Bridge-Maintenance Practice (California)

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THE importance of the proper maintenance of bridges and highways has been recognized, but the procedure has varied widely. In the case of bridge maintenance, several systems of administration are in successful operation. The purpose of this paper is to describe the administration of the maintenance of bridges on the California State Highway System and to outline some of the many problems encountered.

● BRIDGE maintenance administration depends on the size of the territory covered and the number of bridges involved.

The State of California is 1,000 mi. long and 250 mi. wide and extends from the Mexican border to the Oregon state line and from the Pacific Ocean to the Nevada and Arizona state lines. The administration of California highways is delegated to 11 highway districts, each with its district engineer and other administrative officers. The district maintenance engineer is one of these administrative officers.

In 1927 when the first complete highway bridge survey was made, there were 1,500 structures on the 6,000 mi. in the state's highway system and their upkeep and repair was the responsibility of each respective district.

In 1931 and 1933 about 7,000 mi. of county roads were added to the California State Highway System and the 2,000 more bridges thus added pointed to the need for a special unit to be responsible for the proper maintenance of state highway bridges. Thus the organization, now known as the Bridge Maintenance Section of the Bridge Department, was formed in September 1933. The Bridge Department is a headquarters department located in Sacramento, the state capital.

ORGANIZATION

The unit consists of a section chief, a chief deputy, and seven civil engineers, who are assigned territories of one or more districts for the purpose of properly maintaining the bridges therein. Suboffices are located at Fresno, at the center of the state, and at Los Angeles, in the southern part of the state, to handle districts in the southern area. The remainder of the territory is covered from the Sacramento office. The bridge maintenance engineers are aided by five more engineer assistants plus a bridge designer. A civil engineer is assigned to the problems of painting steel structures. He is responsible for the systematic painting of existing structures and choice of paint for new structures. Two clerks in the Sacramento office complete the organization. All personnel responsible for bridge maintenance are licensed civil engineers.

The Bridge Maintenance Section cares for 4,850 state highway bridges. Three state-owned toll bridges on San Francisco Bay are maintained by another unit of the Bridge Department.

In the Bridge Department Organization Chart the section reports to the principal bridge engineer, operations, who, in turn, reports to the assistant state highway engineer, bridges. There is liaison between the section and the state highway maintenance engineer who is under the assistant state highway engineer, operations.

VARIETY OF NATURAL AND STRUCTURAL CONDITIONS

The 14,000-mi. highway system traverses a wide variety of topography, varying from the desert regions of Southern California to the mountainous sections in the north, from the green lands of the coast to the dry areas of the interior. Likewise, there are great variations in temperature in the inland valleys while they are fairly moderate on the coast.

Each area produces its own peculiar problems: frost action on concrete structures in the High Sierras; weakening of substandard bridges by heavy log and lumber loads in Northern California; traffic accidents on

timber bridges resulting from monotonously straight desert roads in Southern California; disintegration of paint and spalling of concrete due to reinforcing bar rust at bridges close to the sea coast; movement of piers on slide planes in areas of heavy rainfall; washing out of bridges by high water resulting from "unusual" weather conditions.

The concentration of structures also varies widely. In one mountainous county in the High Sierras there are only 20 bridges on the state highways while across the Southern California desert on a 160-mi. stretch of US 66 there are 160 timber trestle bridges. In metropolitan Los Angeles there are 36 main-line structures on one 6-mi. section of the Hollywood Freeway.

Although most bridges being built at present are of concrete or steel, there are still many timber structures left in the system. The principal types as of June 30, 1952: concrete or masonry, 2,953 having 292,303 lineal ft.; steel, 596 of 317,312 lineal ft.; and timber, 960, of 81,552 ft.

METHOD OF INITIATING REPAIRS OR IMPROVEMENTS

An original inspection report has been prepared for each bridge on the state's highway system. Each bridge is examined annually by engineers from the section and at more frequent intervals by local maintenance men. A supplementary bridge report is written for following inspections: If work is required on the bridge, it is recommended in the supplementary report. If the work required is of a minor nature, the report contains detailed instructions for its performance or refers to some standard methods previously established. If the work is sizeable or different, design calculations are made and a working drawing prepared to accompany the report.

The original bridge report contains the bridge name, number, location by county, route and section, and bridge log mile, number and length of spans, type, width, clearance diagram, a brief history, by whom built, date, designer, condition of stream bed and other pertinent data. The supplementary bridge reports contain only bridge name, number and location, referring to the original for other basic data. The engineer, however, notes in each the condition, or change in condition, of the various elements of the structure. Repairs, strengthening, improvement, or replacement as required are outlined under the engineer's recommendations.

The number of reports prepared at one time by the engineer depends on the extent of

BRIDGE NO.....
Sheet 1

BRIDGE REPORT

Date of Investigation.....

GENERAL DESCRIPTION

Name.....
Dist.-Co.-Rt.-Sec.

Location.....

Description.....

.....

.....

.....Approximate skew.....

Spans.....

.....Total length.....

Roadway width...between.....Sidewalks....

Alignment.....

Width.....

Standard of design.....

Waterway.....

.....

Vertical clearance.....under.....(See diagram)

HISTORY

Date built.....By.....Contract No.....

Designed by.....

Plans.....

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REMARKS

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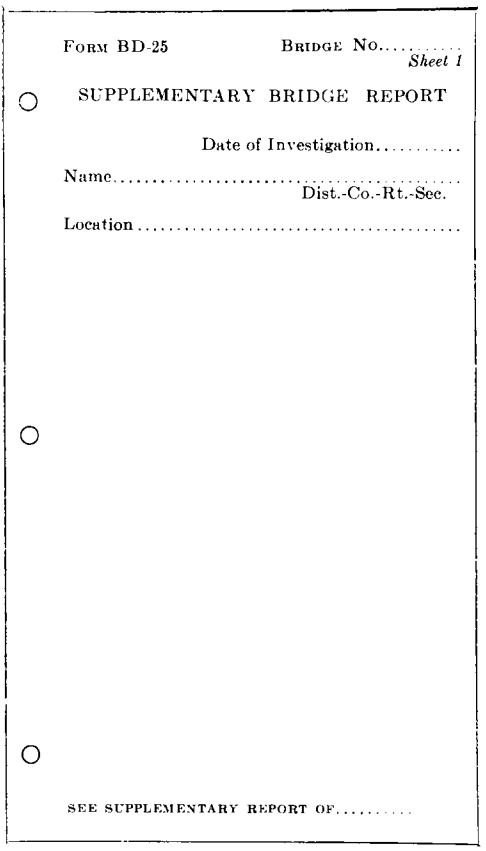
FORM BD-23

his field trips and the condition of the bridges examined. If no work is required and no change in condition is observed, the previous report is rubber stamped with a notation of date and condition filled in. Each engineer keeps a set of 3- by 5-in. cards in a portable file, which he takes on the trip with him and which contains basic historical data on each

bridge along the route, together with its background of condition and repairs.

Copies of bridge reports are made for Headquarters Maintenance Department and the District Maintenance Department. They are assembled in groups and forwarded to the highway maintenance engineer, who sends them on to the appropriate district office with



FORM BD-25 BRIDGE NO.....
Sheet 1

SUPPLEMENTARY BRIDGE REPORT

Date of Investigation.....

Name.....
Dist.-Co.-Rt.-Sec.

Location.....

SEE SUPPLEMENTARY REPORT OF.....

his comments relative to prosecution of the recommended work and financing.

If the maintenance work costs less than $500, district forces may proceed with the job under blanket authorization. However, if it costs more than $500 or is in the nature of an improvement, they next must submit a work order request to headquarters to finance it. After financing is cleared, the district maintenance engineer transmits the reports to the appropriate maintenance superintendent for processing.

If the repair or improvement is of a magnitude that day-labor forces cannot undertake, the bridge report is prepared and forwarded through the channels described above but in less detail; a copy is turned over to the office engineer and advance planning engineer in the Bridge Department for them to initiate the job as a contract project. They arrange the financing either from maintenance or construction funds and assign it to the Design Section of the Bridge Department for preparation of plans and specifications. Once a contract is let, the Construction Section administers the work.

RELATION TO HIGHWAY-MAINTENANCE FORCES

Engineers of the Bridge Maintenance Section are responsible for all structures in the district assigned to them. They keep in close contact with district maintenance engineers and their superintendents regarding bridge conditions in these areas. In addition to the annual inspection, they examine the poorer bridges oftener, depending on their condition. Besides these investigations, the maintenance superintendent inspects all structures in his territory at least once each three months and his maintenance foreman in turn examines those in his area at least each month.

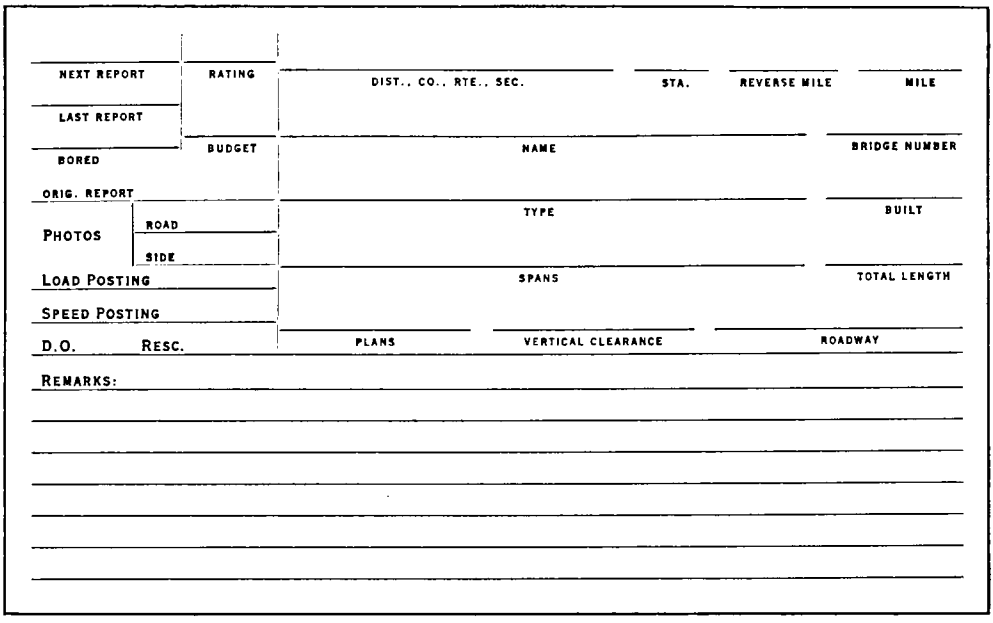
Any serious defects noted by district maintenance men of a nature to endanger traffic or the structure itself, are reported to headquarters office. If an emergency exists, steps are taken immediately to protect traffic, either by closing the bridge or shoring it up. The section engineer leaves for the bridge site at once and prepares details and makes recommendations for the repair or for the posting of the bridge.

All districts are not staffed with full-time bridge crews, only 5 of the 11 districts being so organized. District I, at the northwest corner of the state, employs two full-time bridge crews to handle the tough maintenance problems in this area. Regular road maintenance crews handle the work in the remaining four districts. Before writing reports, district maintenance engineers and superintendents are often consulted to arrive at the most suitable method of repair.

The installation of two-way FM radio in the principal equipment of the Maintenance Department was started a number of years ago and is now about complete for all districts.

Vehicles of the Bridge Maintenance Section are similarly equipped, and this has greatly improved communications with engineers while on field trips. The radio system has been particularly valuable during the winter season.

The active maintenance forces in all districts total about 2,600. The annual cost of state highway maintenance has been about $23 million, of which $1 million is for bridge maintenance. These figures do not include any charges from the state-owned toll bridges on San Francisco Bay.



EXAMPLES OF MAINTENANCE PROBLEMS

Paint

The rusting of structural-steel bridges close to the Pacific Ocean and along inland waters has become critical in some cases, and an engineer was assigned to the Bridge Maintenance Section 3 yr. ago to devote full time to the paint problem. Several different types of paint and methods of application have been tried, but to date the basic red-lead paint has been most successful. The key to the trouble appears to be the proper preparation of surfaces in damp atmospheres subject to fog or ocean spray. California hopes to obtain some answers on paint service life from an experimental job just completed at Leffingwell Creek on the central California Coast just north of Cambria. A number of different paints and various methods of application were used, including complete housing of the steel members during painting operations.

Timber

Six timber arches and 39 timber trusses remain on the state highway system. Their ages vary from 15 to 35 yr. Many are located over deep canyons, which make replacement of individual members very difficult. While much of the trouble is due to decay, brittleness of the stress-carrying timbers from fatigue has resulted in failure of lower chords which are otherwise in good shape. To overcome this dangerous condition California has, in the last few years, supplemented timber lower chords with steel I bars, either welding them to metal shoes at panel points or keying them to the timber at strategic locations.

Concrete

In the High Sierras considerable trouble has been experienced with frost action, particularly on concrete rails and curbs, on bridges over 20 yr. old. A number of different pro-

tective coatings have been tried for the past 8 yr. Some of the experiments have been a failure, and we are forced to completely replace disintegrated curbs and rails. We have been most successful in the case of members not too far gone with a double application of latex asphalt; this material is sprayed on and, in effect, seals the concrete completely from the elements. An aluminum-colored finish provides an acceptable cover.

Steel

Of the 178 steel trusses within the highway system, many are old and of light design. Some were posted for restricted loadings when taken over from the counties, but the increased demands of traffic are making these light bridges totally inadequate. At the same time, finances are not always available for their complete replacement. Sometimes temporary strengthening is done by day labor, welding additional members along the weak side of chords, adding plates or hog-rodding floor beams, or by placing additional lines of stringers under the deck. Many additional years of life have been given to old structures in this manner.

Surfacing and Deck

Occasionally we find a concrete deck which has developed serious transverse and longitudinal cracks; when they are numerous and large, a remedy is necessary for the protection of the reinforcing steel against the elements. A recent case on an old swing bridge also required that this protection not add greatly to the dead load. A latex-asphalt emulsion was sprayed over the deck and a light course of screenings applied as a wearing surface. The cracks in the concrete have been bridged completely and are not visible. This material sticks much better to concrete than an asphaltic seal and total thickness is less than $\frac{3}{16}$ in., thus satisfying the weight requirement.

Where cracked concrete decks have disintegrated to the extent of spalling, it has been found beneficial to blanket the entire roadway with dense graded asphaltic surfacing ranging in thickness from 1 to 2 in.

REPLACEMENT OF STRUCTURALLY-CRITICAL BRIDGES

The tentative scheduling of highway and bridge construction projects by the California Division of Highways is set up by means of a 5-yr. planning program, which is developed on the priority of each project balanced against the available funds. When a bridge maintenance engineer, as a result of his continued investigation, has decided that a certain bridge will reach the end of its economic or structural service life within the forthcoming 5 yr., he calls attention to this information in a bridge report and recommends the fiscal year for replacement of the bridge. The Bridge Department's office engineer, from such reports, makes up a critical bridge replacement program for the forthcoming 5-yr. period, noting all those bridges recommended for replacement by bridge maintenance engineers. This program is then forwarded to each district engineer and to the headquarters planning engineer for incorporation into the overall program.

Bridge No.....Date.....

Name.....Rating.....

Route.....Sta.....

.....Miles.....of.....

Total Length.....Roadway.....

Spans.....

Superstructure.....

Substructure.....

Standard of Design.....Capacity.....

Built.....Calculations.....

Plans.....Photos.....

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FORM BD-52
See reverse side for additional data and information

Because of the many desirable highway improvements and the shortage of funds, the Bridge Maintenance Section has been placed

under considerable burden to provide substantial facts concerning the condition of each critical bridge so that there will be no doubt of the need for its replacement. Thus we are having to make our investigations very thorough and also to extend the service life of each bridge to the maximum. As a result, maintenance emergencies sometimes occur while a new bridge is under construction, thus demonstrating how precarious the stretching of life has become.

Bridge Number	Name or Description	Dist.	Co.	Rte.	Sect.	Structure Type or P.U.C. Number	Bridge Log Mile	Length	Protection	Width	Div.	Sd. Walks No.	Sd. Walks Tot. Wid.	Vert. Clear.	Cap.	Year Built
12 56	Big But Cr Oflw	3	But	45	A	SS	0 60	121		24					2	43
12 55	Dry Creek	3	But	45	A	CG	1 40	42		20					5	19
12 42	Cherokee Can	3	But	45	A	TS	6 70	422		19					5	19
12 41	Rice Canal	3	But	45	A	CG	7 00	30		20					5	
12 98	N Biggs Gr Xing	3	But	45	A	C 165 2	7 40	1	X							
12 110	Tule Canal	3	But	45	A	CG CSC	7 95	16		26					4	19
12 40	Biggs Ext Canal	3	But	45	A	CSC	8 10	48		26					1	51
	Jct Rte 3	3	But	45	A		9 70									
12 54	Sacto River	3	But	47	A	STT	0 00	580		19				14 7	5	08
	Glenn Co Line	3	But	47	A		0 00									
12 53	Pine Cr Lagoon	3	But	47	A	CG	1 40	101		21					4	21
12 52	Pine Cr Oflw	3	But	47	A	CSC	1 60	121		26					1	43
12 51	Pine Cr Oflw	3	But	47	A	CSC	1 70	121		26					1	43
12 50	Kusal Slough	3	But	47	A	CG	1 90	242		21					2	21
12 49	Rock Creek	3	But	47	A	CG	2 10	212		21					2	21
12 48	Rock Cr Oflw	3	But	47	A	CS	2 30	33		22					2	21
12 47	Rock Cr Oflw	3	But	47	A	CS	2 40	33		22					2	21
12 46	Gable Draw	3	But	47	A	CG	3 70	21		21					5	21
12 45	Mud Creek	3	But	47	A	CG	4 40	152		22					5	21
12 44	Lindo Channel	3	But	47	A	CG	6 40	90		22					4	21
12 43	Big Chico Cr	3	But	47	A	CG	8 40	66		24		1	04		4	21
	Wel Chico	3	But	47	ChC		8 50									
12 99	Chico Gr Xing	3	But	47	ChC	C 184 4	8 55	1	W							
	Jct Rte 3	3	But	47	ChC	RT On 3	9 10									
12 95	1st St Gr Xing	3	But	47	ChC	8 184 4	9 11	1	O							
12 94	Humbolt Ave Gx	3	But	47	ChC	8 183 80	9 69	1	O							
	Jct Rte 3	3	But	47	ChC	LT ON 47	9 70									
	Ecl Chico	3	But	47	B		10 20									
12 89	Dead Horse Sl	3	But	47	B	CG	10 40	32		21					4	20
	Forest Rch P O	3	But	47	C	Sect Ch	28 10									
	Tehama Co Line	3	But	47	C		40 00									
	Yuba Co Line	3	But	87	A		0 00									
12 59	M Honcut Cr	3	But	87	A	CSC	0 05	197		26					2	41
12 60	No Honcut Cr	3	But	87	A	CSC	0 10	257		26					2	41
12 61	Oak Knob Draw	3	But	87	A	CS	8 10	22		40					2	22
12 62	Dredger Gulch	3	But	87	A	SS	9 80	26		26					2	22
12 100	S Oroville Spur	3	But	87	A	4 204 59 C	12 10	1	X							
12 63	Tailing Ditch	3	But	87	A	SS	13 00	26		27					5	10
	Jct Rte 21 Lt	3	But	87	A		14 40									
	Jct Rte 21 Rt	3	But	87	OvL	Sect Ch	16 30									
	Nel Oroville	3	But	87	B		16 36									
12 64	Feather River	3	But	87	B	STTSTD	16 40	665		19		1	04	15 7	5	07
12 65	Tule Creek	3	But	87	B	CS	17 90	27		20					4	30

BRIDGE RECORDS

The original system of designating state routes in California still is in use. When the state legislature establishes an existing or future road as a state highway, it is assigned a number. Thereafter, the different parts of the road as it passes through the various counties are identifiable by the district, county, route number, and section. Thus *VII-LA-4-B* would be Section B of Route 4 in Los Angeles County in District VII.

A bridge, in addition to being located by means of district-county-route-section, is given an official name and bridge number by the Bridge Maintenance Section. Thus, each structure can be identified three ways, and at least two are necessary, since there are many streams named Dry Creek, Clear Creek, etc., that are crossed by various routes.

The bridge number is composed of two parts, the prefix and the number. Each of the 58 California counties has a prefix number, ascending from 1 in the north through 58 in the south. San Diego County's prefix is 57 and bridge numbers there presently range from 57-01 to 57-292.

In the Bridge Department the Design Section has charge of the filing of all bridge plans and the Preliminary Investigation Section handles the filing of preliminary survey and construction field notes and Preliminary Reports.

The Bridge Maintenance Section, being interested principally in existing structures, has the following files and records:

BRIDGE LIST ITEMS AND KEYS TO CODED INFORMATION

1. BRIDGE NUMBER: When used suffix is coded as follows:
   D—For divided highway grade crossings considered one crossing by P.U.C.
   K—Left outer highway structure
   L—Left structure or left inner structure
   R—Right structure or right inner structure
   S—Right outer highway structure
   Y—Structures or grade crossings on State owned and maintained connections not on main highway

2. NAME OR DESCRIPTION (See Note)

3. DIST.—COUNTY—ROUTE SECTION

4. STRUCTURE TYPE OR P.U.C. NUMBER
   Spacings are 3 col., 3 col. and 2 col., thus showing 3 types in composite structures where required

   Coding First 2 Columns
   TS—Timber Stringer
   TT—Timber Truss
   TA—Timber Arch
   SS—Steel Stringer
   SG—Steel Plate Girder
   ST—Steel Truss
   SA—Steel Arch
   CS—Concrete Slab
   CA—Concrete Arch
   CG—Concrete Girder
   SU—Suspension
   MP—CMP or Multiplate
   MA—Masonry Arch
   CT—Combination Truss
   TU—Tunnel
   TW—Timber Retaining Wall
   CW—Concrete Retaining Wall
   ED—Earth Dam
   CD—Concrete Dam

   Coding 3rd Column
   T—Through
   D—Deck
   P—Pony
   O—Open Spandrel
   F—Earth Filled
   C—Continuous
   E—Continuous with Std. Cantilevered ends (No abutments)
   B—Boxed (Boxed gir.)
   W—Sidewalk
   K—Pier or Tower Span

   P.U.C. Number (For R.R. Grade Crossings)

5. BRIDGE LOG MILE (to 1/100 mile). A blank indicates mile 0.00

6. TOTAL LENGTH (feet)

7. PROTECTION: Main type of signal only, coded as follows:
   FL—Flashing light signals
   G—Manual gates
   H—Human flagmen
   K—Automatic gates
   M—Flashing light signals with rotating stop banner
   O—Standard Overhead sign
   T—Traffic signals synchronized
   W—Standard wigwag
   WM—Magnetic wigwag flagmen or other type of wigwag with flashing light aspect
   X—Standard crossbuck
   XR—Reflectorized crossbuck

8. TOTAL WIDTH OF ROADWAY (feet)

9. DIVIDED HIGHWAY: Type of division coded as follows:
   1—2 sets double lines
   2—Raised arrows, etc.
   3—Curb section or barrier
   4—Separate structures

10. SIDEWALKS: 1st col. shows number, next 2 cols. total width of sidewalks

11. VERTICAL CLEARANCE (to 1/10 foot)
    Where X is shown in the 3rd col. the clearance shown is not minimum but represents a center portion of 1, 2 or more traffic lanes (usually arch sections)

12. CAPACITY RATING: Coded as follows:
    1—H-20, S-20-12 or H20-S16 design
    2—H-15 or known equivalent in steel or concrete
    3—H-15 timber bridges
    4—Doubtful concrete bridges (plans not available)
    5—Reduced safety factor due light design
    6—Reduced safety factor due poor condition
    7—Posted for load—could be strengthened
    8—Posted for load—beyond economical repair

13. DATE BUILT: A blank indicates date unknown.

NOTE: Miscellaneous information will be coded under "NAME OR DESCRIPTION." Additional miscellaneous information may be found on the same line under the heading "STRUCTURE TYPE OR P.U.C. NUMBER."

1. *Bridge Card File.* This file sets up a 4- by 6-in. card for each bridge, showing only such pertinent information as should be readily available for frequent use. The cards are filed in standard metal cases, in alphabetical order of counties, increasing order of routes in counties.

2. *Bridge Books.* We have about 330 volumes of these 8½- by 11- by 2-in. loose-leaf bridge books filed in steel wall cases. They contain the construction final report and original and supplementary bridge reports previously mentioned, showing basic dimensions, condition, costs, high water and other facts about the structure. A road-view and a side-view photograph are mounted together with other photographs showing major defects or special conditions. Bridge capacity calculations, when necessary, are also filed in these books. The books are numbered and filed in increasing order of route number with a suitable index for access.

3. *Photo file.* All bridge department photographs are handled through the Bridge Maintenance Section, and can be broken into three classifications. First, preliminary photos taken by preliminary survey crews at the site of the proposed bridge. Second, construction photographs taken during the progress of bridge jobs showing views at all stages of the work. Third, two views of each existing bridge in

the system, plus additional shots showing special conditions or major defects. The photos are postcard size and are filed in standard metal cases by order of district, county, and route.

BRIDGE NO.....

RAILROAD CROSSING REPORT

Date of Record.....

Name.....
Dist.-Co.-Rt.-Sec.

Public Utilities Comm. No.....Railroad.....

Location.....

Description.....

.....

.....

.....

.....

Angle of intersection.....

Protection.. .....

.....

Visibility.....

.....

Accidents, since 1-1-26....Killed....Injured.. ..

.....

Average daily vehicular traffic .....

Average daily trains—Passenger..Freight....19..

.....

Factors affecting separation .....

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REMARKS.....

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FORM BD-26. .....

4. *Bridge list.* This 9- by 15-in. loose-leaf booklet contains about 250 pages and lists each bridge in the state highway system by county and order of route number, showing in 81 spaces across the page vital information regarding each bridge and its location. It is made up from standard IBM punch-type cards and is corrected annually. Copies are distributed to 125 persons and units in the highway department and the California Highway Patrol. The 11 general items recorded are bridge number, name, route, structure type, bridge log mile, length, width, division strip, sidewalk number and width, vertical clearance, capacity rating and year

P.U. Comm. No..... Date of Record.....

Name .....Index No.....

Route.....Station .....

.....Miles.....of.....

R.R. Traffic[1]. .....Highway Traffic[2]. .....

Protection[3].....

Accidents. .....

Align.....

Grade.....

Roadway.....Photos.....

Angle with Roadway.....Jurisdiction.....

Visibility[4].....

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Future Status[5].....

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Remarks[6].....

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1. Average trains per day.
2. Average vehicles per day.
3. X = Std. No. 1 sign. O = Std. No. 2 sign. H = Human Flagman (hrs.) G = Crossing gates (hrs.) W = Wigwag. B = Boulevard Stop. FL = Flashing light. FLRD = FL with stop disc. MW = Magnetic Flagman. AD = Advance sign. Suffix R = Reflectorized.
4. Cross corner views, obstructions, etc.
5. Probable date separation, type, costs, etc.
6. P.U. Comm. Dec. Restriction on train movement, etc.

FORM BD-52

built. The IBM cards contain other valuable entries and any type of information can be tabulated from them by machine in a matter of minutes.

5. *Railroad Crossings.* State highway-railroad crossings are examined regularly and records maintained on each, similar to bridges.

Several other records such as maps, catalogs, posted bridge lists, restricted vertical clearance lists, and a small library relating to

maintenance problems are kept by the section.

RELATION TO CITIES AND COUNTIES

The California Vehicle Code provides that the State Department of Public Works shall make an engineering investigation and hold a public hearing to determine the safe load capacity of a structure when the department has received a request therefor from the Board of Supervisors or county road commissioner of the county, the governing body of the city, or other agency or person, having jurisdiction over such bridge. The Bridge Maintenance Section annually examines about 200 bridges for other agencies, analyzing them to determine their safe load capacities. Reports are prepared and forwarded to the county, and the hearings held where necessary to officially establish load or speed postings. Our "Limiting Specifications for Checking Live Load Capacities of Existing Bridges" are used to rate the bridges. We also informally advise county and city engineers on methods of repair or strengthening their structures.

In addition to the above outside activity, we inspect and prepare reports for the proper maintenance of bridges belonging to the California Division of Beaches and Parks. The California Division of Forestry occasionally requests that we rate their bridges or prepare details for their reconstruction.

CONCLUSION

The maintenance of bridges in the California State Highway System has become a big problem, but it is being managed successfully under the present system. It has been effective principally due to the early establishment of complete records, the regular and thorough examination of bridges, and an orderly method for all following functions.

Centralization with the opportunity to exchange ideas for the best solution of problems has also been an important factor.