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16. ABSTRACT

Introduction

This second supplemental report summarizes surveys made December, 1957, and September-October, 1958. It compares changes that have taken place in the selected sections of Portland cement and bituminous pavements during a period of from three to three and one-half years since a survey in 1955, and a total period of from six to seven and one-half years since the original surveys.

A report dated August 13, 1953, gives complete description of the pavements at the time of the original survey, including structural section and drainage details. These are not included in this report.

The report dated August 13, 1953, covers 25 pavement sections but 11 were omitted in the first supplemental report and 4 more of them are omitted from this second report. Sections have been omitted for reasons such as relocation or reconstruction of the highway, or abandonment of the nearby loadometer station.

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STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

LOAD CONDITION STUDIES

in co-operation with

U. S. BUREAU OF PUBLIC ROADS

SECOND SUPPLEMENTAL REPORT

DATA ON
ROADWAY STRUCTURE AND ROADWAY CONDITION
AS SURVEYED
December, 1957; September-October, 1958

State of California
Department of Public Works
Division of Highways
- - -
MATERIALS AND RESEARCH DEPARTMENT

LOAD CONDITION STUDIES

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U. S. BUREAU OF PUBLIC ROADS

SECOND SUPPLEMENTAL REPORT

DATA ON ROADWAY STRUCTURE AND ROADWAY CONDITION AS SURVEYED December, 1957; September-October, 1958

Prepared by
MATERIALS AND RESEARCH DEPARTMENT

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Research No. 00258
Work Order No. 13NN26

December, 1958

LOAD CONDITION STUDIES

Introduction

This second supplemental report summarizes surveys made December, 1957, and September-October, 1958. It compares changes that have taken place in the selected sections of portland cement and bituminous pavements during a period of from three to three and one-half years since a survey in 1955, and a total period of from six to seven and one-half years since the original survey.

A report dated August 13, 1953, gives complete description of the pavements at the time of the original survey, including structural section and drainage details. These are not included in this report.

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The sections included in this report are:

Portland Cement

Load.	Sta. No. 5	X-S.J-66-A	Mossdale*
"	" " 12	III - Col-7-B	Williams
"	" " 26	VI-Fre-4-C	Herndon
"	" " 32	IV-Ala-5-F	Greenville
"	" " 61	XI-S.D-2-D	Oceanside

Bituminous

Load. Sta. No.	24	V-Mon-2-D	Soledad*
" " "	44	VII-Ven-2-C	Ventura
" " "	50	VI-Ker-4-D	Bakersfield
" " "	50	VI-Ker-4-D	Bakersfield
" " "	67	VIII-Riv-26-C	Whitewater
" " "	75	I-Hum-1-E	Scotia

* These sections were reconstructed soon after this supplemental survey was made and will not be available for further study.

The sections included in this second supplemental report are summarized on the following pages and are arranged in the order listed above.

Each section is 1000 feet in length and the total defects shown per section are comparable, one with the other.

Three of the bituminous pavements and some of the shoulders have been patched. Patched areas are shown as a separate item and are not included in the individual totals of alligator cracking, block cracking and shoving. In some cases patching has reduced the tabulated areas of these defects below those shown in a previous survey.

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Loadometer Station No. 5
Road X-S.J-66-A (Mossdale)
1000-foot test section.
PCC Pavement; 50 20-ft. slabs

PAVEMENT CONDITION

	Nov. 1951	May 1955	Dec. 1957

NUMBER OF CRACKED SLABS

Right Lane	50	50	50
Left Lane	49	49	49

NUMBER OF CRACKS

Right Lane	138	149	150
Left Lane	185	190	191

TOTAL FOOTAGE OF CRACKS

Right Lane	827	880	883
Left Lane	1016	1068	1070

FAULTING AT CRACKS

Measured 18" from inner and outer ends of cracks

Right Lane	None	None	None
Left Lane	None	None	None

FAULTING AT JOINTS

Measured 18" from inner and outer edges of pavement

Right Lane:				
Inner:	Average	0.12"	0.17"	0.19"
	Total	6.07"	8.47"	9.43"
Outer:	Average	0.14"	0.18"	0.20"
	Total	6.96"	9.09"	10.22"
Left Lane:				
Inner:	Average	0.11"	0.14"	0.17"
	Total	5.66"	7.01"	8.40"
Outer:	Average	0.12"	0.15"	0.18"
	Total	6.13"	7.53"	8.78"

SHOULDER CONDITION

1951: Shoulders were in good condition.

1955: Shoulders were in generally good condition with the following exceptions: On the right there is a longitudinal crack approximately 6" from the edge of pavement throughout the section. On the left approximately 6" from the edge of the pavement, there is a longitudinal crack from Sta. 241+00 to Sta. 244+00. Both shoulders have several transverse cracks, many of which are extensions of pavement cracks and joints.

1957: Shoulders were in generally good condition with the same exceptions noted in 1955. In addition, there is a substantial increase in the number and severity of transverse cracks in both shoulders.

The state highway route which includes this test section, was in the process of relocation and reconstruction when the 1957 survey was made. It will not be available for future consideration.

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Loadometer Station No. 12
Road III-Col-7-B (Williams)
1000-foot test section
PCC pavement; 50 20-ft. slabs

PAVEMENT CONDITION

	Oct. 1952	May 1955	Dec. 1958
NUMBER OF CRACKED SLABS			
Right Lane	33	45	49
Left Lane	16	28	42
NUMBER OF CRACKS			
Right Lane	40	55	62
Left Lane	16	28	45
TOTAL FOOTAGE OF CRACKS			
Right Lane	353*	523*	593
Left Lane	165*	281*	430

*Corrected figures for 1952 and 1955 reports

FAULTING AT CRACKS
Measured 18" from inner and outer ends of cracks

Right Lane				
Inner:	Average	0.03"	0.03"	0.03"
	Total	1.00"	1.46"	1.88"
Outer:	Average	0.02"	0.03"	0.03"
	Total	0.88"	1.77"	1.67"
Left Lane				
Inner:	Average	0.03"	0.03"	0.03"
	Total	0.50"	0.98"	1.26"
Outer:	Average	0.04"	0.03"	0.03"
	Total	0.61"	0.88"	1.40"

FAULTING AT JOINTS
Measured 18" from inner and outer edges of lanes

Right Lane				
Inner:	Average	0.18"	0.24"	0.25"
	Total	8.81"	11.96"	12.73"

Loadometer Station No. 12

FAULTING AT JOINTS (Continued)

		Oct. 1952	May 1955	Dec. 1958
Right Lane (Continued)				
Outer:	Average	0.17"	0.23"	0.27"
	Total	8.62"	11.72"	13.21"
Left Lane				
Inner:	Average	0.15"	0.22"	0.25"
	Total	7.33"	11.11"	12.35"
Outer:	Average	0.15"	0.23"	0.27"
	Total	7.40"	11.60"	13.63"

SHOULDER CONDITION

1951: The shoulders were in generally fair condition throughout the section.

1955: The shoulders are practically a total failure with the exception of the right shoulder from Sta. 488+70 to Sta. 490+00, and the left shoulder from Sta. 284+10 to Sta. 483+40 and from Sta. 485+00 to Sta. 486+50.

1958: Shoulders throughout the test section area were road mixed during the summer of 1958 and additional asphalt was added. At time of resurvey, both shoulders appeared to have had a heavy fog seal after recompaction. Shoulders are in generally excellent condition. A few cracks are developing adjacent to some of the most active PCC slabs.

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Loadometer Station No. 26
Road VI-Fre-4-C, (Herndon)
1000-foot test section.
PCC Pavement:
50 20-foot slabs

PAVEMENT CONDITION

	April 1952	March 1955	Oct. 1958
NUMBER OF CRACKED SLABS			
Right Lane	25*	28	31
NUMBER OF CRACKS			
Right Lane	35	44	53
TOTAL FOOTAGE OF CRACKS			
Right Lane	297*	343*	379

*Corrected figures for 1952 and 1955 reports

FAULTING AT CRACKS
Measured 18" from inner and outer ends of cracks

Right Lane

Inner:	Average	0.05"	0.08"	0.07"
	Total	1.78"	3.35"	2.30"
Outer:	Average	0.05"	0.07"	0.05"
	Total	1.77"	3.20"	2.68"

FAULTING AT JOINTS
Measured 18" from inner and outer edges of lane

Right Lane

Inner:	Average	0.07"	0.10"	0.06"
	Total	3.48"	5.15"	2.84"
Outer:	Average	0.06"	0.10"	0.06"
	Total	3.26"	5.34"	3.25"

SHOULDER CONDITION

1952: The shoulder was in generally good condition throughout the section.

SHOULDER CONDITION
(continued)

1955: The shoulder was in generally good condition with the exception of an area approximately one foot wide adjacent to the edge of pavement. This area of short transverse cracks, is bounded by the edge of pavement and longitudinal cracks. The area extends the length of the section except from Sta. 353+90 to Sta. 354+30.

1958: Shoulder has been patched adjacent to outer edge of PCC pavement and has received a fine sand seal coat. Patch and seal coat are 2.0' $\pm$ wide and extend the entire length of the section. There are several areas which appear to be shoving. Shoulder is generally in good condition.

Research No. 00258
Work Order No. 13NN26

Loadometer Station No. 32
Road IV-Ala-5-F (Greenville)
1000-foot test section
PCC Pavement:
67 15-foot slabs

PAVEMENT CONDITION

	July 1952	May 1955	Oct. 1958
NUMBER OF CRACKED SLABS			
Right Outer Lane	3	11	16
Right Inner Lane	None	None	1
NUMBER OF CRACKS			
Right Outer Lane	3	11	17
Right Inner Lane	None	None	1
TOTAL FOOTAGE OF CRACKS			
Right Outer Lane	21	91	155
Right Inner Lane	None	None	5

FAULTING AT CRACKS
Measured 18" from inner and outer ends of cracks

Right Outer Lane				
Inner:	Average	None	0.06"	0.02"
	Total	None	0.70"	0.26"
Outer:	Average	0.01"	0.01"	0.03"
	Total	0.03"	0.10"	0.46"
Right Inner Lane				
Inner		None	None	None
Outer		None	None	None

FAULTING AT JOINTS
Measured 18" from inner and outer edges of lanes

Right Outer Lane				
Inner:	Average	0.04"	0.06"	0.05"
	Total	2.68"	3.84"	3.53"
Outer:	Average	0.05"	0.07"	0.09"
	Total	3.12"	4.87"	6.26"

Loadometer Station No. 32

		July 1952	May 1955	Oct. 1958
		FAULTING AT JOINTS (Continued)		
Right Inner Lane				
Inner:	Average	0.02"	0.03"	0.04"
	Total	1.77"	2.31"	2.52"
Outer:	Average	0.02"	0.05"	0.04"
	Total	1.53"	3.04"	2.78"

SHOULDER CONDITION

1952: Shoulders were in generally good condition except for a 3/4-inch opening between the shoulder and the pavement.

1955: Shoulders were in generally good condition. The 3/4-inch opening between shoulder and pavement has been sealed.

1958: Shoulders have pulled away from edges of PCC pavement. In many areas, shoulders have also settled from 1/2-inch to 1 inch lower than PCC. There are a few new cracks in shoulders.

Research No. 00258
Work Order No. 13NN26

Loadometer Station No. 61
Road XI-S.D-2-D (Oceanside)
1000-foot test section
PCC Pavement:
67 15-foot slabs

PAVEMENT CONDITION

	Feb. 1955	Oct. 1958
NUMBER OF CRACKED SLABS		
Right Outer Lane	None	None
NUMBER OF CRACKS		
Right Outer Lane	None	None
TOTAL FOOTAGE OF CRACKS		
Right Outer Lane	None	None
FAULTING AT CRACKS		
Right Outer Lane	None	None
FAULTING AT JOINTS (Measured 18" from inner and outer edges of lane)		
Right Outer Lane		
Inner: Average	0.004"	0.01"
Total	0.30"	0.87"
Outer: Average	0.004"	0.02"
Total	0.29"	1.48"

SHOULDER CONDITION

1955: The asphaltic mix shoulder on the right is in generally good condition.

1958: The asphaltic mix is in fair condition. A road mix blanket averaging 3.0' in width has been placed adjacent to the outer edge of PCC pavement. The resulting joint between pavement and shoulder is open and has not

SHOULDER CONDITION

1958: (continued)

been sealed.

There are pumping stains on the shoulder near many of the contraction joints in the PCC pavement and in many cases, there are depressed areas in the shoulder at these stains. There is one area of block cracking in the shoulder blanket. This area is approximately 2.0' wide and extends from Station 295+80 to Station 296+25 (90 square feet).

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Loadometer Station No. 24
Road V-Mon-2-D (Soledad)
1000-foot test section
Bituminous pavement

PAVEMENT CONDITION

PMS blanket has received a seal coat since the survey made in 1952. The section was not surveyed in 1955.

	Oct. 1952	Oct. 1958
FOOTAGE OF SINGLE CRACKS		
Right Lane	54	108
Left Lane	None	27
AREA OF ALLIGATOR CRACKING		
Right Lane	None	1222 sq.ft.
Left Lane	None	2715 " "
AREA OF BLOCK CRACKING		
Right Lane	None	2968 sq.ft.
Left Lane	None	927 sq.ft.
AREA OF SHOVING		
Right Lane	None	None
Left Lane	164 sq.ft.	None
AREA OF PATCHES		
Right Lane	None	16 sq.ft.
Left Lane	None	1170 " "
TOTAL AREA OF FAILURE*		
Right Lane	None	4206 sq.ft.
Left Lane	164 sq.ft.	4812 sq.ft.

*Sum of areas of shoving, alligator cracking, block cracking and patches.

Loadometer Station No. 24

SHOULDER CONDITION

FOOTAGE OF SINGLE CRACKS

	Oct. 1952	Oct. 1958
Right Lane	450	560
Left Lane	1414	1414

AREA OF ALLIGATOR CRACKING

Right Lane	None	None
Left Lane	None	None

AREA OF BLOCK CRACKING

Right Lane	None	575 sq.ft.
Left Lane	None	None

AREA OF SHOVING

Right Lane	684 sq.ft.	684 sq.ft.
Left Lane	None	None

AREA OF PATCHES

Right Lane	None	100 sq.ft.
Left Lane	None	None

TOTAL AREA OF FAILURE

Right Lane	684 sq.ft.	1359 sq.ft.
Left Lane	None	None

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Loadometer Station No. 44
Road VII-Ven-2-C (Ventura)
1000-foot test section
Bituminous pavement

PAVEMENT CONDITION

Entire test section was covered with a plant-mixed surfacing blanket in early summer, 1958. No cracks or failure areas are in evidence. Blanket extended beyond original traveled way pavement onto shoulders. Cracking noted in 1955 survey could not be retraced.

AREA OF ALLIGATOR CRACKING

(SHOULDERS)

	Feb. 1951	Feb. 1955	Oct. 1958
Right Lane	None	None	None
Left Lane	None	None	1000 sq.ft.

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Loadometer Station No. 50
Road VI-Ker-4-D (Bakersfield)
Sta. 290+00 to 300+00
1000-foot test section
Bituminous pavement

PAVEMENT CONDITION

Note: Both lanes of the traveled way have had a "slurry" seal coat applied since 1955 survey was made.

	May 1952	March 1955	Oct. 1958
FOOTAGE OF SINGLE CRACKS			
Left Outer Lane	91	312	606
Left Inner Lane	252	437	656
AREA OF ALLIGATOR CRACKING			
Left Outer Lane	None	None	131 sq. ft.
Left Inner Lane	None	None	147 sq.ft.
AREA OF BLOCK CRACKING			
Left Outer Lane	None	None	542 sq. ft.
Left Inner Lane	None	None	30 sq. ft.
AREA OF SHOVING			
Left Outer Lane	None	None	None
Left Inner Lane	None	None	None
AREA OF PATCHES			
Left Outer Lane	None	None	None
Left Inner Lane	None	None	None
TOTAL AREA OF FAILURE*			
Left Outer Lane	None	None	673 sq.ft.
Left Inner Lane	None	None	177 sq.ft.

*Sum of areas of alligator cracking and block cracking.

Loadometer Sta. No. 50

SHOULDER CONDITION

Note: Both shoulders have been patched adjacent to the edge of traveled way since the 1955 survey was made. Areas shown as single cracks or block cracking in previous surveys are included in patched areas.

	May 1952	March 1955	Oct. 1958
FOOTAGE OF SINGLE CRACKS			
Outer Shoulder	4	23	None
Inner Shoulder	21	100	437
AREA OF ALLIGATOR CRACKING			
Outer Shoulder	None	None	None
Inner Shoulder	None	None	None
AREA OF BLOCK CRACKING			
Outer Shoulder	None	90 sq.ft.	None
Inner Shoulder	None	465 sq.ft.	None
AREA OF SHOVING			
Outer Shoulder	None	None	None
Inner Shoulder	None	None	None
AREA OF PATCHES			
Outer Shoulder	None	65 sq.ft.	1525 sq.ft.
Inner Shoulder	None	350 sq.ft.	1550 sq.ft.
TOTAL AREA OF FAILURE			
Outer Shoulder	None	155 sq.ft.	1525 sq.ft.
Inner Shoulder	None	815 sq.ft.	1550 sq.ft.

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Loadometer Station No. 50
VI-Ker-4-D
Sta. 330+00 to 340+00
1000-foot test section
Bituminous pavement

PAVEMENT CONDITION

	May 1952	March 1955	Oct. 1958
FOOTAGE OF SINGLE CRACKS			
Left Outer Lane	847	1197	1487
Left Inner Lane	683	1134	1475
AREA OF ALLIGATOR CRACKING			
Left Outer Lane	20 sq.ft.	45 sq.ft.	85 sq.ft.
Left Inner Lane	None	None	None
AREA OF BLOCK CRACKING			
Left Outer Lane	201 sq.ft.	124 sq.ft.	322 sq.ft.
Left Inner Lane	None	None	50 sq.ft.
AREA OF SHOVING			
Left Outer Lane	None	None	None
Left Inner Lane	None	None	None
AREA OF PATCHES			
Left Outer Lane	None	205 sq.ft.	1225 sq.ft.
Left Inner Lane	None	None	473 sq.ft.
TOTAL AREA OF FAILURE*			
Left Outer Lane	221 sq.ft.	374 sq.ft.	1632 sq.ft.
Left Inner Lane	None	None	523 sq.ft.

*Sum of areas of alligator cracking, block cracking and patches.

SHOULDER CONDITION

FOOTAGE OF SINGLE CRACKS			
Outer Shoulder	15	160	373
Inner Shoulder	8	116	300

Loadometer Station No. 50

SHOULDER CONDITION
(Continued)

	May 1952	March 1955	Oct. 1958
AREA OF ALLIGATOR CRACKING			
Outer Shoulder	20 sq.ft.	60 sq.ft.	270 sq.ft.
Inner Shoulder	None	None	None
AREA OF BLOCK CRACKING			
Outer Shoulder	140 sq.ft.	None	None
Inner Shoulder	None	None	None
AREA OF SHOVING			
Outer Shoulder	None	None	None
Inner Shoulder	None	None	None
AREA OF PATCHES			
Outer Shoulder	None	195 sq.ft.	510 sq.ft.
Inner Shoulder	None	None	375 sq.ft.
TOTAL AREA OF FAILURE*			
Outer Shoulder	160 sq.ft.	255 sq.ft.	780 sq.ft.
Inner Shoulder	None	None	375 sq.ft.

*Sum of areas of alligator cracking, block cracking and patches.

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Loadometer Station No. 67
Road VIII-Riv-26-C (Whitewater)
1000-foot test section
Bituminous pavement

PAVEMENT CONDITION

Both lanes of the traveled way in this section have received a heavy asphalt and chip seal coat since the time of the last survey. Seal coat is approximately 23.5 feet wide and effectively covers almost all of the previously charted cracks.

SHOULDER CONDITION

AREA OF SHOVING

	May 1951	Feb. 1955	Oct. 1958
Outer Shoulder	None	None	10 sq.ft.

Throughout most of the test section, the outer shoulder has subsided along the longitudinal crack which was first charted in 1951. There is one exception to this condition; between Station 291+12 and Station 292+14.

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Loadometer Station No. 75
Road I-Hum-1-E Scotia
1000-foot test section
Bituminous pavement

PAVEMENT CONDITION

	Aug. 1951	May 1955	Sept. 1958
FOOTAGE OF SINGLE CRACKS			
Right Lane	181	245	445
Left Lane	5	5	75
AREA OF ALLIGATOR CRACKING			
Right Lane	None	None	None
Left Lane	None	None	None
AREA OF BLOCK CRACKING			
Right Lane	None	None	None
Left Lane	None	None	None
AREA OF SHOVING			
Right Lane	None	None	None
Left Lane	None	None	None
AREA OF PATCHES			
Right Lane	None	None	None
Left Lane	None	None	None

SHOULDER CONDITION

FOOTAGE OF SINGLE CRACKS			
Right Shoulder	182	343	351
Left Shoulder	192	482	497

There are no other signs of shoulder failure.