of the Santa Fe Railroad. The Hobart Yard Overhead consists of a pair of similar parallel welded structural steel bridges with concrete decks consisting of spans from 50 feet to 117 feet in length having a total length of 1,102 feet supported by reinforced concrete bents and abutments on reinforced concrete piles. The





Construction operations in progress on grade separation structure to carry Long Beach Freeway over the Hobart Yard and mainline track of the Santa Fe Railroad

westerly bridge will provide a roadway uniformly 40 feet wide and the easterly bridge will provide a roadway 40 feet wide at one end and 52 feet wide at the other.

All piers are completed and abutments have been started. Seventy-five percent of the structural steel spans have been erected. Approach fills in connection with this particular job have been completed. They were constructed of imported borrow from the huge excavation being made in the Los Angeles Civic Center for the new Los Angeles County Courthouse. The total amount of imported borrow placed on the approaches was 200,000 tons.

The contract allotment is \$1,264,756.38, and the estimated time of completion, December 1, 1954. The contractor is Ukropina, Polich, Kral, and Ukropina of San Gabriel. The contractor's superintendent is K. Rudolph Brozovich.

Cheli Air Force Depot

By BRUCE GENTRY, Resident Engineer

To acquire the right of way for the portion of the Long Beach Freeway through the Cheli Air Force Depot near the northerly end of the project it was necessary to provide an equivalent area of land in exchange. Land was available adjacent to the east side

of the depot but separated from the existing facilities by Eastern Avenue, a heavily traveled county road carrying an estimated 35,000 average daily traffic. A signalized crossing at grade would have introduced an objectionable traffic bottleneck, so it was decided to build a one-lane undercrossing for access to the Cheli Air Force Depot across Eastern Avenue.

The undercrossing structure was designed as a reinforced concrete box, with a 14-foot clear roadway width between curbs and an overhead clearance of 14 feet 6 inches. This structure was positioned to permit approaches on 6 percent grades from existing streets within the base, and consequently projected slightly above the existing profile grade of Eastern Avenue. With the approval of the county road department, Eastern Avenue was raised to cross the structure with a vertical curve, and reinforced concrete retaining walls were designed to limit the necessary fill to the existing right of way.

In conjunction with the Cheli Road Undercrossing, it was necessary to construct drainage facilities including a dewatering pump and a length of 42-inch reinforced concrete pipe culvert to divert the runoff from a large area of the Cheli Air Force Depot which concentrated in the vicinity of

the access road. Signals were provided for one-way traffic control through the undercrossing.

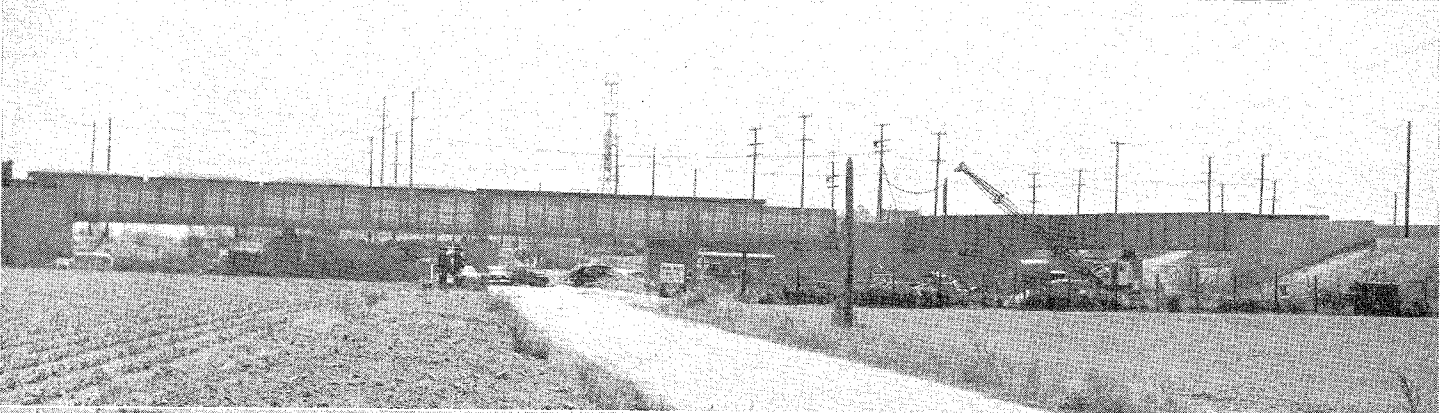
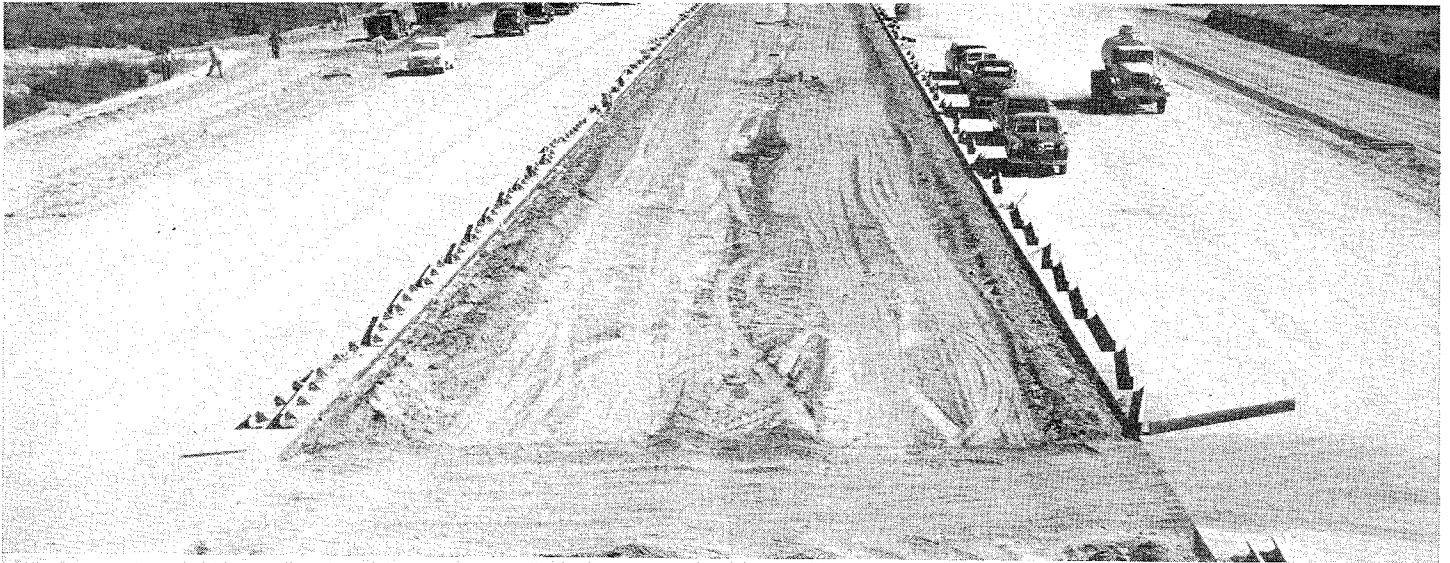
The contractor on this project is N. M. Saliba Company of Gardena. The contract allotment is \$140,000 and completion is scheduled for October, 1954. Carl Johnson is the contractor's general superintendent. Joseph Trujillo is the State Division of Highways Bridge Department representative.

East Yard Overhead

By JACK SYLVESTER, Resident Engineer

To carry the Long Beach Freeway at separated grade across Union Pacific Railroad property, East Yard Overhead is under construction. It consists of twin 14-span, simply supported, welded steel plate girder structures of nearly 1,400-foot total length. An accompanying photograph shows a concrete deck placing operation in progress; the contractor is placing the full 40-foot width of deck in one operation, and the finishers' working bridges are seen in the photograph. The strike-off float is seen: it consists of a 5-inch 10-pound "I" beam, 16 feet long, actuated by an electric vibrator.

The bridges are composite structures, requiring the deck slabs to act



UPPER: Looking northerly toward Atlantic Avenue Undercrossing. The pavement on main traffic lanes of freeway has been completed, and construction operations are in progress on the side collector roads and ramps. CENTER: Looking easterly along Dominguez Street showing, on left, steel girders in place for Pacific Electric grade separation and on right steel girders in place for Union Pacific Railroad grade separation. LOWER: Looking southerly along Long Beach Freeway showing the overpass bridge carrying Long Beach Boulevard over the freeway. Northbound on-ramp from Long Beach Boulevard shown on left.

as compression members under live load. Lugs transmitting horizontal shear between the steel plate girders and the deck slab are seen in the same photograph. Or it may be said that the deck slab is not riding as a free passenger on the tops of the steel girders, but is forced to earn its fare by carrying a share of the load. The contractor has adopted the unique method of moving his form and false-work materials ahead on steel roller conveyors—they appear as ladderlike objects in the photograph.

Another photograph shows the space forming the median between the two bridges of the overhead. The double track main line of the railroad appears in the foreground. Eighteen permanent tracks of the railroad are crossed, and East Yard bustles with moving railroad freight equipment at all times. The Union Pacific Railroad has installed the new "pick-a-back" system of moving freight on semi-trailers carried by specially fitted flat

cars, and it is proving to be a source of considerable business.

J. A. Thompson & Son, of Inglewood, is the contractor on the project, represented by Paul Barnard, Superintendent. Total cost of the job, including railroad work, is expected to amount to about \$1,180,000. It is anticipated that the work will be completed about September 15, 1954. It will not be possible to open the overhead to traffic until completion of roadway work under the adjoining contract, upon which Resident Engineer J. M. Curran is reporting.

Freeways Connected

By J. M. CURRAN, Resident Engineer

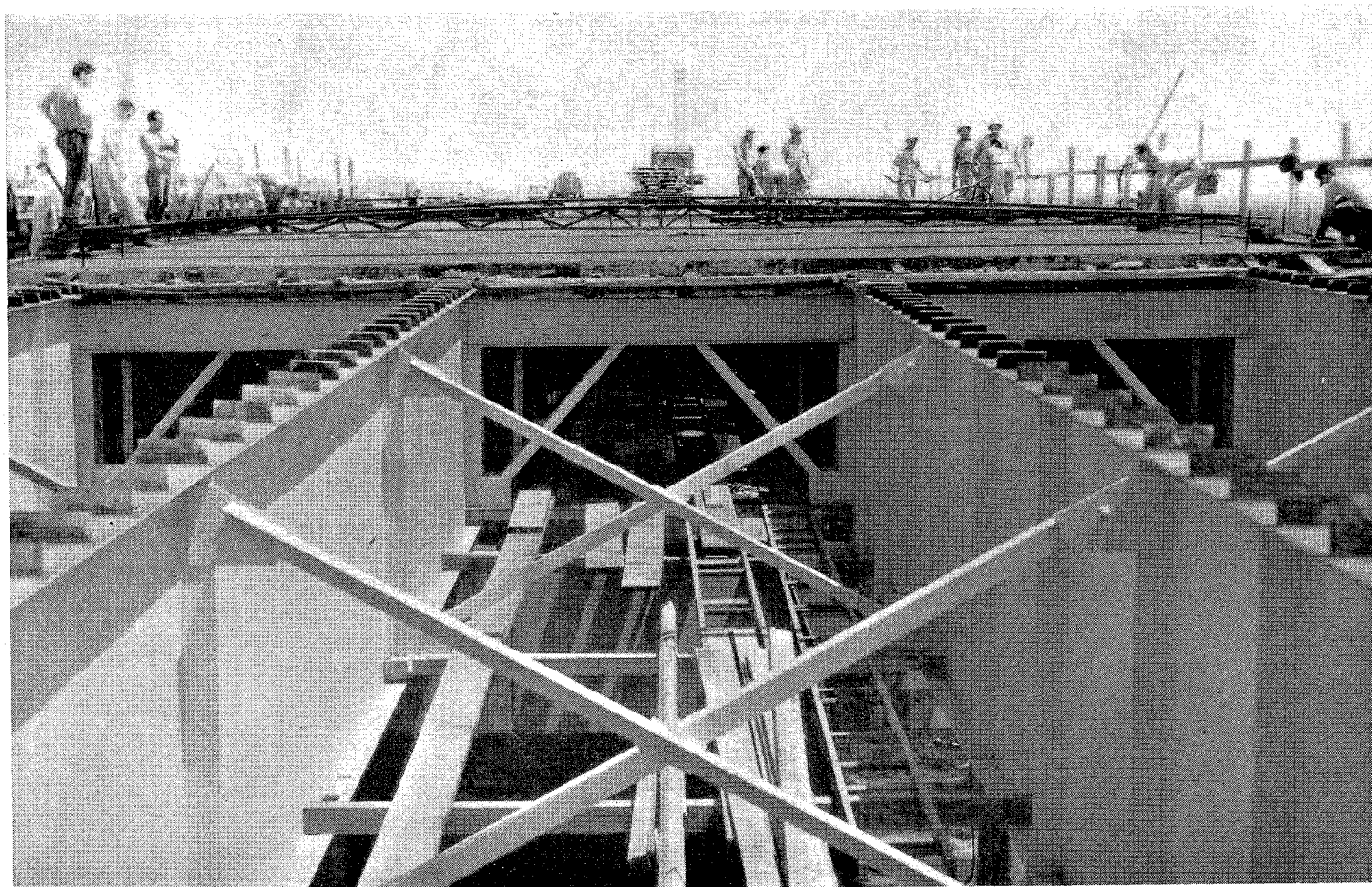
Bids were received in the District VII office in Los Angeles on June 3, 1954, for the construction of an important section of the Long Beach Freeway between Sheila Street and Verona Street, having a net length of one mile. This construction will pro-

vide complete interchange connection between the Long Beach Freeway and the Santa Ana Freeway. It will connect the two railroad grade separations now under construction as described above and will provide completed freeway to a point south-erly of Washington Boulevard. In addition to grading and paving the freeway and connecting interchange roadways, this contract provides for the construction of eight bridges. These bridges are located as follows:

Washington Boulevard Undercrossing. This is a reinforced concrete slab and girder bridge, measuring about 101 feet long on centerline of freeway, consisting of two adjacent single-span structures, supported by common reinforced concrete abutments with concrete pile foundations.

Leonis Street Pedestrian Undercrossing. This is a reinforced concrete box, about 239 feet long, providing a clear interior width of 12 feet.

Placing deck slab concrete one span length from east end of Union Pacific Railroad East Yard Overhead



Triggs Street Undercrossing. This is a reinforced concrete slab bridge about 60 feet 4 inches long, composed of one span, supported by reinforced concrete abutments with concrete pile foundations.

Route 167 Westbound Interchange/Route 166 Separation. This is a reinforced concrete box girder bridge, about 224 feet long, composed of three spans, supported by reinforced concrete abutments and piers with concrete pile foundations.

Route 167 Northbound/Route 166 Separation. This is a reinforced concrete box girder bridge, about 704 feet long, composed of eight spans, supported by reinforced concrete abutments and piers with concrete pile foundations.

Route 167 Southbound/Route 166 Separation. This is a reinforced concrete box girder bridge, about 695 feet long, composed of seven spans, supported by reinforced concrete abutments and piers. The abutments and one pier will have concrete pile foundations and the balance of the piers spread footings.

Route 167 Eastbound and Northbound Interchange/Route 166 Separation. This is a reinforced concrete box girder bridge, about 459 feet long, composed of six spans, supported by reinforced concrete abutments and piers with concrete pile foundations.

Olympic Boulevard Undercrossing. This is a reinforced concrete box girder, about 97 feet long, composed of one span supported by reinforced concrete pile foundations. The bridge will provide two roadways, each having a minimum clear width of 46 feet between curbs, separated by a 12-foot graded median strip.

The contractor submitting the low bid was B. J. Ukropina, T. P. Polich, Steve Kral, and John R. Ukropina of San Gabriel. The amount of the low bid was \$2,447,821.40 and a contract was awarded on June 22d.

The special provision for the contract provides 300 working days from the date of approval of the contract as a time limit for carrying out the construction under this contract.

Status of Design

By E. G. HANSON
Assistant District Engineer

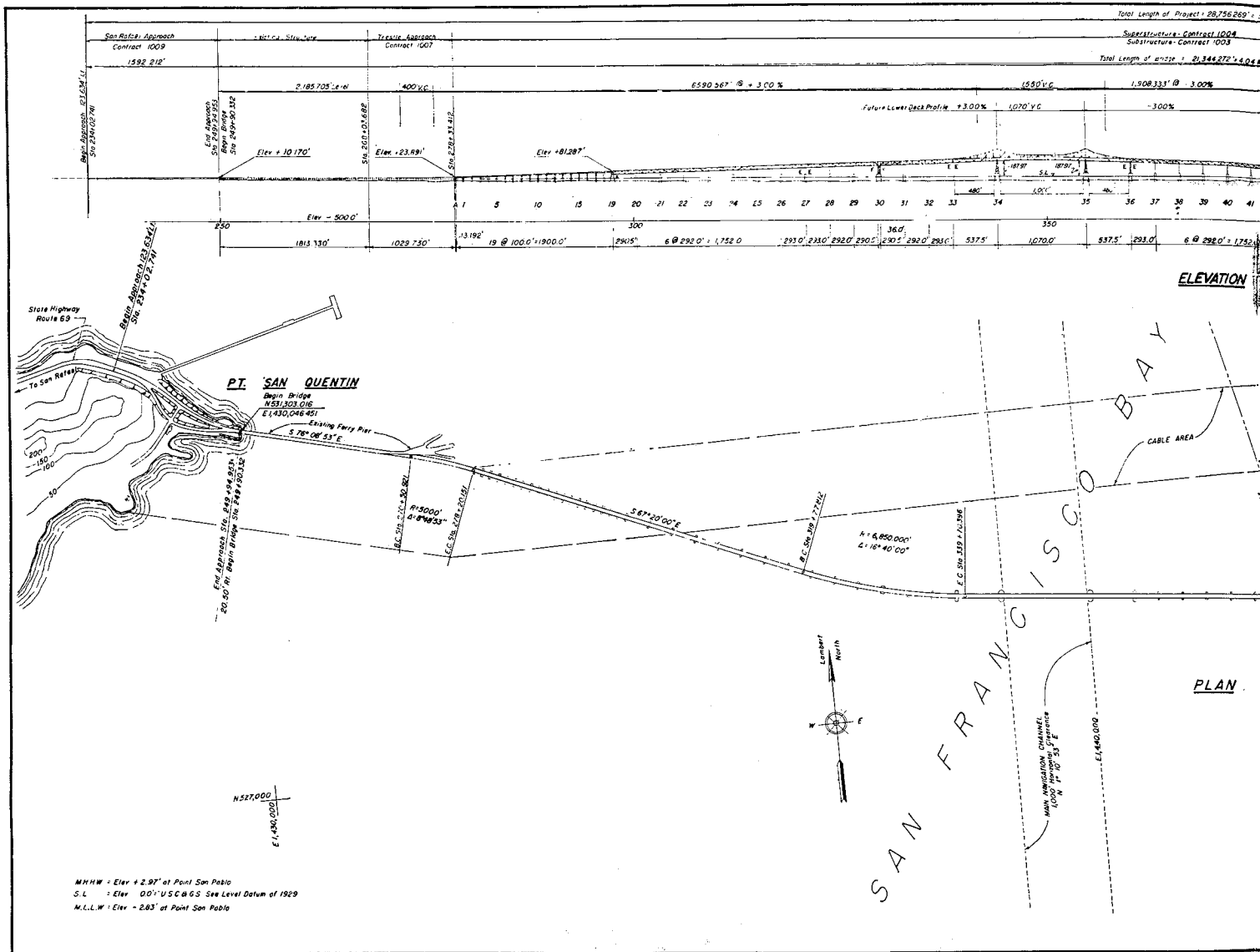
Generally speaking, the design details and preparation of contract plans for the Long Beach Freeway from the Santa Ana Freeway southerly are complete throughout. Design provides for initial construction of a six-lane freeway throughout, with provision being made in design for an ultimate eight-lane width from intersection with the Sepulveda Freeway northerly. However, the setup of future budget limits, when money for construction allocations are made by the State Highway Commission, will often require incidental revisions in the contract plans as finally developed.

Near the northerly end of the project the engineering details of freeway design within the boundaries of the Cheli Air Force Depot are being worked out in cooperation with the U. S. Corps of Engineers under terms of the agreement between the State and the Army.

... Continued on page 62

Union Pacific Railroad tracks under East Yard Overhead as viewed from the north abutment of this bridge





General plan and elevation of Richmond-San Rafael Bridge, extending from Pt. San Quentin in Marin County to San Francisco Bay.

Bridge Innovations

Continued from page 15...

per linear foot of bridge. The change, if and when needed in the future, could prolong the useful life of this structure for many years.

During the first few years under traffic it is believed that the toll sergeant, at his desk in the administration building, can direct all operations within the limits of the project and the personnel (toll collectors) under his jurisdiction.

All bridge and outside telephone calls are handled by the toll sergeant. A driver having trouble with his vehicle can signal in from one of the conveniently located fire alarm and

tow car service boxes to the sergeant who then notifies the tow or fire truck, by short wave, to proceed to the station from which the call was received.

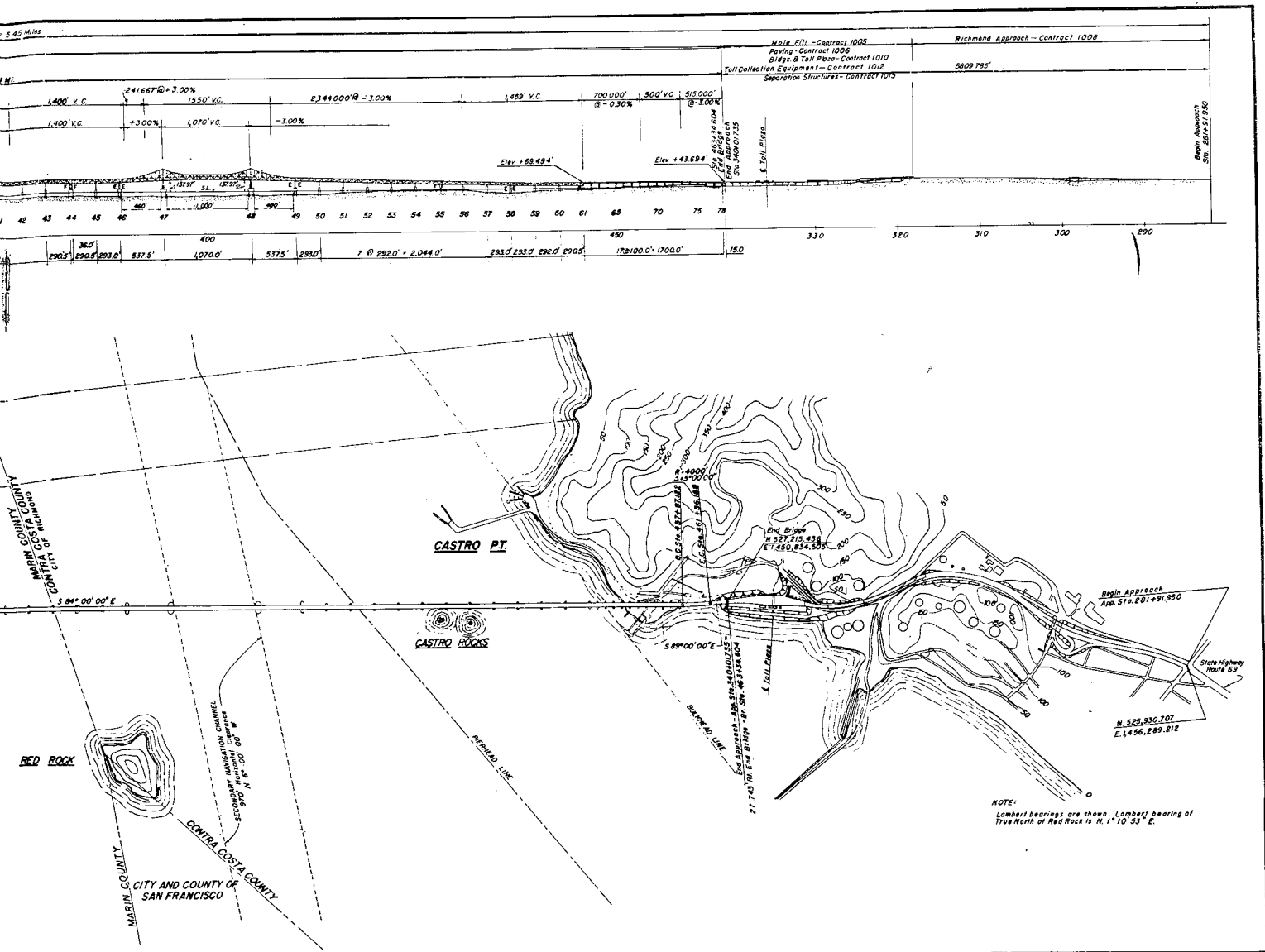
The sergeant can communicate either by telephone or loud speaker to any of the toll booths. He can also broadcast to any car entering or leaving the toll both from a public address system.

A large control and supervisory panel, having the outline of the bridge etched on the surface and small recessed lights located at proper points, is in full view of the attendant. A failure of a bank of roadway lights is indicated by the proper signal on the panel. A failure of the foghorns is

made known by a coded signal, and the failure or change in any of the many electrical devices or circuits is either visually or audibly reported.

Short-wave Radio

During the construction period of the bridge, the short-wave, two-way radio communication system which will eventually be installed on the mobile maintenance equipment is now installed in the division's headquarters in Berkeley, and in the Richmond and San Rafael field offices, for directing operations. Other sets are placed on the floating equipment used in the construction. The survey and triangulation activities are directed by handie-talkies.



Marin County to Pt. Castro in Contra Costa County, construction of which now is 25 percent complete

To permit the bridge to operate efficiently with the minimum of personnel, especially during the early growth of traffic, automatic controls have been widely used. Roadway, aviation, and navigation lighting aids are photo-electrically controlled. Switching devices, protective in nature for the basic electric power distribution, as well as the roadway lighting systems, are relay controlled. Supervising systems (visual, audible, and printed) are indicated to the operator who can direct remote or local action if the necessity arises. In general, an important emphasis has been placed on the devising of efficient means to maintain and operate the Richmond-San Rafael Bridge.

Hawaiian Roads Viewed by Director

A tour of the Island of Oahu to observe roads and road construction was one of the features of a recent trip to Hawaii by Frank B. Durkee, Director of Public Works. Ben E. Nutter, Superintendent of Public Works and Territorial Highway Engineer, conducted Durkee around the island to inspect highway projects, organization and practices.

The territorial highway organization in an endeavor to solve its traffic problems, particularly in the Honolulu area, has an ambitious highway program under way, Durkee reported. A number of projects designed to

bring sections of the highway system up to expressway standards similar to those of California are planned or under construction.

Invited by Secretary of the Navy, Charles S. Thomas, to be a civilian guest on the U.S.S. *Yorktown*, Durkee embarked for Hawaii June 30th on the aircraft carrier and returned to Alameda Air Base July 17th on the Navy flying boat *Mars*.

The purpose of the Secretary's invitation was to afford an opportunity for a representative group of 14 industrial and civic leaders to become

... Continued on page 64

State Fair

*Hundredth Anniversary Will
Be Observed This Year*

A FULL CENTURY of faithfully reflecting California's agricultural, industrial and cultural growth will be climaxed September 2d when the California State Fair and Exposition opens its gates for an anniversary celebration with three-quarters of a million guests, most of whom will travel to the big show over new, modern state highways.

From its humble beginning in a Montgomery Street hall in San Francisco in 1854, when many of the exhibits failed to arrive on time, the State Fair has developed into a many-faceted exposition which can be described only in superlatives.

And directors of the fair expect that the 1954 event will be a fitting climax to its steady growth which has continued in spite of fires, floods and two world wars.

Spectacular Growth

This growth and the spectacular growth and development of the State as a whole will be dramatized on September 2d, opening day. At that time a stainless steel time capsule, filled with microfilms of relics of California's past, its vigorous present, and progress-filled future, will be entombed in a glass covered vault in front of the Counties Building. It will carry stories of the State's achievements in highway construction, in government, engineering, agriculture, fine arts, education and related fields, with instructions that the capsule be opened by the Governor of California in 2054.

Already nearly 15,000,000 people, or more than the entire present population of the State, have attended this granddaddy of western expositions down through the years. During the 100 years more than \$5,000,000 in premiums and purses have been paid to California exhibitors, who last year placed on display some 24,000 separate items. The best of everything grown or manufactured has gravitated

to Sacramento for the annual fall event.

Record Horse Racing Purses

This year's fair will be no exception, and even more has been added. One new record already has been broken by the \$155,300 posted for horse racing purses. Premiums of \$272,911 represent the highest total ever offered by the State Fair. Outstanding judges like Charles Yule of Calgary, Canada, in beef livestock, Phil Wagner of Baltimore in wines, and scores of others from throughout the United States, insure that premium selections will be tops. Innovations in entertainment have been made, including a new headliner every other night at the big night shows in front of the grandstand. A new entertainment addition is the famous "Dancing Waters," a fantasy of lights and flowing water, which will be a free attraction in the Industrial Building.

Three new buildings have been added, including the half-million-dollar foods and hobbies building, facing its twin Industrial Building across the entrance mall. Brand-new buildings for the poultry, and pigeons and rabbits have been erected in the junior division area. An important addition has been built for the Hall of Flowers and outdoor garden area.

Nearly 4,000 square feet of exhibit and aisle space has been added to the Hall of Flowers, and with a new entrance and wider aisles, insure a smoother flow of visitors through the beautiful building which in the past has been crowded and sometimes jammed during heavy days.

Counties Building

In addition to being a spectacular attraction for those interested in everything pertaining to California, the State Fair offers specific items for persons who have less catholic interests. There are the spectacular displays in the Counties Building, where most of the State's counties outdo themselves

in presenting the products and attractions for which they are noted. Brilliantly lighted, animated displays made of everything from oranges and grapefruit to pyramids of California wines, and from wheat sheaves to farmers made from pumpkins are arranged in a colorful array of California's agricultural and industrial might.

For flower lovers and amateur gardeners the Hall of Flowers, where one million blooms are arranged among waterfalls, rivulets, fountains and rocky hillsides and glens is a dazzling display. From exotic orchids to ordinary but still beautiful marigolds, California's most beautiful flora never fails to delight fairgoers.

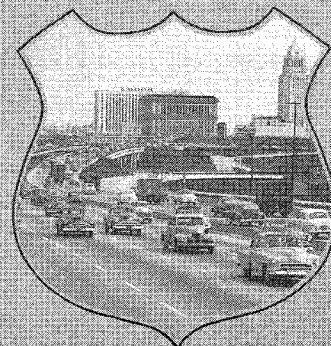
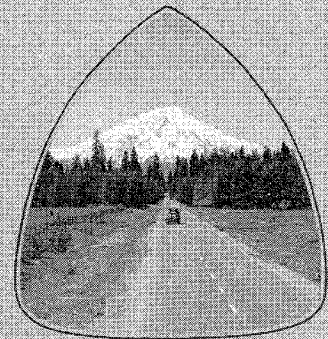
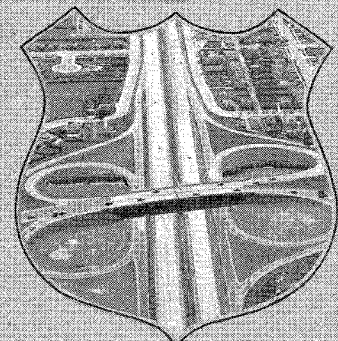
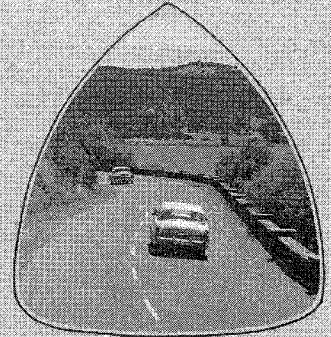
Livestock of dozens of varieties and sizes compete for more than \$100,000 in cash premiums, for the benefit of the ranch-minded and not a few city-bred visitors. Future Farmers of America and 4-H Club members make this event the climax of their year as they prepare their prize stock, clothing projects, farm machinery and feature booths for the ribbons and cash. Poultry, pigeons, rabbits, cows, horses, sheep, goats and swine, all registered stock, are on parade for the improvement of their breed in California.

California's oldest continuous horse show, attracting the aristocrats of the equine world, is a favorite of many fairgoers each year. Nine days of horse racing, during which pari-mutuel windows did a \$4,000,000 business last year, is another top attraction. Wines, foods, cooking, homemaking, needlework, gadgets, fruits, vegetables, nuts, grains, recreational advantages, fashions, fireworks, free vaudeville shows twice daily, bands, major-ettes, clowns, souvenirs all combine into a riot of color, and a tour of California on one 207-acre site.

The driver who races with cars that are trying to pass him on the highway is endangering his own life and the lives of others. When being passed, slow down, pull over to the right a little, and let the other fellow pass.

100th ANNIVERSARY CALIFORNIA STATE FAIR

ALL
HIGHWAYS
LEAD TO
THE FAIR



Carson Pass

Three Projects Improve
Sign Route 88

By E. L. TINNEY, District Advance Planning Engineer

HIGHWAY 88 is the historic Carson Pass, trans-Sierra route which begins at a junction with US 99 near Stockton and terminates at the Nevada state line east of Woodfords. The route serves the communities of Lockeford, Clements, Ione, Jackson, Pine Grove, and the High Sierra areas between Cook's Station and the Nevada state line, including Silver Lake and Twin Lakes.

The route is the most direct between Stockton and Lake Tahoe, and between Stockton and Nevada. In addition to its recreational potential the route provides an outlet for forest products from the Amador forests to shipping points at Stockton and the Bay area.

One project is currently under construction and two have recently been

completed on Highway 88 in San Joaquin and Amador Counties.

The 1953-54 construction program provided for the construction of 6.3 miles in Amador County between Jackson and one mile west of Pine Grove, and 1.4 miles in San Joaquin County between one mile east of Clements and three-fourths mile north of the Mokelumne River.

The 1954-55 program includes a two-mile unit in Amador County between the San Joaquin county line and west of Jackson Creek.

Eliminates Posted Bridge

The first project, between one mile east of Clements and three-fourths

mile north of the Mokelumne River, was constructed under contract by Stolte, Inc., and Stephens Trucking Company. The construction provides a 32-foot all-paved roadway section and a reinforced concrete bridge across the Mokelumne River, 28 feet in width and 256 feet in length. This 1.4-mile unit which was completed the latter part of June of 1954, eliminated from the State Highway System a posted bridge across the Mokelumne River and approximately three miles of narrow, winding, obsolete road. A saving in distance of one-half mile resulted between Clements and the easterly end of project.

	Length	PROJECTS RECENTLY COMPLETED OR UNDER WAY	Construction	R/W
X-SJ-97-B	1.4 mi.	Junction Route 24 to ¾ mile north of the Mokelumne River....	\$244,000	\$63,000
X-Ama-97-A	2.0	Amador county line to west of Jackson Creek.....	155,000	2,000
X-Ama-34-C	6.3	Jackson to west of Pine Grove.....	764,000	75,000
	9.7 mi.		\$1,163,000	\$140,000

Construction between Jackson and Pine Grove in Amador County

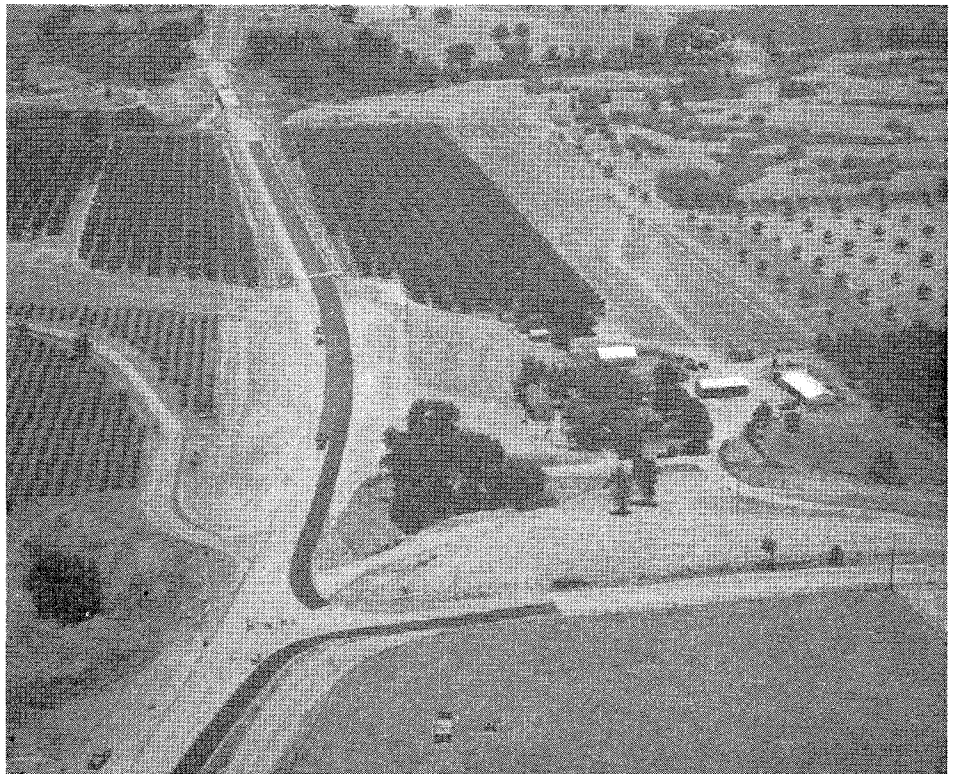


The second project begins at the San Joaquin-Amador county line, approximately five miles east of the first project.

This two-mile unit was constructed under contract by C. V. Kenworthy at a cost of \$155,000. The construction has provided a 32-foot all-paved roadway with 2.5-inch plant-mixed surfacing on cement treated base. This project replaces a narrow, antiquated road which had very restricted sight distance and poor alignment.

The third project begins east of the east city limits of Jackson and terminates one mile west of Pine Grove. This 6.3-mile project will provide a 32-foot all-paved roadway of plant-mixed surfacing on cement treated disintegrated granite. The new alignment being constructed will provide a minimum radius of curvature of 600 feet in contrast to a minimum of 200 feet on the old road. This project eliminates a section of narrow, twisting road.

The project is being constructed under contract by the Clyde Wood Company at a cost of \$764,000.



View, south, showing new alignment of Route 97 across Mokelumne River and elimination of sharp turn in existing state highway

Project Proposed

In addition to the foregoing projects, Amador County proposes to con-

struct an FAS project between 2.5 miles south of Ione and 2.5 miles southeast of Ione. This construction, while not on the State Highway System, will afford through-Highway 88 users a 3-mile saving in distance. The county proposes to construct the project in two stages:

Stage 1: Grading and drainage in the 1954-55 Fiscal Year.

Stage 2: Base and surfacing in the 1955-56 Fiscal Year.

Following is a list of other projects on Highway 88 which have been completed to modern standards in the past 10 years:

Amador County	Miles	Year completed
Through Jackson	1.6	1948
One mile west of Pine Grove to Cook's Station	10.7	1944
Cook's Station to Ham's Station (portions)	3.4	1949
Ham's Station to Lumberyard Ranger Station (U. S. Bureau of Public Roads)	3.9	1952
One mile east of Lumberyard Ranger Station to 1.5 miles east	0.5	1953
Tragedy Springs to Alpine county line (portions)	3.0	1952
Alpine county line to Carson Pass	5.4	1952
Portions between Pickett's and Woodfords	1.3	1952

Grading between Amador County line and two miles easterly



Safety Record

Car Drivers of Division
Of Highways Commended

By A. I. RIVETT, Safety Engineer

DRIVERS of Division of Highways motor vehicles during the year 1953 drove 97,400 miles for every recordable accident charged against them. Just three years prior, they drove 77,400 per recordable accident. In the year 1953, highway employees improved their driving by traveling 20,000 more miles per recordable accident than they did in 1950—that's an improvement of 26 percent.

Improvement in driving, correction of poor driving habits and the reduction of state-driver accidents are only part of the over-all safety program of the Division of Highways. That program includes industrial and occupational safety and the protection of buildings and properties from fire damage. The motor vehicle safety program, however, is an important segment of the over-all program.

In the last four years, motor vehicle accidents for which Division of Highways employees were considered in whole or in part responsible were reduced 20 percent even though the mileage driven increased nearly 10 percent. In 1950, in 39,500,000 miles of driving, Highway employees had 510 accidents charged to them. In 1953, they drove 43,250,000 miles and had but 444 recordable accidents. Of this 1953 mileage, 19,000,000 miles were driven in passenger cars and 24,000,000 miles in trucks and road building equipment. Some specialized equipment does not carry speedometers. This specialized equipment is not included.

This outstanding achievement is of especial interest since there is no forced driver training program, no



Testing vision by telebinocular. This instrument tests a driver's visual acuity, depth perception, muscular imbalance and his color vision. LEFT TO RIGHT: Paul O. Harding, Assistant State Highway Engineer, District VII; Carroll T. Berry, Associate, Safety Section; W. L. Fahey, District Engineer, District VII.

DIVISION OF HIGHWAYS VEHICLE ACCIDENTS

Year	1953	1952	1951	1950
Miles traveled	43,250,031	42,793,084	39,658,319	39,480,416
Recordable accidents for vehicles with speedometers	444	515	501	510
Miles driven per recordable accident	97,400	83,100	79,200	77,400

charging of employees for the cost of damage to their vehicles occurring during the normal course of employment, no spotters on the road, no candid traffic cameras.

The Division of Highways has more than 9,600 employees. In 1953, 3,500

of these employees operated the 3,000 or more pieces of motorized equipment. Most of these drivers have been driving for years. They know how to drive. But, like other drivers, they can fall into bad habits or become overly sure of their driving ability.

Driving Program

Convinced that drivers need to be alerted to their limitations, the Division of Highways Safety Section has developed a program to warn the driver who has not yet had an accident of the possibility of accidents rather than to show the man with an accident record why he has such a record. The program is effective for both.

Through this carefully prepared program, the division has proven the wisdom of the philosophy that if a motor vehicle operator can be shown his weak points, he will learn to compensate for them. And in that knowledge and its application avoidable accidents will be reduced greatly even in the face of the extraordinary high increase of motor vehicle registrations and travel.

In each of the division's 11 districts, on its state-owned toll bridges, in its Headquarters Equipment Department, Materials and Research Department, Bridge Department, and Service and Supply Department—a safety committee of top administrators is responsible to the district engineer or the department head for the safety program.

Safety Committee Duties

Under a directive from State Highway Engineer G. T. McCoy, each district or departmental safety committee must examine and review all the accident reports within its jurisdiction to ascertain that all material facts are contained in the reports and shall decide the basic cause of each accident and determine its recordability.

In the Division of Highways a recordable motor vehicle accident or one charged against the individual's record is an accident which occurred while state equipment was being operated as a motor vehicle and one which could have been prevented or avoided by the driver. The decision as to whether or not an accident is recordable is based solely on whether or not the driver exercised prudent and careful judgment in his attempt

CALIFORNIA AGAIN WINS TRAFFIC SAFETY AWARDS

California's accelerated campaign against traffic accidents has again received national recognition, with Governor Goodwin J. Knight recently accepting five awards for the State's activities during 1953.

In competition with seven other large-population states with major traffic problems, California received first place awards in the fields of traffic engineering, traffic law enforcement, public safety information, and driver licensing, and honorable mention for over-all activities in all phases of traffic accident prevention.

The competition is based on the annual inventory of traffic safety activities conducted by the National Safety Council and various technical and educational organizations.

In the field of traffic engineering, California has now won or tied for first place for four consecutive years.

In accepting the various awards from officials of the National Safety Council and other organizations, Governor Knight commented:

"Naturally, as Californians we are pleased to receive these awards for progressive improvement in the field of traffic safety. However, there is another side to this picture. More than 3,000 persons are killed each year on our streets and highways. The recognition our State has received should serve as added incentive for still greater effort if we are to further reduce the suffering and loss which result from preventable accidents. I urge every public official and every private citizen to intensify efforts to reduce this terrific toll."

The plaques which certify to the various awards were turned over by the Governor to the state agency chiefs concerned.

to avoid the accident, regardless of any legal rights (such as right of way at intersections) to which he may be entitled under the Vehicle Code. The first consideration is whether the state driver did everything possible to avoid the accident.

The safety committees, in their determination of recordable motor vehicle accidents, may interview the state

operators, and always shall advise them as to the committee's decision concerning the recordability of their accidents. The committee in turn may make recommendations to the district engineer or department head and recommend disciplinary action to him when in the judgment of the committee such action is justified.

The safety committee is further directed to carry on an educational program and to do everything in its power to reduce all types of accidents.

Division Safety Committee

At the division level, the State Highway Engineer has appointed a Division Safety Committee to formulate the details of the program within the framework of which the district committees shall operate, to review the monthly reports of the district committees and to advise with the district committees on problems presented, to act as a clearing house for ideas and suggestions which may be incorporated in the program, and to perform the same duties as does the district committee in relation to accidents involving headquarters personnel.

Operational details of the state-wide program are formulated and carried out through Headquarters Safety Section. Headquarters Safety Section is composed of the Safety Engineer, a field assistant, an office assistant, and clerical help. All accidents which occur within the districts are coded and tabulated by Headquarters Safety Section and periodically statistical reports are made and distributed.

To implement the program in the districts, each district has a full-time safety supervisor—the departments have part-time safety supervisors. Safety supervisors are in constant touch with field personnel.

The immediate field effort which we believe is responsible for the fine results achieved in the motor vehicle accident prevention program consists of a series of driver problems given individually. It is our belief that a driver becomes involved in a recordable accident for one of three reasons:

(1) He can't do better. A physical or mental deficiency, temporary or permanent, prevents him from driving more skillfully.

(2) He doesn't know. He has never taken the trouble to learn the rules of the road nor to acquire the skill needed to be a safe driver.

(3) He doesn't care. He really doesn't want to have an accident but he doesn't care enough not to have one. He is careless, inattentive, reckless, and has a "what the heck" attitude. This driver with a faulty attitude is the least understood and needs the greater attention.

Driver Problems

To meet these individual needs, a series of field problems have been developed for drivers:

(1) A visual problem to determine how well and how much he can see.

(2) A brake reaction problem to determine how quickly he can stop, measured in distance so it is meaningful.

(3) A discussion of traffic laws and the rules of good driving—the Vehicle Code and the "social code."

(4) A demonstration of the individual facts uncovered and their relation to the laws of physics—the inflexible laws of kinetic energy, centrifugal force, friction and gravity. These discussions are emphasized by case histories from our own files and are presented with blackboard diagrams, photographs and demonstrations.

Vision Examination

In the vision problem, we use a Keystone Telebinocular. Although this instrument may be used by professional eye men to furnish diagnostic information, we are using the information obtained only as an indication of the employee's visual acuity, depth perception, muscular imbalance and his color vision. Visual limitations when discovered are pointed out to the employee. In our checks we have found many who could benefit by eye correction. We have so informed them. A large number have obtained needed glasses and we are convinced that employee efficiency has been raised in other activities as well as in motor vehicle operation.

In our visual examinations we have found men who have suppression of vision in one eye and were actually one-eyed when looking with both eyes. This condition caused by the dominant eye doing all the work has been pointed out to the employee

who, now being informed, can compensate for this deficiency. Of a special interest has been the observation by drivers, when told that their visual acuity for far distance is poor, that that undoubtedly has been the reason that they did not see the object in the distance which caused a previous accident. It is pointed out that if they cannot read a sign at a distance which will give them an opportunity to follow its instructions a serious accident may ensue.

In addition to these visual checks, drivers are examined for peripheral vision. The lateral field of vision is very important in safe driving. Extreme cases of restricted or narrow field of vision are commonly described as "tunnel vision." Those so afflicted can be taught to turn their head and eyes especially at intersections, to compensate for their restricted field. Rear-view mirrors may also be provided to assist them. Fortunately, less than 1 percent of those checked have been found to have serious restricted side vision.

In the braking problem we use both a braking detonator and a simple device for measuring braking reaction with the test car parked.

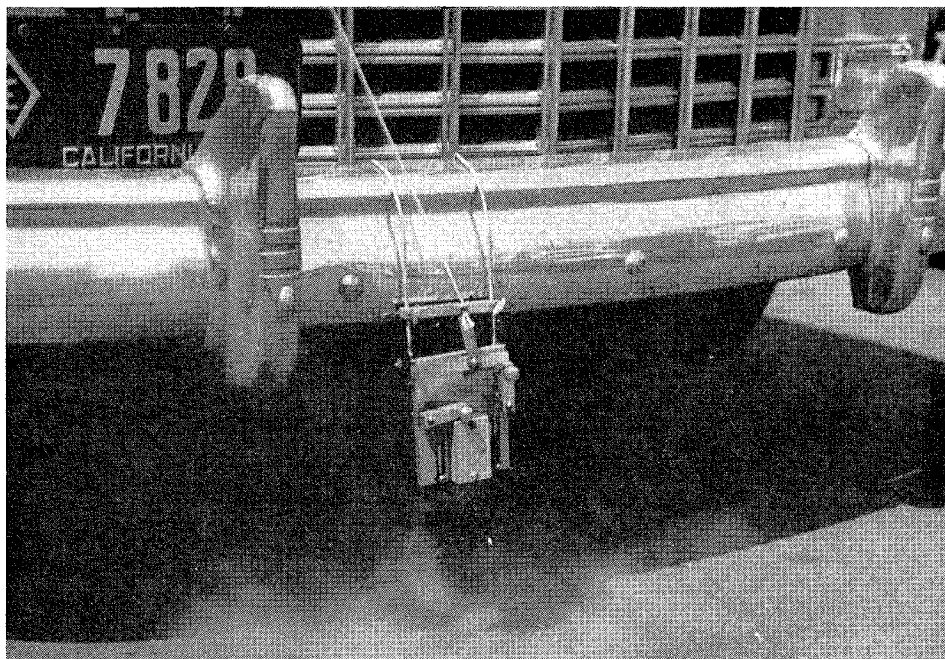
Before giving this problem, the drivers are asked to make an estimate of the number of feet it will take them

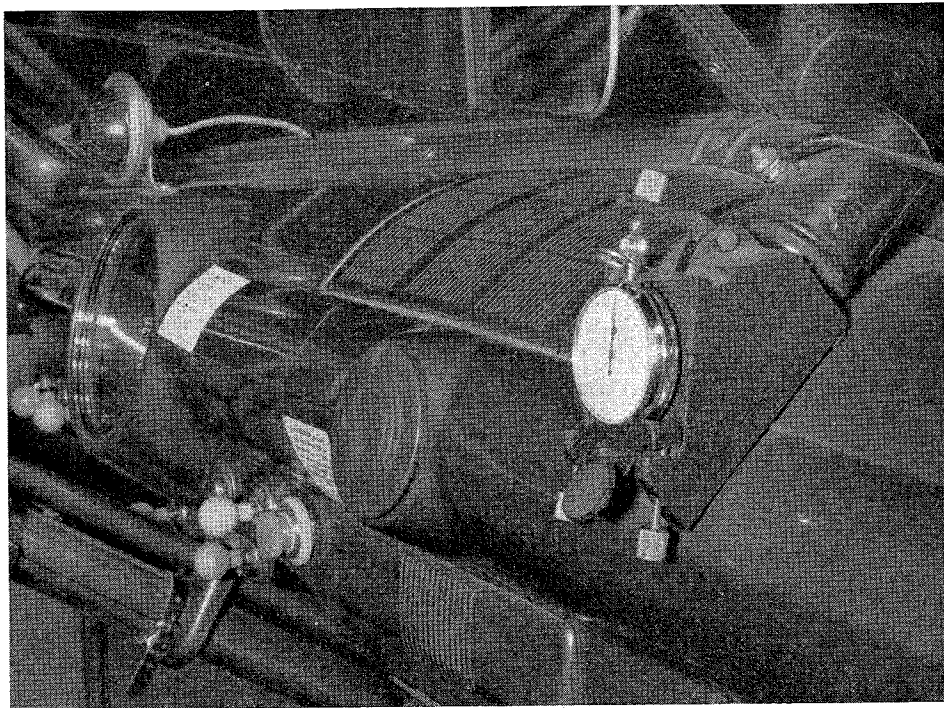
to make an emergency stop from a speed of 20 or possibly 30 miles per hour. About 80 percent overestimate their ability. Most of them believe they can "stop on a dime."

Using the bumper mounted brake detonator, the driver is asked to drive his car at speeds of from 15 to 30 miles per hour during which time the driver observer fires the detonator without notice to the driver. This signals the driver to stop and at that instant makes a small paint mark on the pavement. When the brake is applied, another paint spot is made. After the car is stopped, driver and observer measure the distances from the first and second spot to the front bumper. By determining the distance himself, the driver is made aware of the total distance the car traveled before it stopped. In this test, emphasis is placed on braking and reaction distances, rather than time, because drivers cannot picture time in terms of distance.

In many locations where it is not possible to use the conventional reaction braking detonator because of heavy volumes of traffic, a parked car with an electrical timing device developed by members of the Safety Section and Headquarters Shop is used. The car is parked at a convenient location and the driver sits behind the wheel with the observer at his

Double cartridged braking detonator. Using this bumper-mounted brake detonator a driver's reaction time and stopping distance are determined by cartridge fired chalk marks on the pavement.





Division of Highways electrical timing device with parked testing car. By operating a dummy foot throttle and the car brake a driver's reaction time is found in moving his foot from throttle to brake when the red signal light comes on.

right. The driver, back of the wheel, places his right foot at the accelerator position. The regular accelerator has been blocked off and a dummy accelerator is in its place. A push button switch of the type used to raise or lower the headlight beam is on the floorboard under the observer's right foot. Depressing this button actuates simultaneously a stop watch on the dash in front of the observer and a red light also on the dash but in front of the steering wheel. The dummy accelerator must be pressed down and held against a second push button before the watch and light will operate. This assures the observer that normal foot pressure, as in feeding gas to the motor when driving, is duplicated.

The observer may, at any time the accelerator is depressed by the driver, press the foot button which starts the watch and illuminates the red light. When the red light goes on, it is a signal for the operator to transfer his foot from the accelerator to the brake pedal as fast as he can. When the operator hits the brake pedal, another switch attached to the brake pedal stops the watch. His foot reaction time is then recorded from the stopped watch to one-hundredth of a second. This reaction time may be

converted to reaction distance for say 30 miles per hour.

Driver Checks Results

Previously to this check, metal markers have been placed ahead of the car at five-foot intervals. The driver, after the car test, is asked to walk ahead of the car and stand at the foot marker that represents his reaction distance. It is pointed out to him that this is the distance that he would have traveled if his vehicle had been going at the speed of 30 miles per hour while transferring his foot from the accelerator to the brake pedal. The observer may use any speed and corresponding reaction distance to illustrate this point. To this reaction time is added the braking distance to determine the total distance required of the average car traveling at the speed under test. The driver then is asked to walk ahead to this total stopping distance so that he can better visualize the entire distance that is required for him to stop his car under speed which he was being tested.

The driver is also reminded that this reaction measurement was made under ideal conditions when he was not actually maneuvering the car in

traffic. Under these conditions, there is nothing to divert his attention from the red light. He has no choice of decisions to make. He has only one thing to think about and do, that is to hit the brake when the red light comes on. Under normal driving conditions, his reaction would probably have been much slower and as a result his reaction distance much greater. These reaction time measuring devices are very impressive. Drivers are anxious to try them and are usually much surprised and confess that they were not as good as they thought they were.

Vehicle Code

A true and false quiz is used to determine how much the driver knows of the rules of the road and the Vehicle Code. To answer the questions, any source of information may be used. The papers may even be taken home to be answered. This is not an examination but a means of education. When the questions and answers are returned, the incorrect answers are marked by the district safety supervisor and the quiz returned to the employee with a complete set of correct answers. Not only does the individual gain by this quiz method but the safety supervisor has pointed out to him areas of misinformation or lack of information in which he should spend some effort.

The last problem presented to division drivers is the only one presented in a group meeting. By the use of a blackboard and demonstration equipment, supplemented by audience participation, answers to questions which have arisen through the other problems of the program are discussed and analyzed. Unusual accidents which have occurred to state-owned vehicles are illustrated and an explanation given on what the car driver did that was wrong and what he should have done to avoid the accident. By simple mathematics, very carefully detailed on the blackboard, the laws of physics which apply to moving bodies are explained.

Braking and stopping distances may seem to be familiar terms but when they are explained in terms of deceleration, friction, cohesion or gripping efficiency, velocity, opposite and

. . . Continued on page 64

Cost Index

State Highway Construction Costs
Continue Downward Trend

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

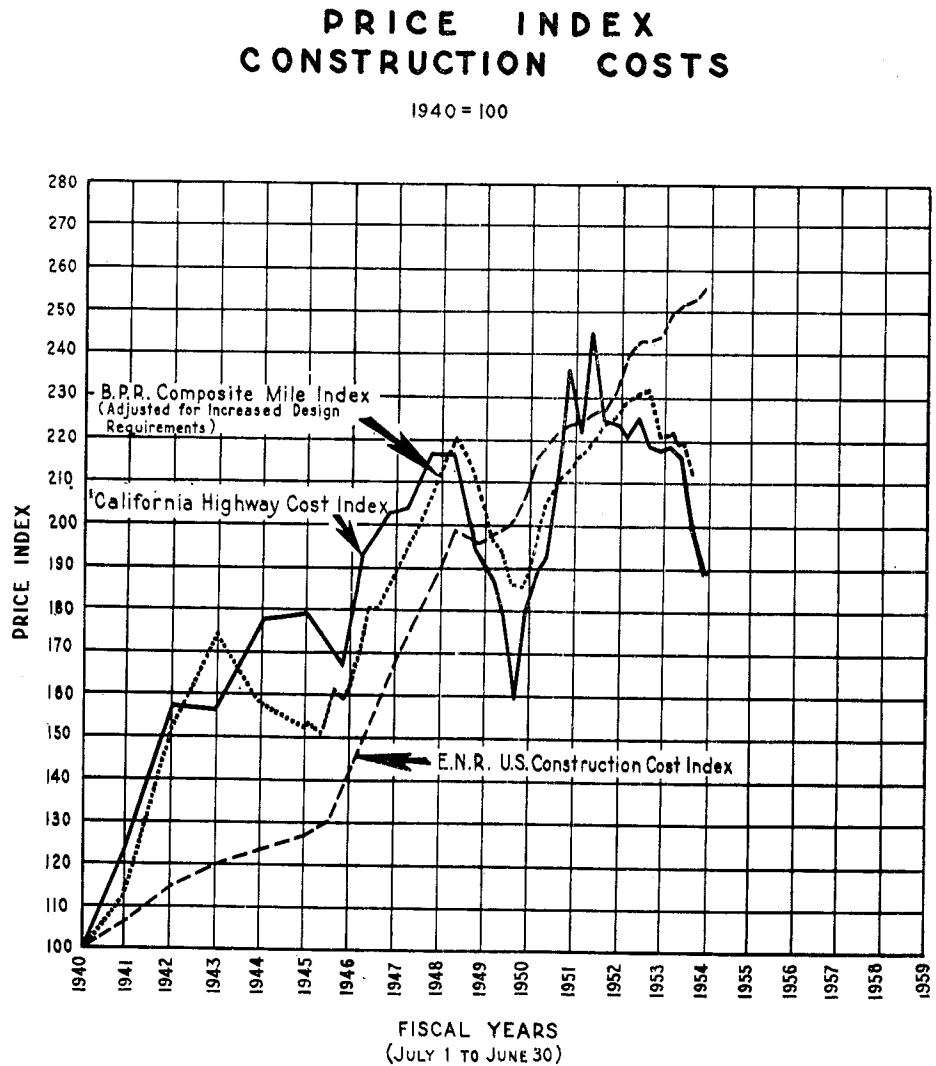
DURING the second quarter of 1954 contract prices on state highway construction projects continued the downward trend which began in the first quarter. The California Highway Construction Cost Index for the second quarter of the year was 5.2 percent under the first quarter.

Highway construction costs as indicated by the Index were relatively stationary throughout 1953 but during the first quarter of this year dropped 8.0 percent, from 216.7 to 199.4 (1940 = 100). During April, May, and June the 5.2 percent drop was from 199.4 to 189.0, which is a rate of decline about two-thirds that during the first three months of the year. This drop puts the index of highway costs back to approximately where it was in the third quarter of 1950.

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

THE CALIFORNIA HIGHWAY CONSTRUCTION COST INDEX

Year	Cost index
1940	100.0
1941	125.0
1942	157.5
1943	156.4
1944	177.8
1945	179.5
1946	179.7
1947	203.3
1948	216.6
1949	190.7
1950 (1st quarter)	160.6
1950 (2d quarter)	180.0
1950 (3d quarter)	189.2
1950 (4th quarter)	194.8
1951 (1st quarter)	215.4
1951 (2d quarter)	238.3
1951 (3d quarter)	221.9
1951 (4th quarter)	245.4
1952 (1st quarter)	224.8
1952 (2d quarter)	224.4



1952 (3d quarter)	221.2
1952 (4th quarter)	226.2
1953 (1st quarter)	218.3
1953 (2d quarter)	217.5
1953 (3d quarter)	218.0
1953 (4th quarter)	216.7
1954 (1st quarter)	199.4
1954 (2d quarter)	189.0

This 5.2 percent drop in California highway construction costs during the second quarter of this year confirms our opinion that the 8.0 percent drop

in the first quarter marked a definite break in such costs. Competition among bidders for state highway work while lower during April, May, and June than during the first three months of the year still remains at a high level, particularly in view of the unprecedented volume of work for which bids were opened during that period. Accompanying tabulations show the number, size and average number of bidders on state highway projects for the first six months of

1954 and for the fiscal year from July 1, 1953, to June 30, 1954, with summaries of the average number of bidders by months.

The factors which effected the continued decline of bid prices and the continued keen competition among bidders are thought to be the same as were reported for the first quarter of the year: falling off of federal work and scarcity of new work in other branches of construction; willingness or necessity of bidders to lower their prices in order to keep their organizations intact and meet their equipment obligations; and ample availability of materials and equipment. Increased labor productivity in recent months is another factor which is thought to have contributed to the decline in prices.

This downward trend in contract costs is in the face of continued increases to labor in wages and fringe benefits. To offset the increases to labor in both industry and construction there must be the development of increased efficiency and productivity of machinery. During peace times such development makes its greatest advances and it is thought that we may look for greater mechanical improvements during the months ahead. However, it also is believed that increased payments to labor must eventually catch up with contract prices and turn prices again upward. It is expected that the downward trend will continue at least for another quarter or two before a new up-trend begins.

The accompanying tabulation of average contract unit prices for the eight items on which the California Highway Construction Cost Index is based shows these average unit prices by years and quarters since 1940. From this tabulation it will be noted that during the second quarter of 1954 the average bid price for roadway excavation dropped from \$0.45 to \$0.38 per cubic yard, a decrease of 15.5 percent; untreated rock base dropped 8.3 percent, from \$2.28 to \$2.09 per ton; portland cement concrete pavement was down 4.1 percent, from \$14.89 to \$14.28 per cubic yard; and structural steel went down from \$0.126 to \$0.114 per pound, a drop

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

(January 1, 1954, to June 30, 1954)

Project volume	Up to \$50,000	\$50,000 to \$100,000	\$100,000 to \$250,000	\$250,000 to \$500,000	\$500,000 to \$1,000,000	Over \$1,000,000	All Projects
Road projects:							
No. of projects	167	51	46	24	23	7	297
Total value*	\$2,971,052	\$3,687,802	\$7,688,695	\$8,444,938	\$16,410,375	\$15,333,119	\$54,535,981
Ave. no. bidders	5.4	6.7	7.7	8.0	9.2	10.1	6.7
Structure projects:							
No. of projects	22	5	3	3	2	2	37
Total value*	\$425,893	\$322,029	\$440,209	\$849,747	\$1,584,969	\$6,642,283	\$10,265,130
Ave. no. bidders	7.5	9.8	8.0	14.7	13.0	9.0	8.8
Combination:							
No. of projects	---	---	---	---	---	9	9
Total value*	---	---	---	---	---	\$19,464,822	\$19,464,822
Ave. no. bidders	---	---	---	---	---	10.9	10.9
Summary:							
No. of projects	199	56	49	27	25	18	343
Total value*	\$3,396,945	\$4,009,831	\$8,128,904	\$9,294,685	\$17,995,344	\$41,440,224	\$84,265,933
Ave. no. bidders	5.4	7.0	7.7	8.8	9.5	10.4	7.0

* Bid items only.

Total Average Bidders by Month

	Jan.	Feb.	March	April	May	June
1954	7.6	8.4	8.8	6.9	5.7	6.3
1953	5.5	6.1	7.5	6.4	5.9	6.0

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

(July 1, 1953, to July 1, 1954)

Project volume	Up to \$50,000	\$50,000 to \$100,000	\$100,000 to \$250,000	\$250,000 to \$500,000	\$500,000 to \$1,000,000	Over \$1,000,000	All Projects
Road projects:							
No. of projects	281	83	74	45	35	100	528
Total value*	\$5,198,555	\$5,864,185	\$12,211,718	\$15,553,979	\$23,819,224	\$18,998,488	\$81,646,149
Ave. no. bidders	5.2	6.9	7.6	8.4	9.3	10.0	6.4
Structural projects:							
No. of projects	43	13	10	9	5	5	85
Total value*	\$988,387	\$858,769	\$1,465,315	\$3,203,612	\$3,683,561	\$12,696,200	\$22,895,844
Ave. no. bidders	7.4	9.7	9.6	11.6	10.6	11.2	8.9
Combination:							
No. of projects	---	---	---	---	---	16	16
Total value*	---	---	---	---	---	\$36,373,422	\$36,373,422
Ave. no. bidders	---	---	---	---	---	10.5	10.5
Summary:							
No. of projects	324	96	84	54	40	121	629
Total value*	\$6,186,942	\$6,722,954	\$13,677,033	\$18,757,591	\$27,502,785	\$68,068,110	\$140,915,415
Ave. no. bidders	5.5	7.2	7.9	8.9	9.5	1.9	6.9

* Bid items only.

Total Average Bidders by Month

	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	Year
1953-54	6.2	6.9	6.4	7.6	7.4	7.7	7.6	8.4	8.8	6.9	5.7	6.3	6.9
1952-53	4.3	4.3	5.9	5.1	5.9	4.8	5.5	6.1	7.5	6.4	5.9	6.0	5.7

of 9.4 percent. Three of the eight items showed increases, plant-mixed surfacing rose 1.4 percent, bar reinforcing steel 1.1 percent and asphalt concrete pavement was up 8.3 percent, however, as quantities for this latter item (asphalt concrete) are small in comparison to the other items, fluctuations in its cost do not greatly affect the Index. It would appear that responsibility for the 5.2 percent drop in the Index is in the

prime items of roadway excavation, untreated rock base, structural steel and portland cement concrete pavement.

The accompanying chart compares the California Highway Construction Cost Index with the U. S. Bureau of Public Roads Composite Mile Index and the Engineering News-Record Construction Cost Index, all reduced to the base of 1940 = 100. The Bureau of Public Roads Composite Mile

... Continued on page 61

New Bridge

*San Lorenzo River Span Is
Federal Aid Secondary Project*

By CARL R. KING, Design Engineer-Bridges, Santa Cruz County

THE BEAR CREEK ROAD was first surveyed by M. V. Bennett in 1873 for a corporation known as the Bear Creek Toll Road Company. The right of way width was given as 50 feet and the length as approximately 10 miles. The lower portion followed an existing road and was unsurveyed. The road was completed and opened in September, 1876, and this fact was reported to the county supervisors by Wm. Parkhurst, President, and R. W. Craig, Secretary, of the Bear Creek Toll Road Company.

The road was operated as a toll road until some unrecorded date between 1888 and 1890. In 1890 the county accepted a deed for right of way for that portion of the road in lands of McMillan and Harmon who owned a considerable part of the land along the road.

The first complete survey of the road was made in 1921 by Lloyd Bowman, County Surveyor, who relocated a portion of it to improve the grade and reduce the number of bridges.

The road was widened and the surface improved in the period between 1934 and 1940 under the auspices of the WPA.

As presently located the Bear Creek Road starts at the northerly limits of the unincorporated town of Boulder Creek on State Sign Route 9 and traverses easterly and northerly 9.82 miles to State Sign Route 5.

The town of Boulder Creek is located in the heart of the Santa Cruz Redwood country and the San Lorenzo River valley. This general area is becoming increasingly popular as a site for summer homes for residents of the San Francisco Bay region.

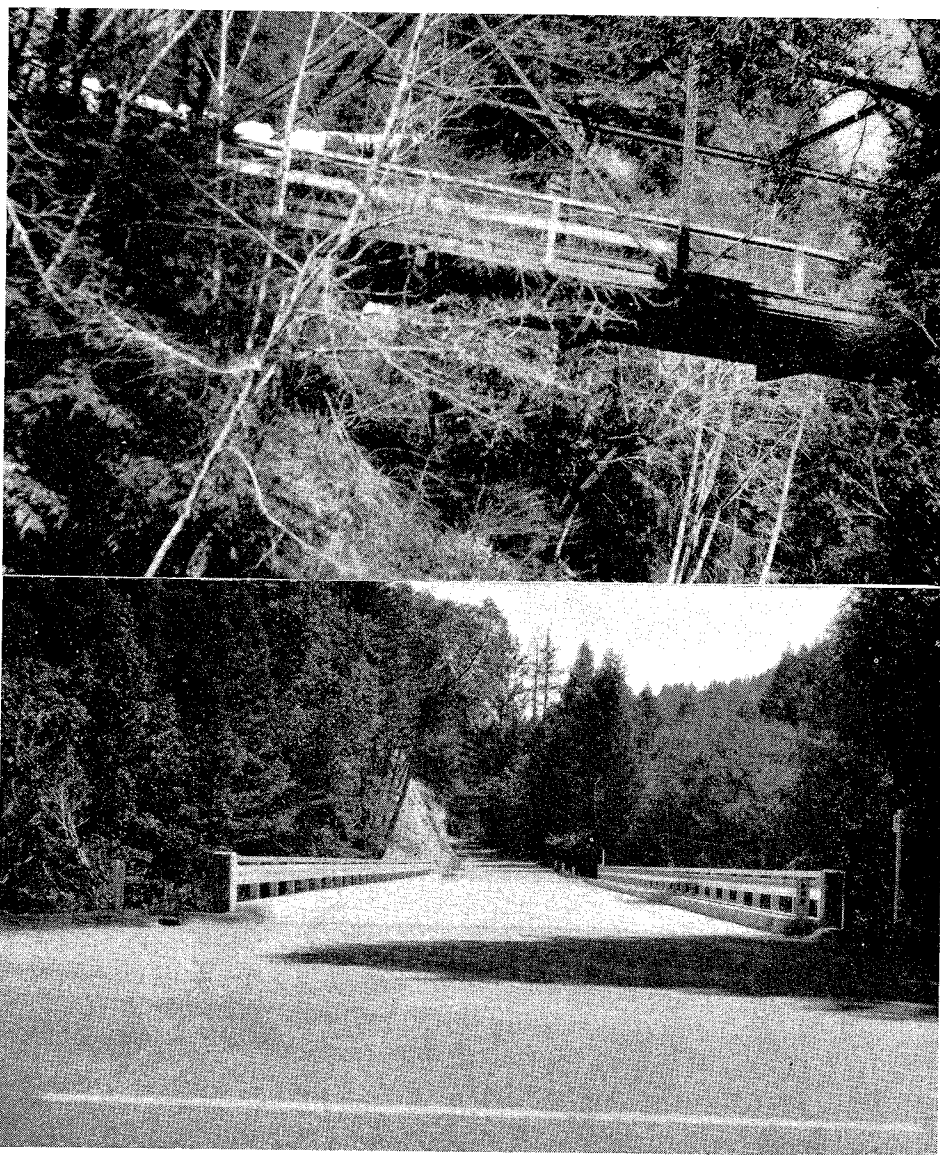
In view of the increasing importance of the Bear Creek Road the board of supervisors requested that it be included in the Federal Aid Secondary System. On April 5, 1950, it was accepted as FAS 1172 by the U. S. Commissioner of Public Roads.

The most critical feature of the road was the light truss bridge over the San Lorenzo River and its indirect approach to State Sign Route 9 in Boulder Creek. The bridge was a through Pratt truss, 100 feet long, 19.5 feet between trusses, and of about 1910 vintage and loadings.

It was decided to construct a new bridge and approaches about 250 feet upstream of the existing structure to

carry modern highway loadings and to improve the approach to State Sign Route 9. As an FAS project, plans for a continuous three-span bridge with spans of 55, 90, and 70 feet supported on wide flange girders on steel bents with a steel grid deck and 350 feet of approaches were completed.

Negotiations for the two parcels of land required for this project were started during the design of the



UPPER: Old San Lorenzo Bridge on Bear Creek Road in Santa Cruz County near the town of Boulder Creek. LOWER: New San Lorenzo River Bridge constructed by Santa Cruz County under the Federal Aid Secondary Highway Program.

bridge. One parcel was secured without difficulty. The other parcel was held by an absentee owner and had a tax lien by the Collector of Internal Revenue against it. Both the owner and the Collector of Internal Revenue were cooperative, but the necessary three-way correspondence and legal requirements delayed acquisition of this parcel enough to make the original design a Korean War casualty.

In July, 1950, prior to the Korean War price rise, the total cost estimate for the bridge was \$66,197. By August the cost estimate climbed to \$77,017. In October the estimate was \$80,850. By February of 1951 the estimate reached a total of \$119,316. The board of supervisors decided the price excessive and in March of 1951 deferred the project indefinitely.

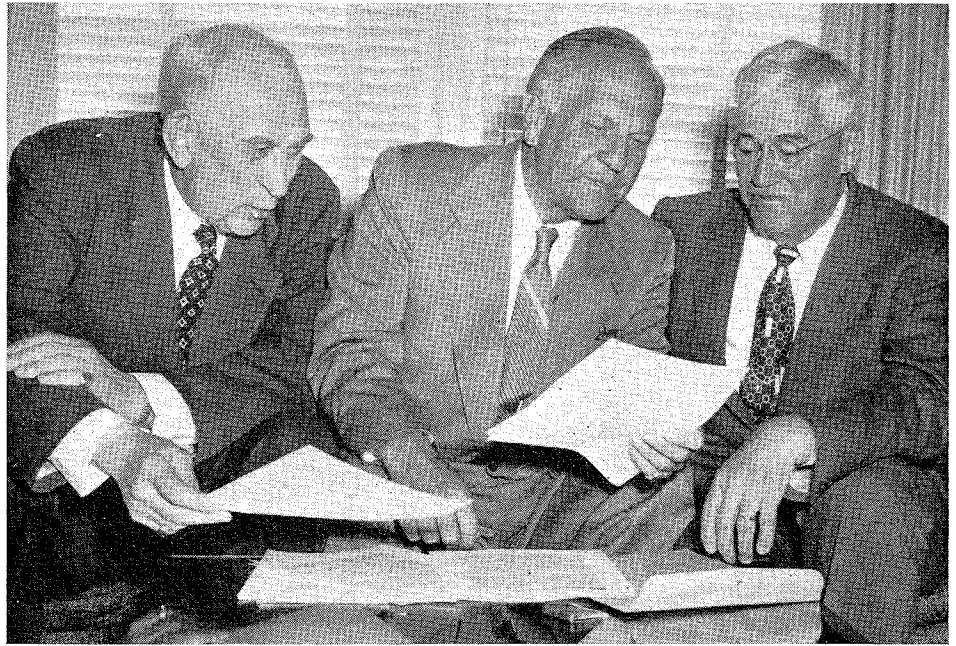
In late 1952 the project was reconsidered and it was decided that a redesign of the bridge would lower the cost to about the original estimate. The proposed redesign was to shorten the structure to three continuous spans of 57, 70, and 50 feet. The deck was to be of reinforced concrete supported by wide flange girders on reinforced concrete bents and abutments. Design loading was to be AASHO H20 - S16 - 44. The width of the deck was to be of 26 feet, with two foot safety curbs on either side and an over-all length of 173.5 feet.

The redesign was completed in the spring of 1953 and plans submitted to the Division of Highways and the Bureau of Public Roads for approval, and awarding of the contract.

The contract was awarded in September, 1953, and construction started in October, 1953. Construction was carried on throughout the winter with little difficulty as all parts of the structure were above high water. The project was completed in March, 1954, at a total contract cost of \$56,806.74.

The contractor was Stolte, Inc., of Oakland. Alfred Cantor and T. B. Coull were joint superintendents. Walter I. Nilsson was resident engineer for the County of Santa Cruz. The project was under the supervision of Fred R. Pracht, County Road Commissioner. The writer was responsible for the redesign of the bridge.

Engineers Report to Governor on Bay Crossing



Governor Knight confers with consultants on Southern Crossing. LEFT TO RIGHT: Richard E. Dougherty, New York; Governor Knight; Dean Daniel V. Terrell, Kentucky.

Two of America's most outstanding engineers were selected by Governor Goodwin J. Knight as consultants on a southern crossing of San Francisco Bay.

They are Daniel V. Terrell, President of American Society of Civil Engineers and Dean of the College of Engineering, University of Kentucky, and Richard E. Dougherty, a graduate of Columbia University, with a long record of accomplishments as a consulting engineer and a member of the firm of Seeley, Stephenson, Value-Knecht of New York.

These consulting engineers are shown discussing their findings with Governor Knight. Their report to the Governor stated:

In accordance with your request, we have spent the past several days in a very complete inspection in the field of the proposed southern crossing of San Francisco Bay, as provided for in California Statutes of 1953, Chapter 1056, and have otherwise reviewed the problem at length with the Project Engineer of the Division of San Francisco Bay Toll Crossings, and the Assistant State Highway Engineer in

charge of District IV of the Division of Highways, California Department of Public Works.

We believe that the Department of Public Works demonstrated its ability to direct a project such as the southern crossing when it successfully planned and constructed the San Francisco-Oakland Bay Bridge, one of the world's greatest engineering and financial accomplishments. This ability is currently demonstrated by the very satisfactory progress now evident on the Richmond-San Rafael Bridge.

We recommend that the same basic engineering and financial procedure be followed, and that the Department of Public Works continue the work already initiated, for the southern crossing project.

At the appropriate time, an independent board of consultants would be advisable to collaborate with the Department of Public Works and its division in charge of the project, in such manner and under such procedure as may be determined by the Director of Public Works and the California Toll Bridge Authority.

Harbor Freeway

Retaining Walls and Bridge Structures Are Important

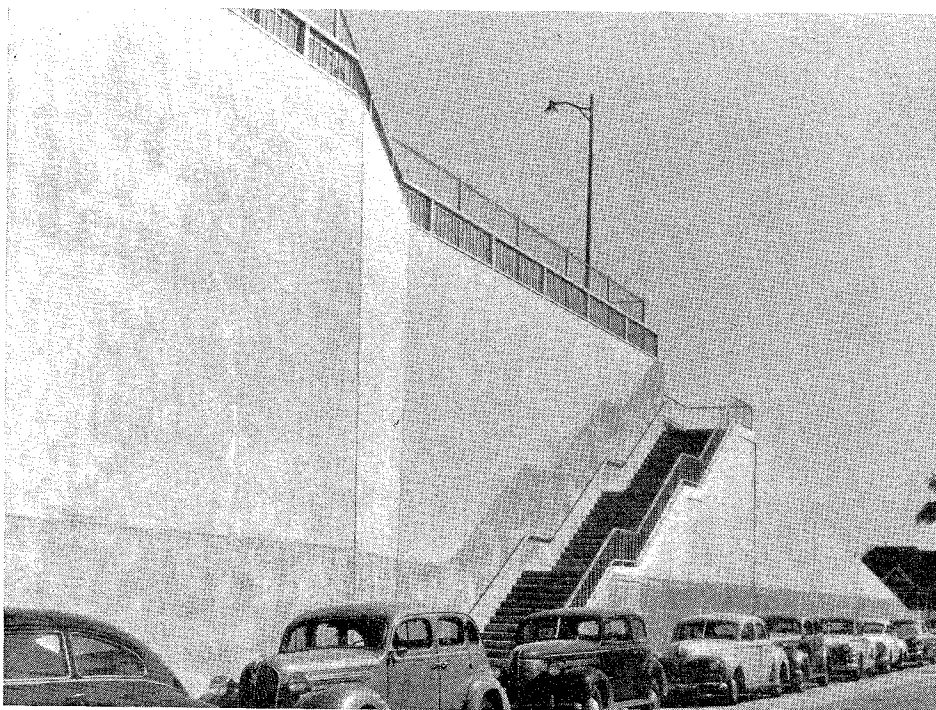
By W. A. McINTYRE, Associate Bridge Engineer

IN THE May-June, 1954, issue of *California Highways and Public Works* was a story on the Harbor Freeway by District Engineer W. L. Fahey. The purpose of this present write-up is to supplement the general information in Mr. Fahey's story and to describe in detail important structures being built under Contract No. 53-7VC60-F. The third section of the Harbor Freeway in the Los Angeles metropolitan area extending from Olympic Boulevard to Flower Street is rapidly nearing completion. Two-thirds of a mile of eight-lane freeway from Olympic Boulevard to Washington Boulevard is now in full operation, having been opened to public traffic on May 14, 1954.

Contract work for the construction of this total 1.3 miles of freeway amounts to \$1,655,000. The cost of bridges and miscellaneous structures amounts to 45 percent of the total cost



Looking southerly along completed section of Harbor Freeway from above Pico Boulevard, showing bus turnout on east side of freeway for northbound traffic. The city street shown on extreme left is Bond Street.



Looking southeasterly, showing portion of retaining wall and stairway construction on east side of Oak Street to provide passenger interchange between bus stop above and city street below

of project the remaining 55 percent covers grading, paving, and miscellaneous work. The structure work included in this contract consists of 10 retaining walls of various sizes and lengths, the Washington Boulevard Undercrossing, the 21st Street Pedestrian Overcrossing, and the Figueroa Street Overcrossing at 23d Street. Other bridges and retaining walls within the limits of this contract, including structures over 11th Street, 12th Street, Pico Boulevard, and Venice Boulevard, were constructed under earlier contracts.

Extensive Retaining Wall

The largest retaining wall in this contract adjoins the bridge structure at Pico Boulevard and is located on the westerly side of the Harbor Freeway adjacent to Oak Street. This structure involved the placement of 2,000 cubic yards of concrete and 90 tons of bar reinforcing steel. The central section of this retaining wall car-



UPPER—Looking easterly along Washington Boulevard showing nearly completed underpass bridge structure carrying the Harbor Freeway.
 LOWER—Looking southeasterly, showing Harbor Freeway in vicinity of 21st Street, construction details of pedestrian overcrossing.

ries at freeway level a special roadway to serve as a turn-out for southbound buses and a passenger loading and unloading area. A stairway seven feet in width was constructed for pedestrian use from the bus landing area on the

freeway down to Oak Street at ground surface. A much smaller retaining wall on the other side of the freeway provides an area at freeway level for similar facilities for northbound buses.

The Washington Boulevard Undercrossing about one-half mile south of the bus turn-outs is a rigid frame box girder structure 106½ feet in length, which carries eight lanes of freeway traffic over Washington Boulevard.



Looking northwesterly along Harbor Freeway construction, showing nearly completed Figueroa Street bridge at 23d Street

The freeway roadways for north and southbound traffic are separated by a 12-foot median strip with open metal gratings at top curb elevation to provide light during the day for vehicular traffic underneath on Washington Boulevard.

Bridge for Pedestrians

To the south of Washington Boulevard a reinforced concrete pedestrian overcrossing has been constructed on 21st Street over the freeway. Bridge abutments with sidewalk ramps and a single circular pier near the center of the bridge provide the supports for span lengths of $100\frac{1}{2}$ feet and 81 feet. The $4\frac{1}{2}$ -foot double girder section is in the form of a U, with the lower slab or walkway ramp being eight feet wide and the girders of the section forming the side walls. Ornamental galvanized steel picket fences have been installed for pedestrian safety on the tops of the side girders.

Southerly of the pedestrian crossing the freeway crosses under Figueroa Street, and one of the major features of this project is the unusual design of this structure. The bridge

designer was confronted with the difficult problem of designing a freeway structure to carry 23d and Figueroa Streets where they intersect over the Harbor Freeway. The freeway crossing under the structure will carry eight lanes of traffic in addition to an inlet ramp from Flower Street on the northbound side. The bridge structure consists of eight separate frames or structures placed adjacent to each other. The longer span of this structure is parallel to Figueroa Street and about 108 feet in length, resting on expansion angles on the cantilever protruding from Bent No. 2 and on rockers on the bridge seat at abutment No. 1. The three exterior girders carrying the sidewalk are over eight feet in depth. The sidewalk slab forms the top of box girders for this span.

Design Requirements

In general, girder depths are seven feet for all frames south of frame No. 4, and four feet six inches deep north of this frame. Another factor resulting in complicated design require-

ments is the sharp 32-degree angle between the Harbor Freeway and Figueroa Street centerlines. Sidewalks, curbs and gutters have been constructed on the bridge to form the street intersection, with standard traffic signals at the four corners. Paving work for the street surface is plantmix surfacing placed immediately over the top slab of the bridge deck to conform with City of Los Angeles typical pavement sections. A standard 28-inch steel handrail was constructed on the outside of the 7-foot and 14-foot sidewalks.

This contract was approved for construction on July 10, 1953, with 360 working days allowed to complete all of the contract work. Construction work on the retaining walls and the bridge structures began about July 13, 1953. Due to the speed in which this contractor has completed the structure work, especially the progress made on Figueroa Street Bridge, it was possible to open this bridge to Figueroa Street traffic on June 4, 1954.

. . . Continued on page 64

Foothill Freeway

*Will Relieve Traffic Congestion
At Devil's Gate Dam*

By H. R. LENDECKE, Resident Engineer

CALIFORNIA motorists are about to receive another dividend on their gas-tax investment. Work was started late in February on the Foothill Freeway between Hampton Road in La Canada and Montana Street in northwestern Pasadena, Los Angeles County. The work, which is scheduled for completion early in 1956, is being done by George W. Peterson, Jack W. Baker and Dragline Rentals Company, joint venturers, who submitted a low bid of \$1,831,071.

Foothill Boulevard is one of the two main routes which bypass the metropolitan Los Angeles area on the north, the other being Colorado Boulevard about 3.5 miles to the south, which is currently being improved. The purpose of the Foothill Freeway is to pass the congested Arroyo Seco Canyon at Devil's Gate Dam. This bottleneck has continually grown worse during peak traffic hours due to increased population in the foothill areas, and especially on weekends, since Foothill Boulevard serves the Angeles Crest

mountain resort areas as well as traffic bypassing Los Angeles.

Realignment

This contract calls for constructing a four-lane divided highway about 1.75 miles long, with frontage roads, ramps, speed change lanes and road connections, and the construction of six reinforced concrete bridges and an equestrian tunnel. The present highway passes over Devil's Gate Dam, a Los Angeles County Flood Control District facility, and travels to the northwest over a narrow, curved alignment to Foothill Boulevard at the east end of La Canada and enters Pasadena to the southeast via winding city streets. This improvement will provide a realignment of the highway with full freeway status.

Artistic Bridge

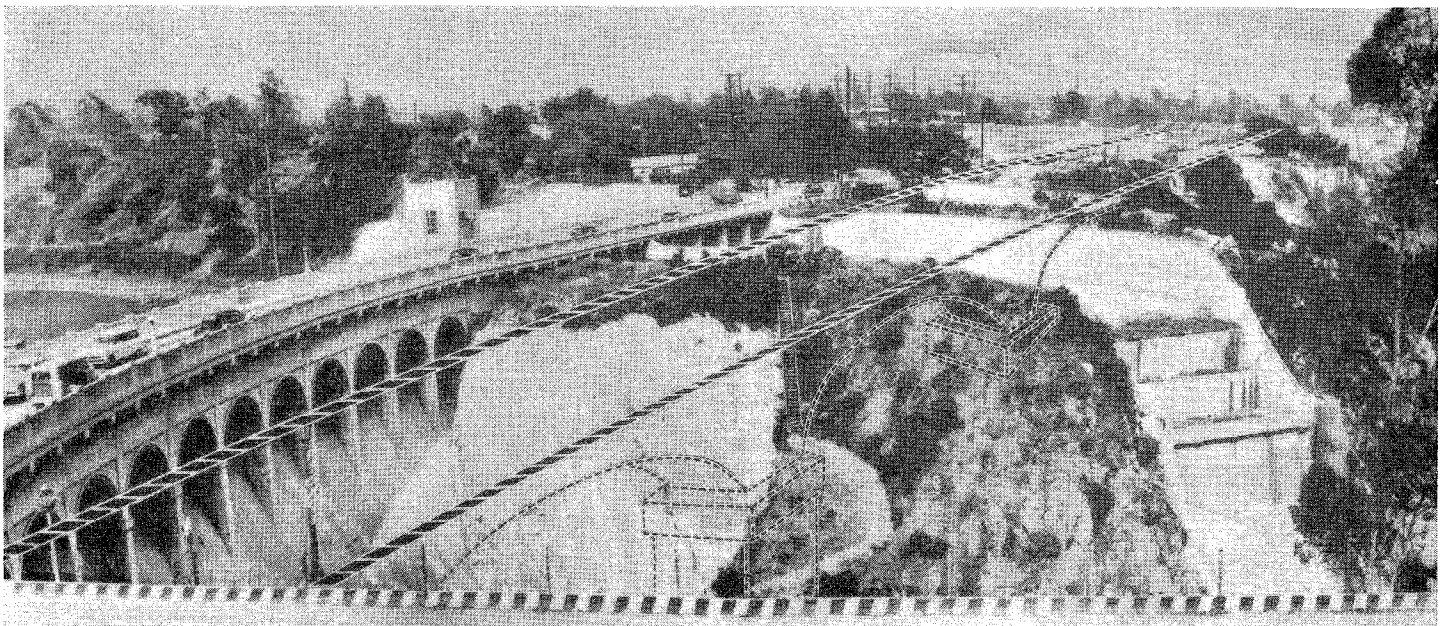
The largest structure on this job is the 418-foot long Arroyo Seco Bridge which will lie just south of Devil's Gate Dam. This bridge will carry the

freeway over the 110-foot deep gorge and over the dam spillway. Several aesthetic features have been incorporated in this structure. The massive center pier (which, incidentally, is hollow) rising from the floor of the gorge will have elaborate rusticated concrete surfaces on its shaft to where it joins with the pleasingly curved soffit of the bridge deck. The pier on the east bank of the canyon also has rusticated surfaces, which will provide a look of masonry construction to blend with the exposed fissured rock of the canyon walls. The curved arch-like deck soffit is accomplished by varying the girder depth of the box girder sections. The estimated cost of this structure based on contract prices is about \$400,000.

The Flint Canyon Wash Bridge carries the freeway over Flint Canyon Wash. This seven-span structure will be constructed at a cost of about \$200,000.

The Route 165/9 separation will carry Route 165 and local traffic from

On this photograph the artist has drawn in lines to indicate how the bridge now under construction on Foothill Freeway at Devil's Gate Dam will fit into the topography. Photo courtesy Los Angeles Times.



the exclusive Flintridge Hills area over Flint Canyon Wash and over the freeway to ramp connections with the freeway. This structure is being built in two phases, the first passing about 70 feet above the wash supported by tall, six-foot diameter, multifaced pier columns. In the second stage the bridge will be built over the freeway in embankment area, with the pier footings resting on steel piles. The total length of this bridge is about 345 feet and the cost about \$140,000.

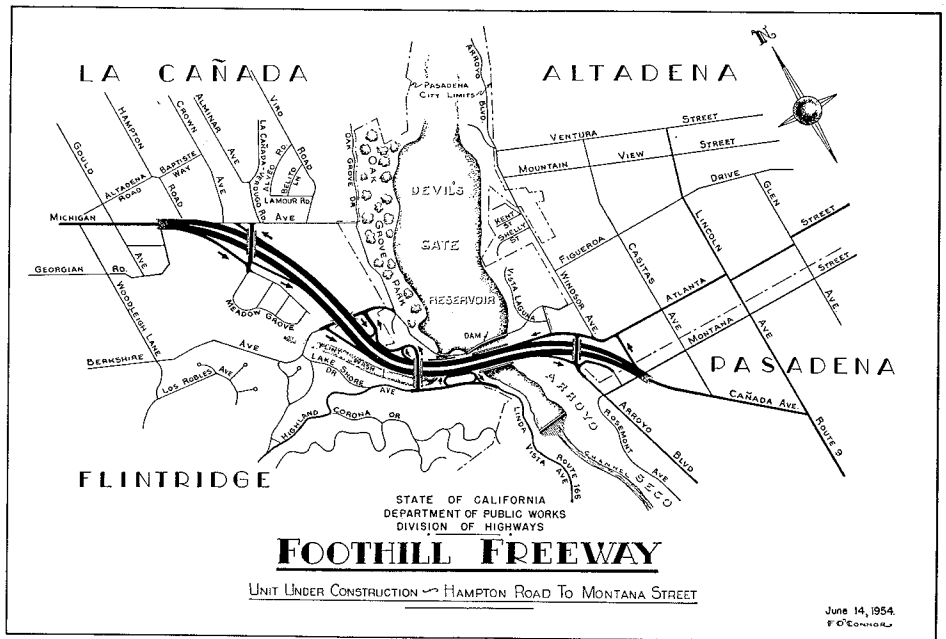
The Meadow Grove Avenue Overcrossing will carry Meadow Grove traffic over the freeway. This box girder structure is about 157 feet long and will cost an estimated \$85,000.

The Arroyo Boulevard Overcrossing will connect Arroyo Boulevard with the north frontage road. This box girder structure is about 107 feet long and will cost \$70,000.

The area adjacent to this contract is a favorite spot for equestrians and contains many bridal paths. To provide passage across the freeway an equestrian tunnel 8 x 10 feet, 118 feet long has been provided under the highway just east of Devil's Gate Dam.

Close Cooperation

A portion of this project is within the jurisdiction of the Los Angeles County Flood Control District. The Flint Canyon Wash bridge and the

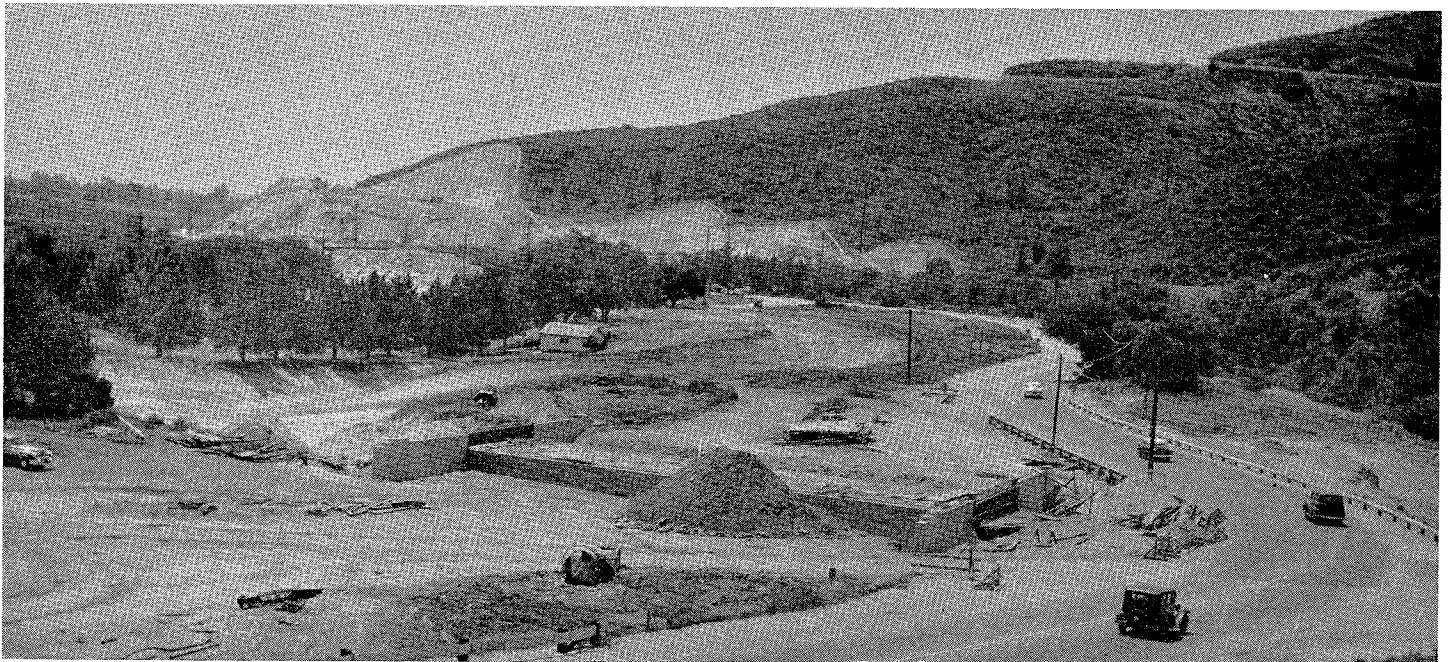


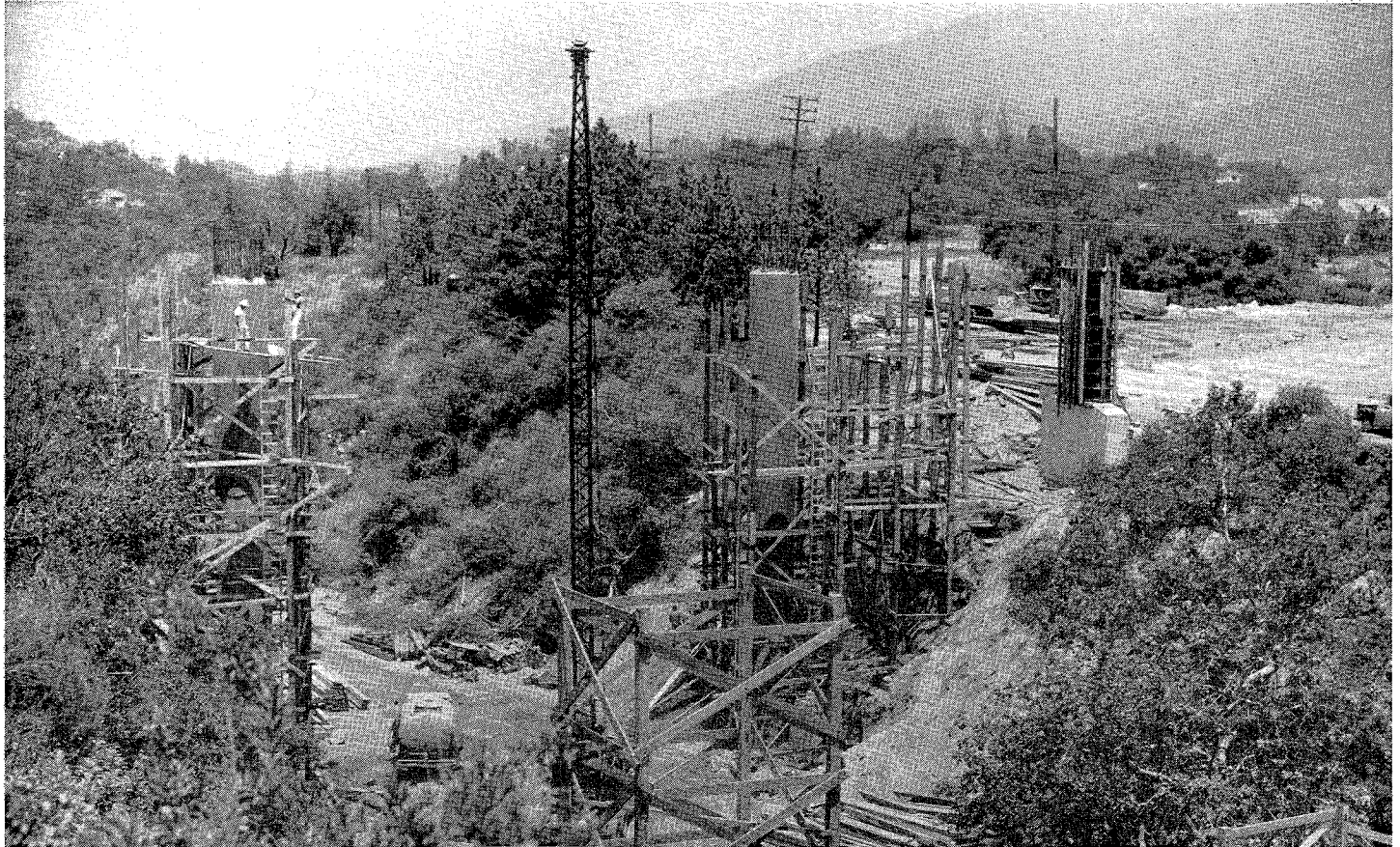
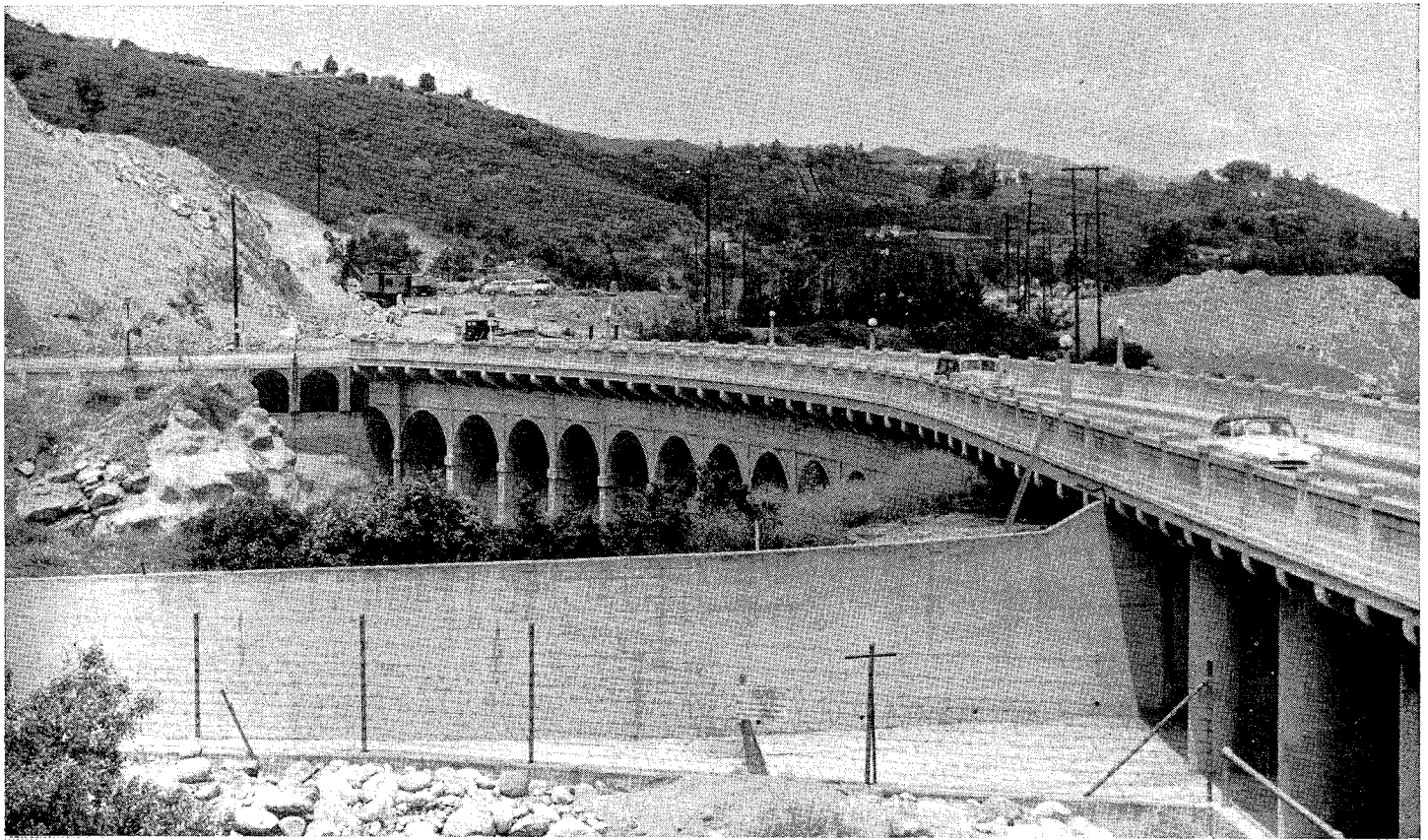
Route 165/9 separation and some roadway embankment are located in the reservoir storage area. The Arroyo Seco Bridge also passes over the dam spillway. Because of these factors, extensive scheduling and close cooperation with the Flood Control District are necessary in order to maintain the reservoir capacity. Substructure work in the reservoir area as well as placing of falsework in the storage area and the dam spillway area must be scheduled for the summer dry season.

Special care must be exercised to remove construction debris from the storage area to prevent damage to the flood control structures prior to the rainy season.

The construction of this portion of the Foothill Freeway is a major step in the solution of some of the traffic problems of the north central Los Angeles area. This construction contract is being administered by the Bridge Department with Mr. Louis Steele acting as District VII representative.

Looking south toward Highland Avenue cut. Structure in foreground is Berkshire Avenue Undercrossing which is substantially completed





UPPER: Looking west along centerline of Foothill Freeway, showing site of Arroyo Seco Bridge. LOWER: Looking north toward Route 165/9 separation structure, showing piers Nos. 4, 5, and 6 under construction.

Industry and Frontage Roads

Continued from page 22 . . .

more desirable than comparable sites on Slauson Avenue (conventional street in industrial area) located approximately the same distance from downtown Los Angeles. Whereas Slauson Avenue was considered a better industrial location in 1950, the frontage road sites are now considered better. The primary reason for this feeling is the advertising value adjacent to the freeway.

Swedlow Plastics Co., 6986 Bandini Boulevard

This industrial firm is one of the largest employers in the area. Prior to constructing their new building on Bandini Boulevard, this company had leased plant facilities in other industrial districts. Before making a large investment for the construction of their own plant, this firm made a thorough study of possible site locations in order to be sure that the building would be in the right place. The new plant site is opposite the Garfield Avenue ramps to and from the freeway. Primary conclusions of the firm with respect to the freeway are:

1. The new building site was chosen in early 1952 on Bandini Boulevard adjacent to the Santa Ana Freeway in preference to other available industrial sites because of consideration of the ultimate value of the property at this particular location, particularly in the event it would be necessary to sell the property at a future date.
2. Certain advertising advantages to the business by reason of being located near the freeway.
3. The freeway contributes immeasurably as a convenience factor to employees and business associates.
4. The freeway is distinctly a property appreciation factor!

Ziegler Steel Corp., 7022 Bandini Boulevard

The Ziegler Steel Corporation plant on Bandini Boulevard conducts op-

erations as a steel jobber. The distance from the plant to nearest freeway exit and entrance is approximately 200 feet. General comments made by this industry with respect to their frontage road site near the Santa Ana Freeway are:

1. Ease of delivery. The commercial deliveries to the San Fernando Valley and Hollywood areas are now made in approximately half the time that was required for delivery from their previous plant location in the industrial area south of downtown Los Angeles.
2. Orange County can now be served with the company-owned trucks. Before the construction of the freeway, traffic was so congested it was necessary for Orange County to be served by common carrier.
3. The freeway has made it easier for the firm to get employees. Before the freeway was built, prospective employees living some distance from the plant were reluctant to work in this area.
4. The company feels that the freeway in every way has been an asset and in no manner has it been a detriment to the operation of its industrial plant.
5. Illuminated signs have been installed on the buildings to take advantage of the advertising value adjacent to the freeway.

Wm. Simpson Construction Co., 7228 Bandini Boulevard

The offices for this construction company are located in downtown Los Angeles. For the successful operation of the business it is necessary to have warehouse facilities which are easily accessible to the entire metropolitan Los Angeles area. The warehouse on Bandini Boulevard is approximately 1,400 feet from the nearest freeway entrance and exit. The feeling of the company with respect to the freeway has been summarized as follows:

It would have been almost out of the question to locate a ware-

house that far out of town if it had not been for the freeway. The Santa Ana Freeway makes it possible for us to get to the center of town in less time than from the old location at 32d and Alameda. (That location was one-third the distance of the new frontage road site to the downtown area.)

American Heat Treating Corp., 7436 Bandini Boulevard

This plant is engaged in the commercial heat treating business. The attitude of this industrial firm with respect to the Santa Ana Freeway was expressed by one of the officers as "amazing." The distance from this new plant to the Garfield Avenue entrance and exit to the freeway is approximately 2,400 feet. General comments of this firm with respect to the freeway can be summarized as follows:

Since the completion of this new industrial plant on the frontage road (Bandini Boulevard), freeway motorists have made inquiries that could add an estimated \$4,000 to \$5,000 worth of business per month. The new plant was built in this location to accommodate a normal business increase, but the freeway has generated an increase so great that the present plant cannot accommodate it. It is the opinion of this industry that if the plant were located on a site not visible from the freeway the additional volume of business would not be available.

Pioneer Broach Co., 6434 Telegraph Road

This industrial firm manufactures precision tools. Their new plant is located at the corner of a freeway off-ramp and Telegraph Road (Test Area "B"). Highlights of the comments made by this firm in regard to their new location adjacent to the Santa Ana Freeway are as follows:

1. The business had been established in downtown Los Angeles before moving to this location adjacent to the freeway.
2. The need for business expansion necessitated a new site which

would offer accessibility to customers and business associates by means of rapid transportation.

3. The new site near the Santa Ana Freeway provided the said requirements set forth above. Customers living in the San Fernando Valley area † find it easier to get to the new plant site than to the old downtown location, although the former site was closer to the San Fernando Valley area by six miles. The new site near the freeway has made it possible to hold customers who might otherwise have been lost, because of the difficulty in driving and parking in the downtown location.
4. Employees have moved into suburban residential areas to take advantage of the close proximity of the plant and the rapid transportation to and from the plant via the freeway.

Central Scientific Co., 6446 Telegraph Road

This industrial plant located between the Santa Ana Freeway and Telegraph Road (Test Area "B") at the corner of a freeway off-ramp had this to say with regard to their new plant location:

1. Central Scientific Company in the latter part of 1951 was the first large concern to locate in the area of Santa Ana Freeway—Telegraph Road, excluding the Lever Brothers plant.
2. This company had numerous locations to select from in the general vicinity of the freeway, but picked this specific location because of the availability of rapid transportation and accessibility of plant for employees and customers.

Annin Corporation, 6570 Telegraph Road

This new plant is located between the freeway and Telegraph Road (Test Area "B") and approximately 775 feet from the nearest freeway off-ramp. The attitude of this corporation

† 25 miles from Test Area "B" to the central section of San Fernando Valley area.

in regard to the freeway can be summarized as follows:

1. One of the main problems in finding a suitable location for the establishment of this plant was the transportation for not only the executive employees but also the skilled personnel. This location adjoining the Santa Ana Freeway answered this problem because of availability of rapid transportation.
2. On a percentage basis, the proximity of the Santa Ana Freeway influenced the selection of this site 50 percent.

CONCLUSION

Industries looking for new plant sites in those sections of the State where there are new freeways, can profit by the experience of the industries located on the frontage roads along the Santa Ana Freeway.

A summary of comments by property owners is as follows:

1. The freeway is distinctly a property appreciation factor to adjoining property.
2. The freeway is an asset from an advertising standpoint to business located on a frontage road.
3. Moving to an industrial location near the freeway has made it possible to retain customers discouraged by traffic congestion.
4. The freeway contributes immeasurably as a convenience factor to employees and business associates.
5. Industrial location on frontage road along the freeway accounts for additional business per month which is attributable entirely to prospective customers using the freeway.
6. The freeway facilitates distribution of goods. Crosstown delivery from south to north has been reduced to one-third the former time.
7. The freeway is advantageous in directing customers to the plant without their getting lost on unknown industrial streets.

The enhanced land values and the enthusiastic endorsement by the property owners conducting business along these frontage roads is conclusive evi-

In Memoriam

FRANK A. JOHNSON

In poor health since his retirement last April as principal structural engineer in charge of structural design for the State Division of Architecture, Frank A. Johnson died in Sacramento on June 21st at the age of 65 years.

A graduate of University of California, Mr. Johnson received his basic experience from 1906 to 1909 in his native San Francisco with Dyer Bros., Pacific Rolling Mills, and H. J. Brunnier. He was in private practice from 1911 to 1933.

During this period, he was structural designer on the Pacific Southwest Building and San Joaquin Light and Power Building in Fresno; the main building group of St. Mary's College in Moraga; the Balfour, Guthrie, Standard Oil, and American National Bank buildings in San Francisco, the Broadway Tunnel, and portions of the Golden Gate Bridge approaches.

Mr. Johnson entered the division in June, 1933, and served nine years as supervising structural engineer in administration of the Field Act in Southern California.

He leaves a widow and two daughters.

dence that when industrial improvement represents the highest and best use for land, the location of an industrial site in close proximity to a freeway is a definite advantage.

This study also shows that a location of an industrial enterprise on a frontage road, whether near or some distance from the exit or entrance to the freeway, does not affect the land value or the success of the business. The results of this study should eliminate the erroneous assumption many people have that an industrial site on a frontage road cannot succeed unless it is directly opposite an opening into the through traffic lanes.

MATURE DRIVER

Are you the kind of driver who experiences keen pleasure in showing some courtesy on the road? Then you are a mature, sportsmanlike driver.

Weldon Canyon

Golden State Freeway
Bridges Under Construction

By C. J. WOODBRIDGE, Associate Bridge Engineer

THE FIRST section of the Golden State Freeway within the City of Los Angeles is now being constructed north of San Fernando from near the intersection of San Fernando Road and Sepulveda Boulevard northerly to beyond the city limits in Weldon Canyon, a distance of three miles. This construction is now in progress and the general features and road work were discussed by Resident Engineer Robert H. Butler in the January-February, 1954, issue of *California Highways and Public Works*. The purpose of the present write-up is to give detailed information concerning structures. Included in this contract are seven bridges, the value of which total about one-third of the contract bid of over \$3,000,000.

Seven Bridges

Beginning at the southerly end of the project the bridges listed in order are as follows:

The Route 158/4 separation is a single span to carry the northbound freeway over the southbound ramp to San Fernando Road.

The Route 4/157 separation and overhead consists of twin bridges which will carry the freeway traffic over San Fernando Road and over the track of the Southern Pacific.

The Los Angeles aqueduct bridge will carry the freeway over the open

channel of the Owens Valley-Los Angeles Aqueduct.

The Route 4/23 southbound interchange and the Route 4/23 separation are given two separate bridge numbers and will provide a "three-level" separation of traffic at that junction of U. S. Routes 6 and 99.

The Weldon Canyon Overhead crosses a small box canyon located over the Southern Pacific Railroad tunnel. The structure is being built to avoid placing a large roadway embankment across the canyon, as it is recognized that such a heavy dead load should not be added to the present load now supported by the concrete lining of the railroad tunnel because failure might result. Drilled piles up to 80 feet long were used to transmit the bridge load to an elevation below the railroad track in the tunnel. This procedure makes certain that no damage will result to the railroad tunnel because of the freeway construction above it.

Weldon Canyon Undercrossing

The Weldon Canyon Undercrossing will carry freeway traffic over a ramp connection to the present highway US 99. This bridge is a single span having a skew of about 56 degrees, with abutments founded on new fills up to 60 feet deep. The abutments are adjusting themselves to dif-

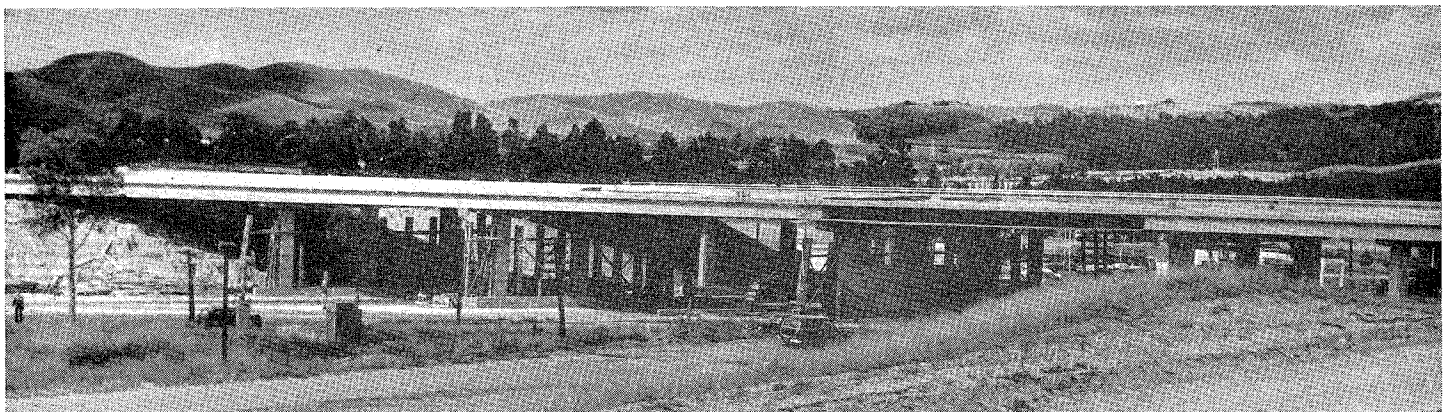
ferential fill settlements through the vertical expansion joints. About half a million cubic yards of embankment have been placed in Weldon Canyon in the vicinity of the bridge, so that some movement is to be expected.

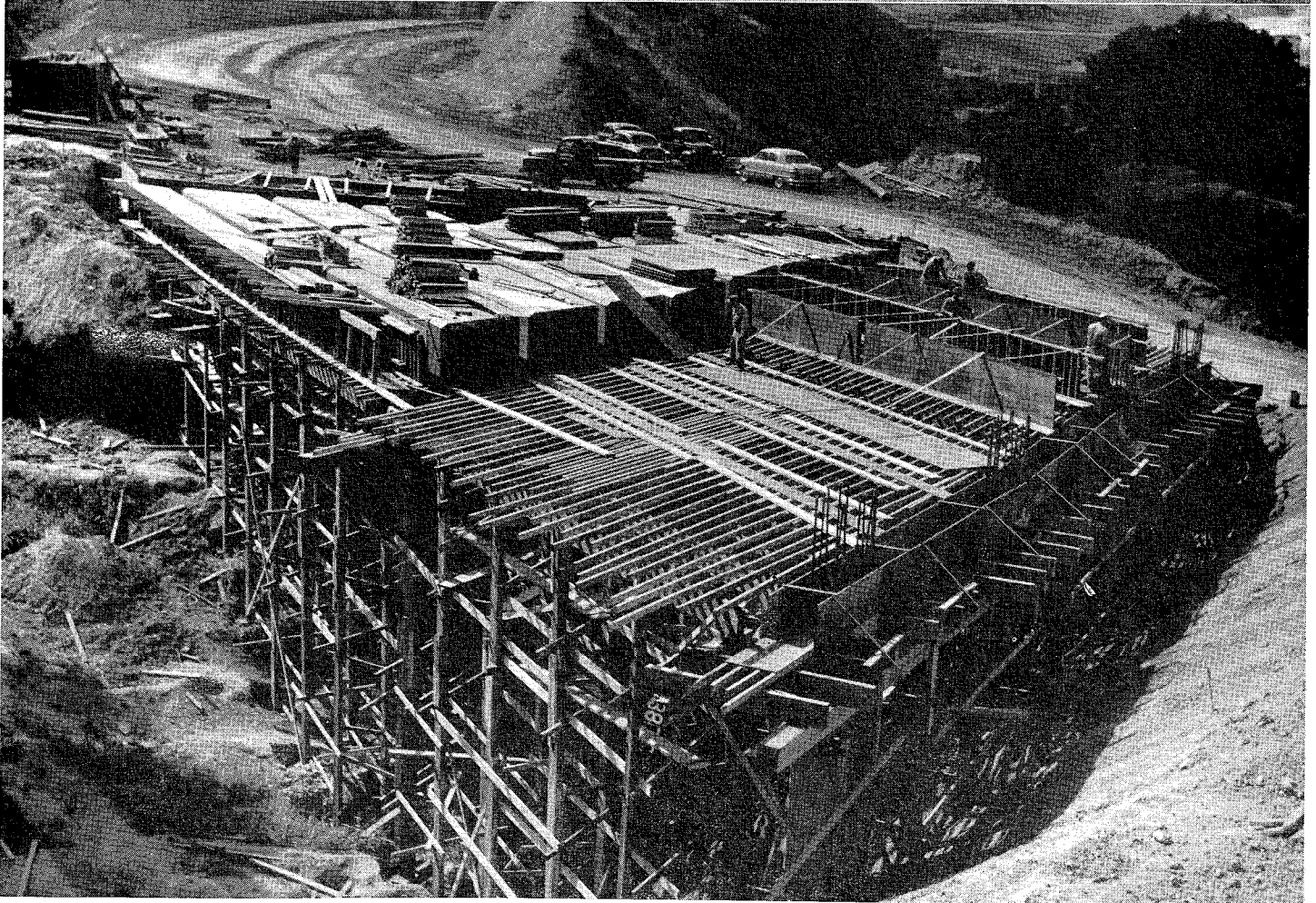
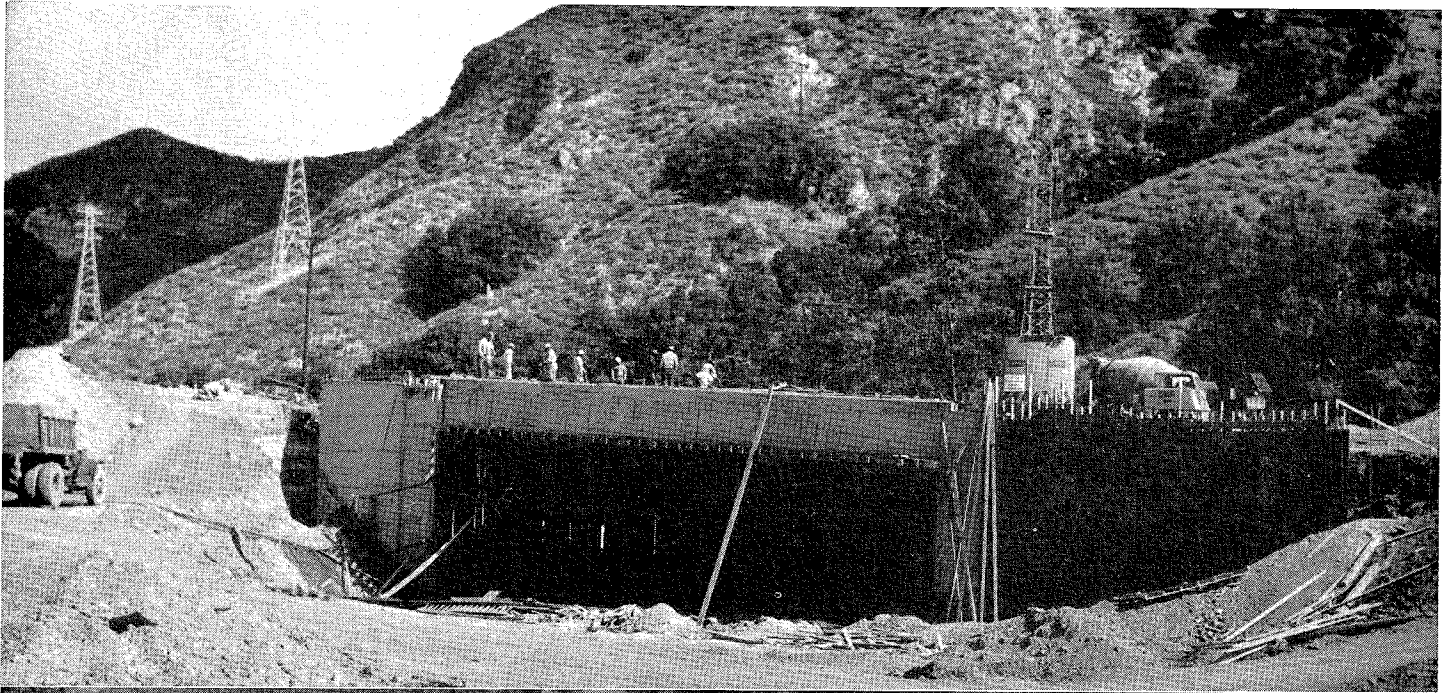
Bridges over freeways are important. They separate traffic streams, thus preventing exasperating traffic jams which often develop at heavily traveled intersections.

A good example is at the present intersection of U. S. Routes 6 and 99 (State Routes 23 and 4) where regular weekend traffic jams are a headache to the public and police alike. As many as six policemen are now required to keep traffic moving, particularly on Sundays, while motorists crawl along in low gear "stop and go" for several miles to pass the intersection. When the three-level structure is completed and all the roadways are in use by public traffic, which will be sometime next spring, the motorists can roll along in high gear.

The contract work is being done by Griffith Company with J. Tomei and Sons doing the grading work. For the Griffith Company, Joe Porcher is construction manager and Hal McGregor is superintendent. The State is represented by R. H. Butler as Resident Engineer and the writer as Bridge Department representative.

Looking westerly at Golden State Freeway bridges over San Fernando Road and the mainline Southern Pacific Railroad track





UPPER: Looking northerly at Golden State Freeway bridge over northbound ramp connection from San Fernando Road. LOWER: Looking southerly along freeway, showing construction in progress on Weldon Canyon Overhead. This structure is over the Southern Pacific Railroad mainline tunnel and is being built to avoid placing a heavy fill load over the tunnel.

US 99 Progress

Highway Reconstruction
Through Riverside County

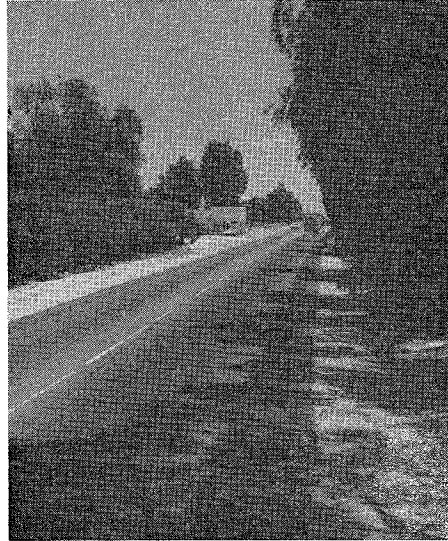
By J. DEKEMA, Assistant District Engineer

WITH THE AWARD of a 2¼ million dollars contract to McCammon-Wunderlich and C. K. Moseman of Palo Alto, reconstruction of US 99 through Riverside County is swinging into high gear. Designated as Route 26 in the State Highway System, this road also carries US 60 and 70 from Beaumont to Indio. This latest improvement is for the construction on new alignment of 14.4 miles of four-lane divided expressway between a point 2.3 miles west of Garnet and Thousand Palms. M. E. Nelson is the resident engineer.

Sandstorm Area

Considerable study and investigation was made before selecting the adopted route. It has been necessary, at various times in the past, to close the existing highway during extremely heavy sandstorms prevalent in this area. Many motorists can attest to windshields pitted to a frosted condition and cars sandblasted to a bright metal finish. While it was impossible to locate the highway around the sandstorm area, several precautionary methods were provided in minimizing the influence of the sand on traffic.

While the sand blows across the existing road at an angle, the location chosen is such that the prevailing winds are parallel to the new centerline. The volume of sand crossing the road is, therefore, expected to be a minimum. The grade line was raised so that profile grade is four to six feet above the surrounding countryside. This insurance against the accumulation of sand on the highway has long been known to engineers familiar with the problem of drifting snow or sand. The high grade line has the further advantage that the larger particles of sand cannot be lifted above the desert floor to roadbed elevation. It is these larger particles that effectively sandblast passing cars, and while visibility on top of the fill may be impaired, the dust should be rela-



The oasis of Thousand Palms is in sharp contrast to the arid wasteland surrounding it

tively harmless to exterior finishes. As a final guard against sand damage, the median and all embankments from the toe of slope to the edge of pavement will be covered with a gravel blanket, for which the specifications permit 100 percent passing the 3-inch sieve and 25-35 percent passing the No. 4 sieve. Engineers anticipate closure of the road will be rare and that maintenance expenditures will be at a minimum, all at the relatively small cost of 88 cents per ton for 150,000 tons of gravel material.

Future Project

A future District XI project will cover the 11 miles between the south end of the current contract at Thousand Palms and Indio. It is at the oasis of Thousand Palms that the traveler heading east from the coastal plain, having entered the Colorado Desert through the San Gorgonio Pass, first discovers the great fertility of this region. Vineyards, date palm groves, and grapefruit trees with their cool green verdure are in sharp contrast with the surrounding desert. With the importation of Colorado River water

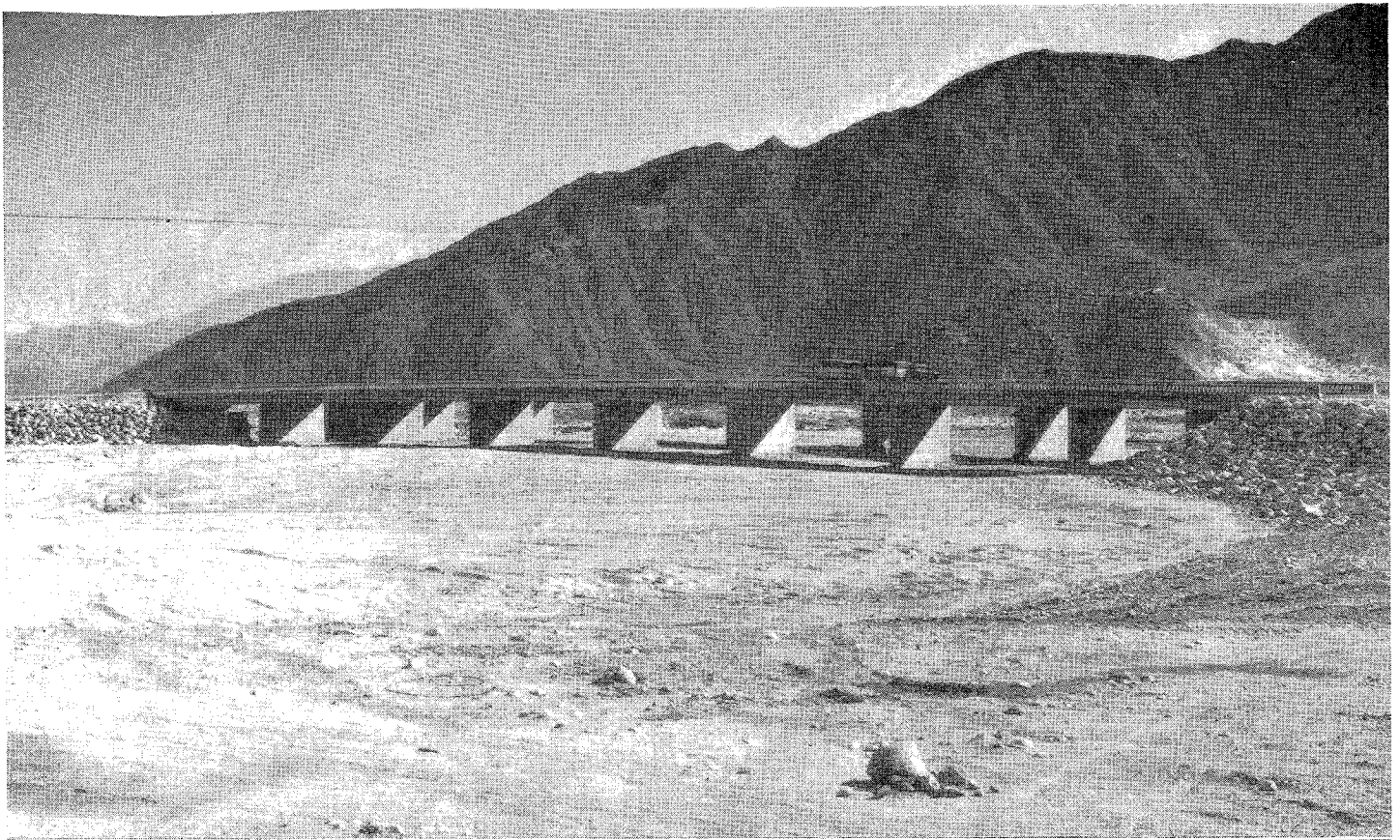
through the great All-American canal, the Coachella and Imperial Valleys of the Colorado Desert have become vast agricultural productive centers.

As a result, thousands of trucks pound up and down US 99, 24 hours a day throughout the year. Twenty-five percent of the traffic on this road is composed of trucks, and the pavement and base of the current contract are designed to support 22 million 5,000-pounds equivalent wheel load repetitions during its initial 10 years of service. Although the native material is of excellent quality and in most cases will support substantial traffic with only a light road oil treatment, eight inches of cement-treated base and four inches of plant-mixed surfacing are needed on top of the basement soil to withstand the incessant pounding to which this highway is subjected.

Coachella Valley

The Coachella Valley derives its name from the misspelling of the Spanish word "Conchella," meaning little shells. The area was once an arm of the Gulf of California and later a great inland lake, and remains of aquatic life are numerous. The Washingtonia palms found at the oases in the foothills along the San Andreas Fault are believed to be the remains of what was once a tremendous palm forest. Date palms were imported from North Africa and the Middle East about the turn of the century, and today nearly all commercial dates produced in the United States are grown in the Coachella Valley.

Although this project traverses 14 miles of arid waste land, six pairs of bridges are to be constructed across various desert washes. To the tourist unfamiliar with the torrential rains that occur in this desert in the late summer and early fall, these bridges must present a strange picture. The average rainfall is only about three



UPPER: Recently completed bridges across Whitewater River. Although the channel in this February scene is dry and dusty, a peak discharge of 42,000 cubic feet per second was recorded at this site in the March, 1938, flood. LOWER: Looking south from the vicinity of Whitewater toward Coachella Valley. Recently completed construction in foreground. Palm Springs in center background beyond Whitewater River.

inches per year, but in nearby Imperial almost four inches of rain have been recorded in less than one hour at the height of a cloudburst.

Roadway Embankment

An interesting feature of this contract is the payment of 780,000 cubic yards of roadway embankment in place rather than the usual method of payment in excavation. This change in normal procedure was adopted for various reasons. Most of the embankment is to be obtained from side borrow areas, and there is a distinct possibility that these borrow pits will fill in during a severe sandstorm before they can be cross-sectioned and measured. Unless the embankments are quickly covered with gravel blanket and cement-treated base, it is also possible that several inches from the top of the fill may blow away in a sandstorm. It will be to the contractor's advantage to keep construction of the fill and blanket close together to minimize the probability of losing many thousands of cubic yards of fill material.

Rainfall is so rare that there are few well-defined drainage channels. The side borrow ditches, while they are expected to fill with sand to some extent, will serve for the purpose of collecting, ponding, and distributing the flash runoffs that occur during summer thunderstorms.

Heavy Excavation

In addition to the roadway embankment, there is also an item of over 300,000 cubic yards of roadway excavation, making a total of well over a million cubic yards of earthwork. Including the gravel blanket, over a half million tons of processed aggregates will be required for base, pavement, and structures, together with a quarter million sacks of cement. If all the asphalt required were to be delivered in a continuous operation, the convoy of tank trucks and trailers would be 20 miles in length, assuming a minimum legal spacing of 200 feet.

This project is a continuation of two contracts recently completed by Basich Brothers Construction Company at a cost of nearly \$1,500,000 for

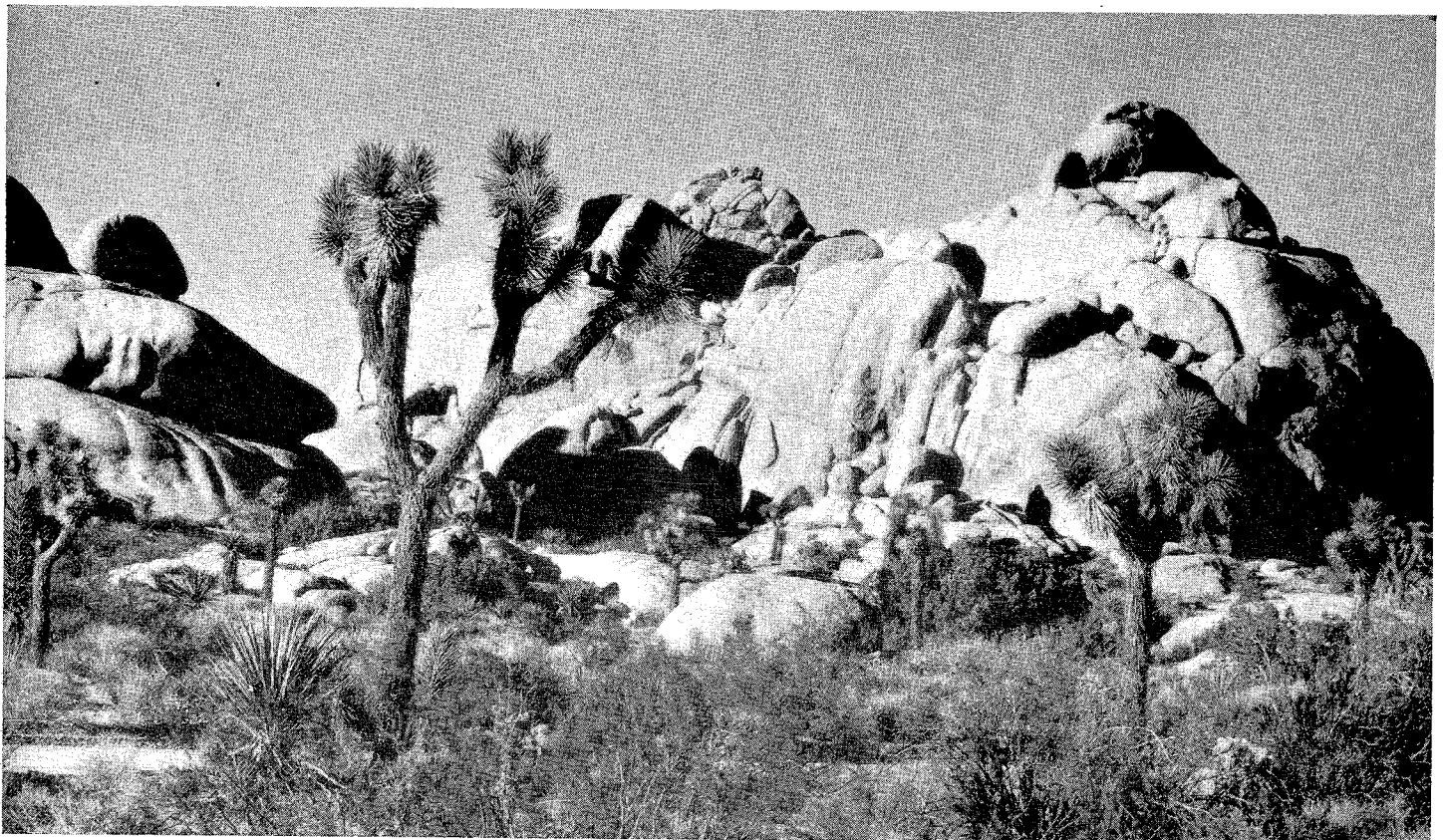
6.2 miles between the junction of US 99 with SSR 111 and a point 2.3 miles west of Garnet. Three resident engineers in succession represented the State on these projects, W. H. Crawford, E. A. Bannister, and T. M. Borman. As a part of the second of these two contracts, the intersection with the highway to Twentynine Palms was channelized.

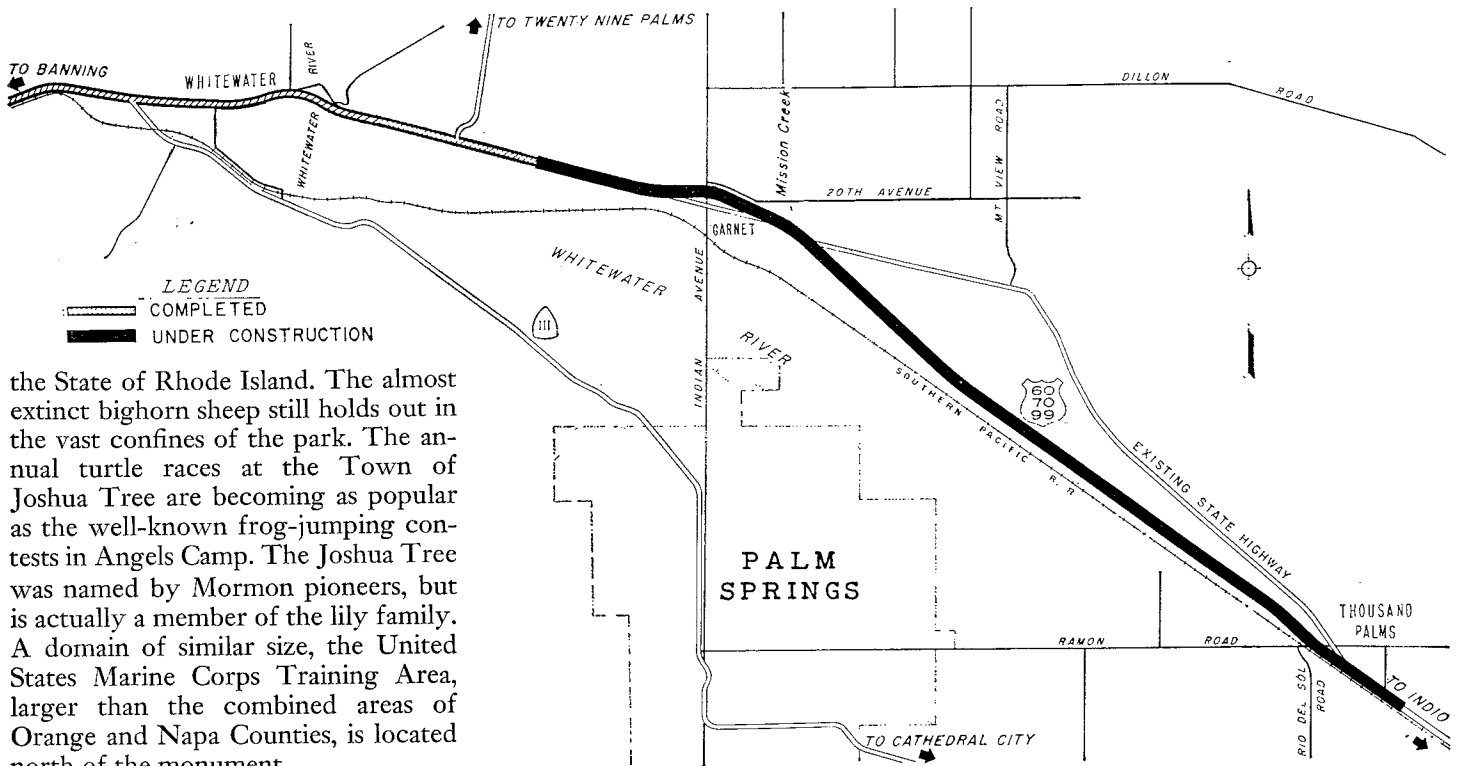
Rapid Development

Only 19 of the 29 palms discovered by Col. Henry Washington in 1855 remain today. While Col. Washington would no doubt recognize the palm trees named in his honor, he would certainly blink his eyes at the tremendous development of this high desert area. Several thriving communities have sprung up in this once isolated desert valley, now only a few hours from the great metropolitan centers of Southern California by modern highway transportation.

The Twentynine Palms Road also leads to the entrance to Joshua Tree National Monument, a desert wonderland of 1,300 square miles, larger than

This formation in Joshua Tree National Monument is known as Giant Rock, and is estimated to weigh about 100,000 tons





the State of Rhode Island. The almost extinct bighorn sheep still holds out in the vast confines of the park. The annual turtle races at the Town of Joshua Tree are becoming as popular as the well-known frog-jumping contests in Angels Camp. The Joshua Tree was named by Mormon pioneers, but is actually a member of the lily family. A domain of similar size, the United States Marine Corps Training Area, larger than the combined areas of Orange and Napa Counties, is located north of the monument.

San Gorgonio Pass

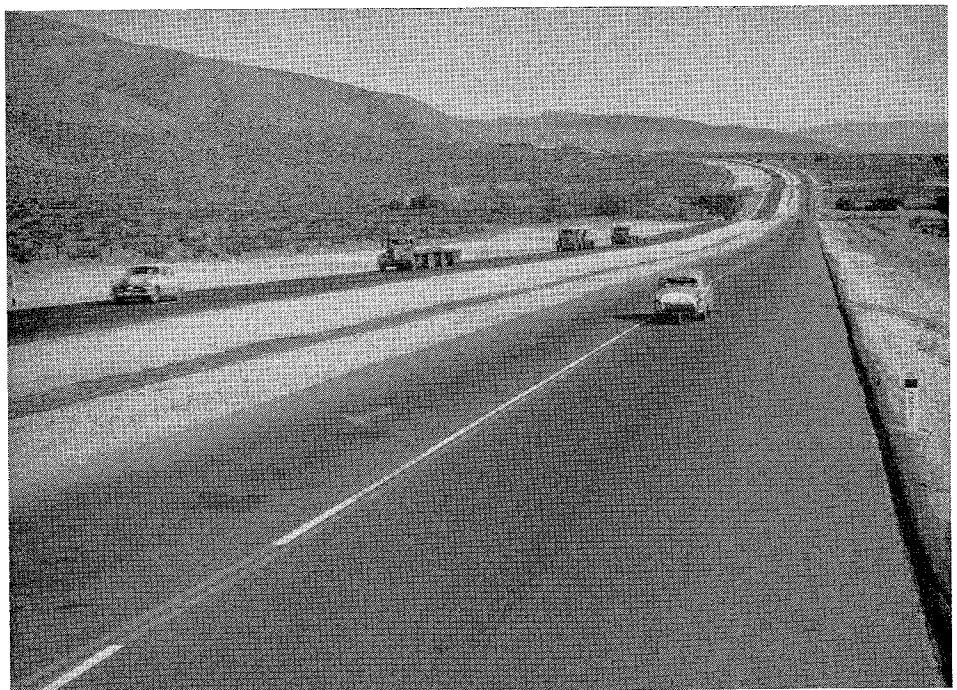
From the Coachella Valley, the highway climbs gradually into the San Gorgonio Pass between the San Jacinto Mountains on the south and west and the San Bernardino Mountains on the north and east. An amount of \$280,000 has been earmarked in the 1954-55 Fiscal Year construction budget for building the grade separations for the freeway through Banning a few miles east of the summit of the pass. Elimination of this bottleneck, as well as the narrow winding "roller coaster" between Garnet and Thousand Palms, will be welcomed by the thousands who travel this major transcontinental highway. Certainly a sigh of relief will be heard from the 35,000 motorists who crawled through Banning's two-lane city street on a recent peak Sunday.

Upon completion of these projects, all the 37 miles of US 99 in District VIII's portion of Riverside County will be four lanes, although there is as yet no access control through Beaumont and Cabazon. A freeway location bypassing Cabazon has been adopted by the California Highway Commission, and studies are currently under way through Beaumont.

Authorities on the subject of high-transportation economics have

estimated savings as high as 4 cents per mile for the motorist traveling on a freeway compared to congested city streets. Even if the average saving on these 37 miles is only one-fourth of that amount, the impressive total of

\$2,000,000 per year is accumulated. As future traffic increases, this annual total savings will become even greater, proving once again that the motorist pays for freeways whether he has them or not.



UPPER: Intersection of US 99 and road to Twentynine Palms and Joshua Tree National Monument has been channelized as shown here in the latest contract completed. Snow-capped Mt. San Jacinto, elevation 10,831, in background. LOWER: Note heavy trucks pulling upgrade from Coachella Valley into San Gorgonio Pass. Before completion of this four-lane section, each truck would have been trailed by five to twenty passenger cars.

Retirements *from* Service

Helen F. Randolph

Mrs. Helen Frances Randolph, Supervising Stenographer-clerk with the Division of Highways, Office Engineer Department, officially resigned on July 21st, after over 31 years of continuous service with the State of California. A party honoring Mrs. Randolph was held on July 2d at the Capitol Inn.



HELEN FRANCES RANDOLPH

Born in Sacramento on August 8, 1903, as Helen Sullivan she received her education in the local schools and, after working as a legal stenographer in a law office, went to work in the State Department of Agriculture as a junior stenographer in January, 1923.

Her next position was as an intermediate stenographer with the Department of Finance, where she worked from November, 1923 to January, 1927.

In 1927, when Governor C. C. Young took office, the Finance Department loaned Helen to the Governor's Office. Within a few months, Governor Young decided he needed Helen's services permanently and requested she be transferred to his office. After working as secretary for the Governor's two secretaries for the next three years, Mrs. Randolph transferred to the Adjutant General's Office. It was here that she received her rating of senior stenographer.

But Helen had not yet found the office where she really wanted to settle down, and so in February, 1931, she went to work with the Division of Highways in the office engineer's department.

In June, 1933, she took over the duties of supervisor in the office engineer's department. Mrs. Randolph has seen her stenographic unit grow from

James B. Woodson

The organization for the construction of the California State Highway System began on January 1, 1912. Upon that momentous occasion, seven men took office under Austin B. Fletcher, the first Highway Engineer, who had been appointed by Governor Hiram Johnson. These seven men took their respective assignments in the then seven divisions (later districts) throughout the State.



JAMES B. WOODSON

Jim Woodson had charge of the Fresno Division VI which comprised nine counties, being seven in the San Joaquin Valley and Inyo, Mono and part of Kern east of the Sierra. The first Division VI headquarters consisted of a single apartment in the Old Forsythe Building in Fresno. Woodson's office was the kitchen. The bedroom was the drafting department, and the bathroom was the blueprint laboratory. In those early days, the Division Engineer had more duties than he has now, 42½ years later. He not only handled the reconnaissance, the location, the rights of way, the construction, the bridges and the maintenance, but also personally sold the bonds, as the original \$18,000,000 bond issue carried only a 4 percent

... Continued on page 64

10 employees to its present 21, and has hired and trained over 300 women employees during the intervening years.

Helen married Tipton W. Randolph in November, 1933. She intends to travel with her husband who is also retired. They hope to visit some of the places of interest they have heard so much about, and also do a little fishing, golfing, and hunting along the way.

Harold H. Hill

Harold H. Hill, associate right-of-way agent with District III, Division of Highways, retired July 31, 1954, after 12 years of state service.

Harold has always claimed to be a native of the rugged eastern state of Vermont, but research developed the fact that his parents lived in Arizona, and were merely visiting in Waitsfield, Vermont, when Harold was born July 28, 1896. His parents returned to the West Coast soon after the happy event and Harold's early life was spent around the Los Angeles area.



HAROLD H. HILL

World War I interrupted Harold's career. He was not lucky enough to be sent overseas, and was in OCS when the armistice was signed. He was rather foot-loose in the early days and there is hardly a place on the Pacific Coast that he has not worked, nor any job he hasn't tried. In the early 20's he ran a tire shop in Sacramento and was probably responsible for many of the flat tires prevalent at that time. His wanderings were somewhat curtailed in 1925 when he married Miss Claire Mahan of Virginia.

From 1936 to 1938 Hill worked as title searcher for the County of Los Angeles, and from 1938 to 1942 as title searcher for Department of Water and Power of Los Angeles.

In May, 1942, Harold started as assistant right-of-way agent at Marysville, California, where he continued until his retirement.

Harold is a member of Jordan Lodge, F. & A. M., Los Angeles, Ben Ali Shrine and the York and Scottish Rite bodies.

Harold and Claire Hill intend to remain in Marysville.

Cost Index

Continued from page 43 . . .

Index at 212.3 for the first quarter of 1954 continues, on a national basis, to follow closely the California Index. The Engineering News-Record Index, which includes all classes of construction on a nation-wide basis, continued during the second quarter its gradual rise, from 253.9 to 255.8 (0.7 percent). The large percentage of building construction included in this Index is apparently responsible for the differences between it and the two road construction cost indexes.

As stated previously, it is now believed that highway construction costs in California will continue to decline during the next three to six months until a balance is reached between the factors of increased labor costs and the present keen competition among contractors, at which time an upward trend may be expected.

Highway Progress

Continued from page 4 . . .

must be accommodated. A careful inventory has been made of these needs and plans are under way to convert our present highway system into a fully adequate one.

How rapidly this can be accomplished depends to a large degree on the amount of money available for construction. Under the present law there will be a decrease on July 1, 1955, of one-half cent per gallon in the state tax on gasoline and diesel fuel and a corresponding reduction in the other highway user taxes. It should be recognized that this will result in an appreciable slowdown in our present rapid construction pace. This reduction in available construction funds is estimated to be in excess of \$25,000,000 per year.

CHIEF JUSTICE WRITES

Chambers of The Chief Justice
SUPREME COURT OF THE UNITED STATES
Washington, D. C.

MR. KENNETH C. ADAMS, *Editor*

Thanks very much for seeing that I receive a copy of *California Highways and Public Works*.

I always have enjoyed this magazine very much, and now it serves as a link with the past. It is good of you to take care of it for me.

With best wishes,

Sincerely,

(Signed) EARL WARREN

Governor Knight has announced that it is his intention, in the coming months, to ascertain the desires of the people of California with regard to the continuance of present highway user taxes in order that he may make appropriate recommendations to the 1955 Session of the Legislature on this vital question.

CALIFORNIA DIVISION OF HIGHWAYS—AVERAGE CONTRACT PRICES

	Roadway excavation, per cu. yd.	Crusher run base, per ton	Plant-mix surfacing, per ton	Asphalt concrete pavement, per ton	PCC pavement, per cu. yd.	PCC structures, per cu. yd.	Bar-reinforcing steel, per lb.	Structural steel, per lb.
1940	\$0.22	\$1.54	\$2.19	\$2.97	\$7.68	\$18.33	\$0.040	\$0.083
1941	0.26	2.31	2.84	3.18	7.54	23.31	0.053	0.107
1942	0.35	2.81	4.02	4.16	9.62	29.48	0.073	0.103
1943	0.42	2.26	3.71	4.76	11.48	31.76	0.059	0.080
1944	0.50	2.45	4.10	4.50	10.46	31.99	0.054	0.132
1945	0.51	2.42	4.20	4.88	10.90	37.20	0.059	0.102
1946	0.41	2.45	4.00	4.68	9.48	37.38	0.060	0.099
1947	0.46	2.42	4.32	5.38	12.38	48.44	0.080	0.138
1948	0.55	2.43	4.30	5.38	13.04	49.86	0.092	0.126
1949	0.49	2.67	4.67	4.64	12.28	48.67	0.096	0.117
1st quarter 1950	0.34	2.22	3.65	3.74	—	40.15	0.077	0.081
2d quarter 1950	0.40	2.13	4.48	3.74	10.86	43.03	0.080	0.105
3d quarter 1950	0.41	2.32	4.25	5.50	10.91	44.34	0.093	0.131
4th quarter 1950	0.42	2.81	4.64	4.61	12.55	43.18	0.098	0.120
1st quarter 1951	0.45	3.07	4.06	5.22	11.71	46.38	0.103	0.206
2d quarter 1951	0.63	3.88	4.56	4.63	12.93	51.50	0.105	0.166
3d quarter 1951	0.56	2.88	4.59	3.90	12.41	46.14	0.107	0.165
4th quarter 1951	0.66	2.91	5.66	4.89	12.71	49.38	0.105	0.169
1st quarter 1952	0.56	3.25	4.88	4.77	14.25	47.46	0.094	0.152
2d quarter 1952	0.53	3.19	5.29	4.13	14.20	49.12	0.091	0.143
3d quarter 1952	0.55	2.61	5.49	4.60	12.80	48.21	0.094	0.132
4th quarter 1952	0.66	2.68	4.97	—	12.53	48.45	0.094	0.128
1st quarter 1953	0.45	2.48*	5.27	4.46	12.47	53.19	0.098	0.150
2d quarter 1953	0.50	2.07	5.38	4.59	13.06	52.68	0.091	0.132
3d quarter 1953	0.54	2.15	5.30	4.82	13.78	49.23	0.092	0.129
4th quarter 1953	0.48	2.11	4.74	4.47	14.77	53.41	0.105	0.139
1st quarter 1954	0.45	2.28	4.23	4.78	14.89	47.52	0.092	0.126
2d quarter 1954	0.38	2.09	4.29	5.18	14.28	47.12	0.093	0.114

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

Long Beach Freeway

Continued from page 31 . . .

Centrally located on the project, between Olive Street north of Atlantic Boulevard and the Pacific Electric Railway tracks north of Rosecrans Avenue, the established location of the freeway is partially within the right-of-way area owned by the Los Angeles County Flood Control District. This position for the freeway cannot be occupied until the Los Angeles River channel has been reconstructed to final location, grade and cross section. The utilization of this portion of the county's right of way for the Harbor Freeway was first suggested by representatives of the Los Angeles County Flood Control District and has resulted in very substantial savings to the State in right-of-way costs. In connection with construction contracts carried out by the City of Long Beach and the Los Angeles County Flood Control District that have contained items of work which provide construction essential to the development of the freeway, cooperative agreements have been worked out covering the split in the financing so that the State would pay its proportionate share of the work being done directly to further freeway construction.

In the negotiations carried out by the State Division of Highways with others in connection with the development of the Long Beach Freeway, excellent cooperation has been received not only from the City of Long Beach and the Los Angeles County Flood Control District, but also from various other departments of Los Angeles County, the Los Angeles City Bureau of Power and Light, the Cities of Maywood, Lynwood, South Gate and Compton, the Southern California Edison Company, the Standard Oil Company, the Richfield Oil Company, and the Los Angeles Junction Railway. Freeway plans have required extensive revisions in the trackage of the Los Angeles Junction Railway serving the East Los Angeles industrial area.

The original design of the Long Beach Freeway was predicated on a freeway agreement executed in 1948. The rapid development of the area between Del Amo Boulevard and Long

Beach Boulevard indicated the necessity for additional interchange facilities at Del Amo Boulevard. The proposal for additional facilities at this location has been approved by State Highway Engineer G. T. McCoy. However, until the bridge across the Los Angeles River has been raised, it will not be practical to provide additional traffic interchange facilities on the east side of the freeway. At the crossing with Pacific Coast Highway the U. S. Corps of Engineers proposes to raise the channel levees of the Los Angeles River approximately 10 feet. This will require the construction of a new bridge for Pacific Coast Highway across Los Angeles River, and will also require revisions of the easterly portion of the interchange system between Long Beach Freeway and Pacific Coast Highway that are now being designed.

Byron L. Green, Senior Highway Engineer, is in immediate charge of design work for the Long Beach Freeway.

Right of Way

By L. P. FRIEL, Senior Right of Way Agent

The necessary right of way required for the construction of the Long Beach Freeway comprises approximately 1,100 parcels of real estate, a substantial portion of which is located in the heart of the Central Manufacturing District, one of the largest built-up heavy industrial areas in the State. The total estimated cost of right of way in connection therewith aggregates approximately \$17,000,000, and of the 1,100 parcels required, over 950 have so far been acquired by the District VII right of way staff.

These parcels include practically every conceivable type of property among which are oil refineries, brake-shoe companies, tractor and farm machinery equipment plants, lumber yards, junk yards, churches, schools, cemeteries, steel plants, oil wells, and even a quite substantial portion of the United States Air Corps depot.

Early state acquisition of right of way for the freeway in this area eliminated many industrial sites. The result of this scarcity, created by our own purchase was reflected in an in-

crease in market value of parcels remaining to be acquired.

Most of the right of way located in the industrial section necessitated the relocation of fantastic networks of railroad and utility facilities and it should be emphasized that this could only have been accomplished with the wholehearted support and cooperation which we received from all the railroads, various utility companies and from Los Angeles Flood Control District.

We are in the process of negotiating for the acquisition of approximately 150 parcels required for the ultimate completion of this freeway. Some of these remaining parcels are in the central manufacturing district, and in the Compton, Bell Gardens, and Lynwood areas.

Construction by City Of Long Beach

By JESS D. GILKERSON
City Engineer

The extension of the freeway southerly from Pacific Coast Highway (Route 60) in Long Beach merits special mention because it is one of the few cases where a local agency and not the State Division of Highways is financing a modern freeway. This condition, of course, results from the fact that the southerly terminus of the freeway (Route 167) as a state highway is Pacific Coast Highway.

The early completion of the freeway, which will ultimately provide for a high-speed through artery between Los Angeles and Long Beach, the two largest cities in Los Angeles County, is expected to have a terrific traffic impact at the southerly terminus of the freeway. In an attempt to devise an adequate means of distributing this traffic into our harbor and business districts, the city had a report on "Traffic Distributors in the Central Area" made for it in February, 1953, by The DeLeuw Cather & Company, Engineers, Chicago, Illinois. This study indicated the need for a separation in the major traffic movements into the business district east of the river from the harbor traffic by means of a diagonal bridge in the general vicinity of Ninth Street. It further contemplated a one-way street

system east of the Los Angeles River with added provision for two one-way bridges in the general vicinity of Broadway and Third Street over the Los Angeles River.

The general problem of construction is complicated by the active land subsidence in this area which has already resulted in seven feet of settlement in the vicinity of Ocean Boulevard and with an additional predicted ultimate subsidence of some 11 feet at this point.

To reduce the flood hazard created by land subsidence, the Army Engineers, in their major flood control improvement program, have just finished raising the levees approximately 13 feet south of Seventh Street. They also have under contract with Guy F. Atkinson Company a similar levee improvement program which includes raising the levees an almost comparable amount as far north as 20th Street. This levee raising has complicated, as well as increased costwise, the relocation of the utilities and construction of roadways and bridges in this entire area.

The following is a brief resume of the status of improvements undertaken by the city in connection with the freeway project:

The city on June 1, 1953, completed, with a temporary connection to Seventh Street, the section between Anaheim Street and Pacific Coast Highway, which section is open to traffic as a six-lane divided freeway. This section included approximately \$115,000 for purchase of rights of way, \$155,000 to Bodum Construction Company for paving improvements and approximately \$15,000 for safety lighting, as well as \$125,000 for storm drain pump station construction by Gardner & McCall.

The city, likewise, opened to traffic on July 31, 1953, the Anaheim Street Bridge over the flood control channel, a \$2,000,000 construction contract involving the Harbor Department of the City and Guy F. Atkinson Company. This project included a complete cloverleaf-type interchange with the Long Beach Freeway.

In March, 1953, work was started on the piers for the Ninth to Seventh

Street Bridge at an estimated cost of \$800,000. It is expected that the bridge proper and the approaches will ultimately cost \$6,500,000 for construction with more than an additional million dollars for rights of way. The acquisition of rights of way on the west side is virtually complete, and it is expected that construction on the west approach and bridge proper will be under way in October of this year. The target date for finishing the entire bridge, including the east approach, is January, 1957.

The present Seventh Street Bridge is scheduled for demolition by Guy F. Atkinson Company in January of 1955 under the Army Flood Control Program. The utilities presently carried on the Seventh Street span are to be reinstalled on a utility bridge currently under construction also by Guy F. Atkinson Company. Similarly, the Pacific Electric Railway will be relocated on a special railway trestle under construction just north of Third Street across the Los Angeles River. Vehicular traffic currently carried over the Seventh Street Bridge will have to be diverted to Anaheim Street and Broadway prior to completion of the Ninth Street structure.

The existing Ocean Boulevard Bridge was shifted downstream to Santa Cruz Avenue on May 29, 1953, at a cost of \$276,000 and is serving as a four-lane detour for the new Ocean Boulevard Bridge, also under construction. The piers, which were started in 1953, for this bridge should be finished in August, 1954, at a cost approximating \$700,000. Condemnation proceedings have already been instituted for acquisition of rights of way for the west approach to this new structure. It is hoped that acquisition will be completed so that bids for the construction of the bridge proper and approaches can be invited in January, 1955. The construction of this bridge, estimated to cost approximately \$7,500,000 including rights of way, is scheduled for a January 1, 1957, completion date.

Coincidentally with the construction of these bridges, the city has the problem of constructing a six-lane divided freeway along the west side of the river from Ninth Street south

into the harbor district in an area where the land must be raised from 12 to 15 feet. This artery, which is to serve the harbor, is estimated to cost in excess of \$6,000,000. Construction is expected to start in January of 1955 and probably will not be completed until 1958.

On the east side of the river, the terminal facilities for the freeway will be handled by the construction of the DeForest Avenue project from Ocean Boulevard to Seventh Street. The Ninth Street Bridge will terminate on the east side of the channel at Seventh Street in a rather elaborate three-level interchange. It is expected that the DeForest Avenue project, which will provide for an integration of the freeway traffic into a one-way street pattern of the intervening streets between Ocean Boulevard and Eighth Street, will cost approximately \$5,000,000. This construction, which will be financed in part by gasoline tax for major city streets and in the major part with tideland oil funds, is also scheduled for completion by January 1, 1957.

When one attempts to add up the figures in connection with this very expensive improvement program, the amount appears almost staggering. A major portion of this complex financing will be defrayed from Long Beach Harbor and General City funds. However, the Los Angeles County Flood Control District will participate in financing the replacement, in kind, of the bridges required to be reconstructed as a part of the Army Engineers' Flood Control Program.

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March-April, 1952, story by Paul O. Harding, Assistant State Highway Engineer. See page 11.

March-April, 1953, story by Paul O. Harding, Assistant State Highway Engineer. See page 15.

November-December, 1952, story by W. L. Fahey, District Engineer. See page 9.

July-August, 1953, story By E. T. Telford, District Engineer. See pages 17-23.

January-February, 1954, story by Paul O. Harding, Assistant State Highway Engineer. See page 14.

Safety Record

Continued from page 41 . . .

equal reactions, kinetic energy, etc., these fundamental factors of driving become more impressive to the operator. Even though drivers may not clearly understand the demonstration, and we try sincerely to make the demonstration as simple as possible so that it will be understood, a positive psychological impact is made.

Better Drivers

Having been exposed to these driver problems, we find that drivers are more alert to conditions of the road, use better judgment of motion or clearance of other vehicles or objects, give greater forethought to their driving and its possibilities and appreciate to a greater extent the hazards of following too closely or driving too fast for conditions.

The record of the year 1953 convinces us that the program sponsored by the Division Safety Committee is effective in that it is improving driving habits and attitudes of Division of Highways employees. The division committee believes that a continuation of this program will likewise continue to reduce vehicle accidents. The committee is composed of:

R. M. Gillis, Deputy State Highway Engineer and Chairman; G. F. Hellesoe, Maintenance Engineer; Victor R. Henley, Attorney; E. E. Sorenson, Principal Equipment Engineer; and Chas. E. Waite, Assistant State Highway Engineer. The author is Secretary of the Division Safety Committee. Carroll T. Berry is Field Representative for the Safety Section.

Harbor Freeway

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The two main features contributing to the rapid completion of the bridge construction were the utilization of prefabricated falsework bents and the use over and over again of interior box girder forms. All falsework bent units from 16 feet to 20 feet in length were constructed with heavy 10 x 10-inch timbers, each unit consisting of four posts about 12 feet in height, with heavy sill and double cap well-doweled, bolted and braced. Four 20-ton screw jacks were installed at the top on each post between the double caps in each falsework bent unit to facilitate adjustment to the proper grade. Upon completion of one bridge section, as was the case at Washington Boulevard, the entire deck was lowered on the jacks and falsework shifted on rollers into position for the next structure. A number of the above described falsework units were available to construct about one-half of the Figueroa Street structure.

Pouring girder stems and slabs was accomplished with bottom dump bucket and P & H truck crane using an 80-foot boom, working from the adjacent frame. Usually five days after pouring the girder stems and soffit slab of the box girder span, interior forms were unbolted, lifted out and spotted for the next section of girder stems in the adjacent bridge frame. This required careful coordination in placing falsework, decking and reinforcing steel for the girders.

Figueroa Street Structure

The cost of Figueroa Street structure approximates \$500,000, including the removal of 4,400 cubic yards of roadway excavation, 8,600 cubic yards of structure excavation and backfill, 5,600 cubic yards of structure concrete, 1,500 linear feet of rubber water-stop, 9,600 pounds of miscellaneous steel and 600 tons of bar reinforcing steel.

The freeway bridges and major structures on this contract were designed under general supervision of F. W. Panhorst, Assistant State Highway Engineer. On the contract, H. E. Belford is Resident Engineer and W. A. McIntyre is Bridge Department

Hawaiian Roads

Continued from page 33 . . .

better acquainted with the Navy's role in safeguarding national security. Guests were briefed each day on various phases of carrier operation and life aboard ship, and witnessed exhibitions of airplane maneuvering during daylight and blackout conditions, gunnery practice, and other carrier activities.

A similar program was arranged in connection with Naval and Marine installations on the Island of Oahu. The visit to Pearl Harbor included a trip to sea on the submarine *U.S.S. Sabalo*.

WOODSON RETIRES

Continued from page 60 . . .

rate, which at that time was not attractive to bond brokers. So in order to get construction going it was necessary to induce the counties to purchase large blocks by paying a half cent premium.

Among some of the major projects under Woodson's charge were the Yosemite All-Year Highway, Golden State Highway, Tejon Pass, Coalinga, Kern River, Eastern Sierra, and all county seat connections throughout the division.

Woodson has been Right of Way Agent at Bishop, District IX, and was later transferred to San Francisco, taking charge of Right of Way for District IV.

During periods on annual leave, Jim has traveled around the world and visited highways in Germany, England, Greece, Italy, France, Trans-Jordan, Egypt, Pakistan, India, Siam, Malaya, Hong Kong, Japan, Philippines, Sudan, Uganda, Kenya, Transvaal, Capetown, Tanganyika, South Africa, Belgian Congo, French Equatorial Africa, Portugal, Tahgier, Spanish Morocco and Spain. He has written a book entitled: *The Visa Circuit* which he says may or may not be any good.

representative. The prime contractor is the Oberg Bros. Construction Company of Inglewood, with Oscar Krin-glen the general construction superintendent.

GOODWIN J. KNIGHT

Governor of California

FRANK B. DURKEE . . . Director of Public Works

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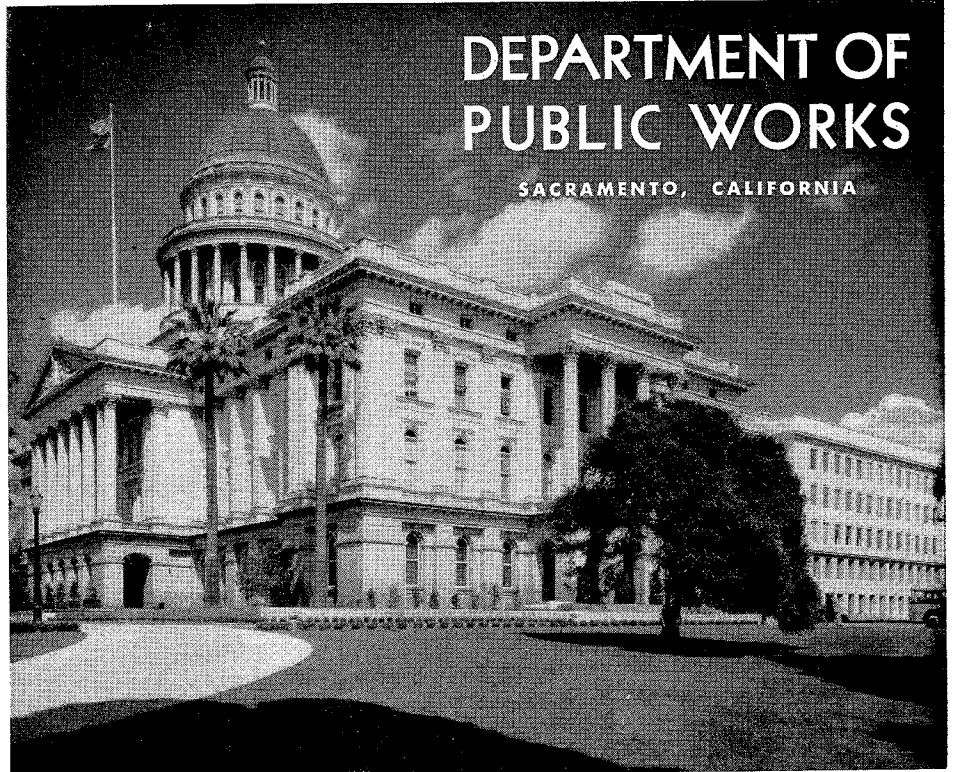
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Please...be careful!



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FOREST
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- **BREAK YOUR MATCHES**
- **CRUSH YOUR SMOKES**
- **DROWN YOUR CAMPFIRES**
- **BE CAREFUL WITH ANY FIRE!**

Thanks, SMOKEY