CONCRETE BRIDGE DECKS WITH ISOTROPIC REINFORCING

SHORT TERM EVALUATION

Final Report
OR-EF-99-06

RESEARCH UNIT

Oregon Department of Transportation

CONCRETE BRIDGE DECKS WITH ISOTROPIC REINFORCING

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by

Eric W. Brooks, E.I.T.
Research Specialist

for

Oregon Department of Transportation
Research Unit
200 Hawthorne SE, Suite B240
Salem OR 97310

and

Federal Highway Administration
Washington DC 20590

September 1998

Technical Report Documentation Page

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16. Abstract

The Oregon Department of Transportation (ODOT) has used traditional truss bar layout for bridge deck reinforcement for many years. Studies by other states found the same performance using an isotropic deck grid steel reinforcement layout. The isotropic system uses less steel, which lowers the cost of the deck and reduces distress caused by rebar corrosion. Three bridges included in this study were built with isotropic reinforced decks. Within two years all the decks had some minor initial cracking. The deck on the Santiam Overflow No. 4 cracked soon after the forms were removed. This cracking could be related to the seismic activity in the area. The other two decks also cracked, but the cracks are very tight and do not appear to be through cracks. The short-term performance is as good as standard deck rebar layouts.

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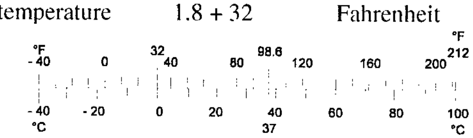
SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	millimeters squared	mm^2
ft^2	square feet	0.093	meters squared	m^2
yd^2	square yards	0.836	meters squared	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	kilometers squared	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	meters cubed	m^3
yd^3	cubic yards	0.765	meters cubed	m^3
NOTE: Volumes greater than 1000 L shall be shown in m^3.				
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams	Mg
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5(F-32)/9	Celsius temperature	°C

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	millimeters squared	0.0016	square inches	in^2
m^2	meters squared	10.764	square feet	ft^2
ha	hectares	2.47	acres	ac
km^2	kilometers squared	0.386	square miles	mi^2
		VOLUME		
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	meters cubed	35.315	cubic feet	ft^3
m^3	meters cubed	1.308	cubic yards	yd^3
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.205	pounds	lb
Mg	megagrams	1.102	short tons (2000 lb)	T
		TEMPERATURE (exact)		
°C	Celsius temperature	1.8 + 32	Fahrenheit	°F



* SI is the symbol for the International System of Measurement

(4-7-94 jbp)

ACKNOWLEDGEMENTS

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DISCLAIMER

CONCRETE BRIDGE DECK WITH ISOTROPIC REINFORCEMENT

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1.0 INTRODUCTION

In September of 1992, the Oregon Department of Transportation (ODOT) replaced a bridge deck using isotropic deck steel. Isotropic decks include uniform reinforcement both longitudinally and transversely along the bottom and top of the deck, thereby giving an isotropically reinforced bridge deck. A few years later, two replacement bridges were constructed with the same pattern. A report entitled "Concrete Bridge Deck with Isotropic Reinforcing" *(Bush, 1996)* documents the deck construction. This report documents the two-year performance of these three bridge decks.

Good, long-term performance has been demonstrated by other research *(Fu, 1991)* for decks without construction or other early life problems. After eight years of service, the decks identified in the study performed as well as those with conventional reinforcement layouts.

Isotropic bridge deck reinforcing is being used as a cost-saving alternative. Using less steel for the same or better performance should produce cost savings in material and faster steel installation time. Long-term savings may result from reduced deck cracking severity, and consequently, a reduction in deck deterioration.

2.0 PROJECT DESCRIPTION

2.1 PROJECT LOCATIONS AND ENVIRONMENTS

In this study, the three bridge decks included; 1) a deck replacement on the USBR Bridge, constructed in 1992; 2) the new Catching Slough Bridge, completed in 1995; and 3) Santiam Overflow No. 4, built in 1994 and opened to traffic in 1996. The locations are shown in Figure 2.1.

The USBR Bridge (BR #8345A) is located on US 97 (Hwy 4) at milepost 273.71, near Klamath Falls, Oregon. This area has cold, dry, snowy winters and warm, dry summers. The average annual rainfall is 344 mm (13.4 in). The Average Daily Traffic (ADT) is 6,100 with 30% trucks.

Catching Slough Bridge (BR #2278E) is located on the Coos River Highway (Hwy 241) at milepost 2.46, near Coos Bay, Oregon. This area has mild winters and summers with very few freezing periods. The average annual rainfall is 2.1 m (6 ft 10 in). The ADT is 4,100 with 25% trucks.

The Santiam Overflow No. 4 (BR # 17342), is located northbound on Interstate 5 (Hwy 1) at milepost 240.42 near Salem, Oregon. This area has mild winter and summers with some freeze-thaw periods. The average annual rainfall is 1.1 m (3ft 7in). The ADT is 48,000 with 15% trucks.

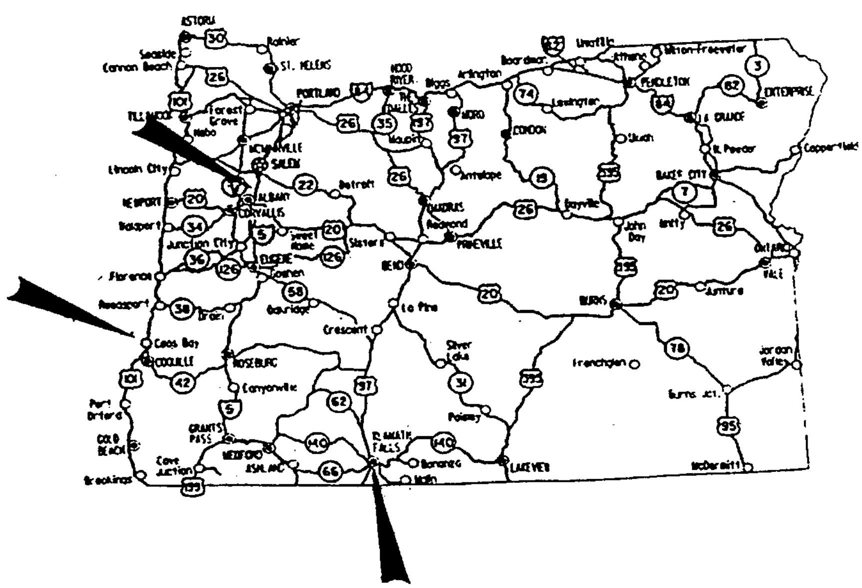


Figure 2.1: Project locations in Oregon.

3.0 POST-CONSTRUCTION DECK INSPECTIONS

All three bridges were inspected soon after construction. Detailed crack maps (see Appendix A) were not made until the spring of 1998. Thus, cracking due to traffic loads has not been established. Comments regarding the type of deck cracking are found in the bridge inspectors' reports in Appendix B. To some degree, all three decks did crack as described in the following sections.

3.1 USBR BRIDGE INSPECTIONS

An inspection of the deck was made before the bridge was completely opened to traffic. The deck was removed and replaced in staged construction. The southbound lanes were completed in October 1992 and carried all the traffic until the northbound lanes were completed in December 1992.

Some cracking near the bents was found and photographed, shown in Figure 3.1. Other cracking was also mentioned. However, a detailed crack map was not made, due to traffic on the southbound side and the contractor's equipment on the northbound side.

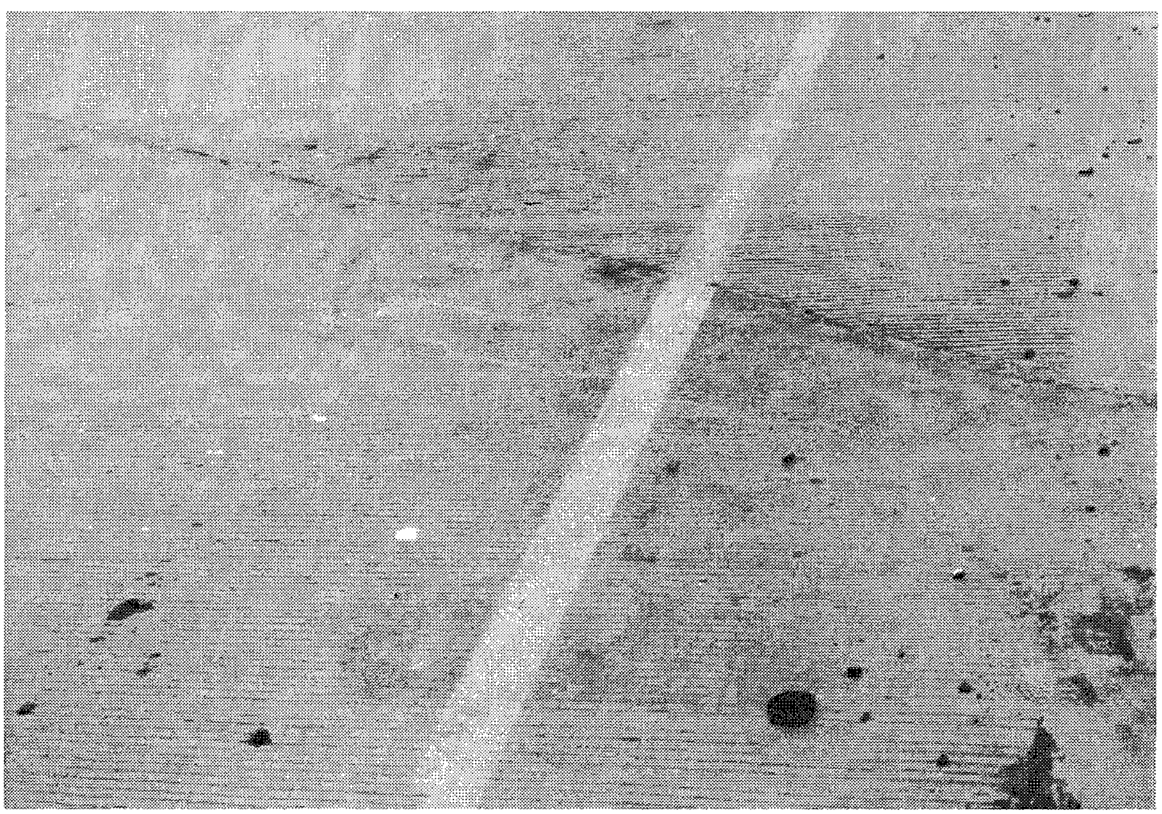


Figure 3.1: Cracks parallel to bents (April 1993).

Several earthquakes and aftershocks occurred in the Klamath Falls area between September 1993 and October 1994 (Figure 3.2). Scattered transverse cracks on the southbound side were difficult to find in October 1993 (Figure 3.3). By October 1994, after the seismic activity subsided, transverse cracking had spread, making it easier to spot. Many of these cracks were sealed with methacrylate in late summer 1995. In Figure 3.4, the cracking severity is distorted by the sealant. Because detailed crack maps were not made, a correlation between seismic activity and cracking cannot be made.

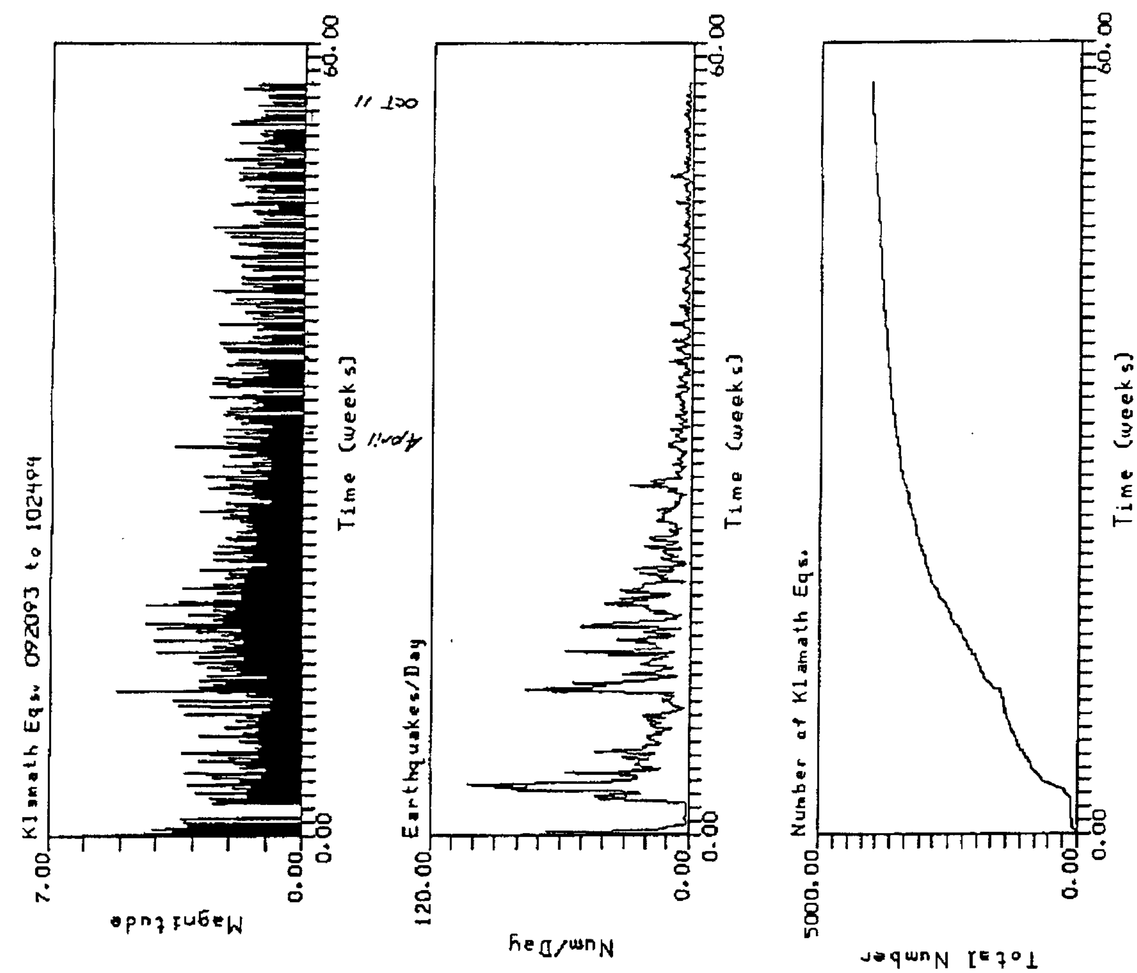


Figure 3.2: Seismic activity in the Klamath Falls area (September 1993 – October 1994)

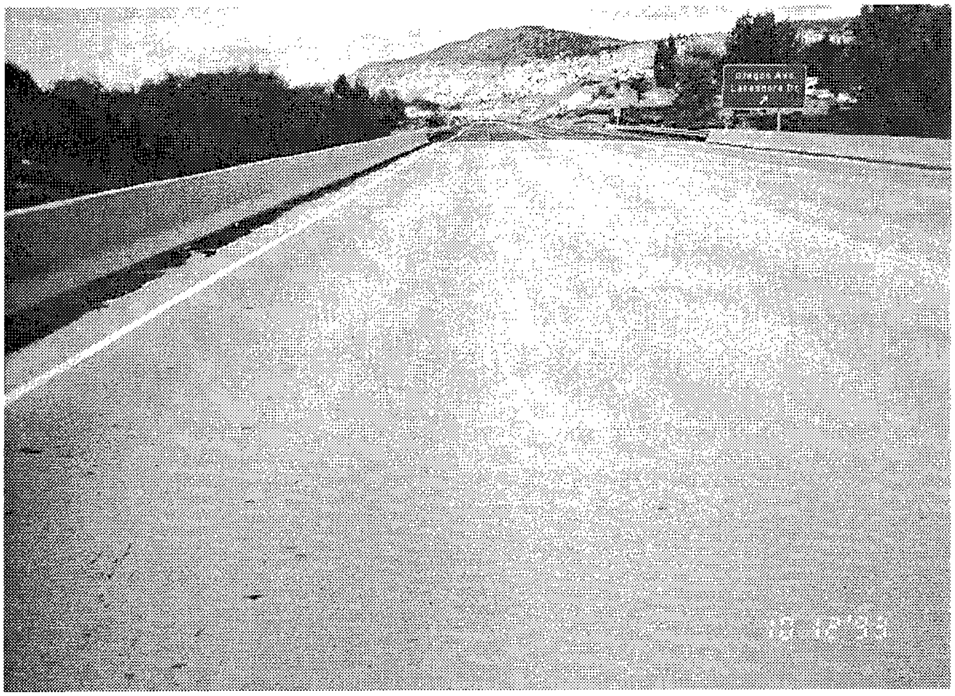


Figure 3.3: Transverse cracking was not visible (October 1993).

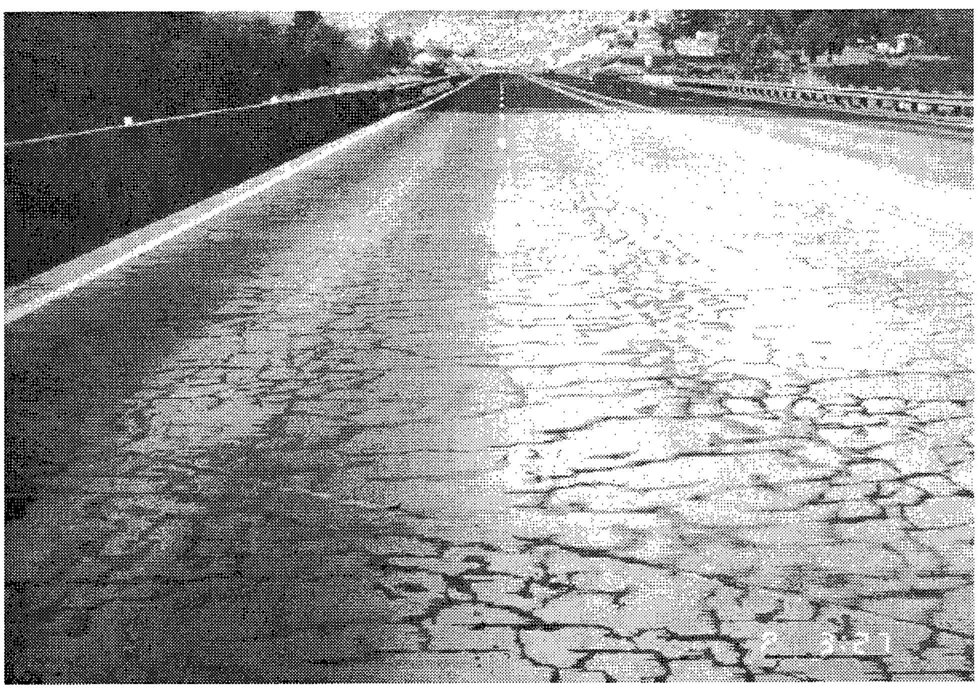


Figure 3.4: Sealed cracks in October 1995 distorted cracking severity.

On April 14, 1998, a detailed survey of the deck was made. It included a crack map, photographs, and depth of cover for the reinforcing steel. Most of the cracks were difficult to find because the crack widths were very narrow. Cracks previously sealed with methacrylate were easier to spot. Some large cracks were found parallel to the bents. The bents on the USBR are at a skew angle of about sixty degrees (see crack map in Appendix A). Typical transverse cracking is shown in Figure 3.5, while cracking parallel to the bents is shown in Figure 3.6.

Figure 3.5: Typical transverse cracks (April 1998).

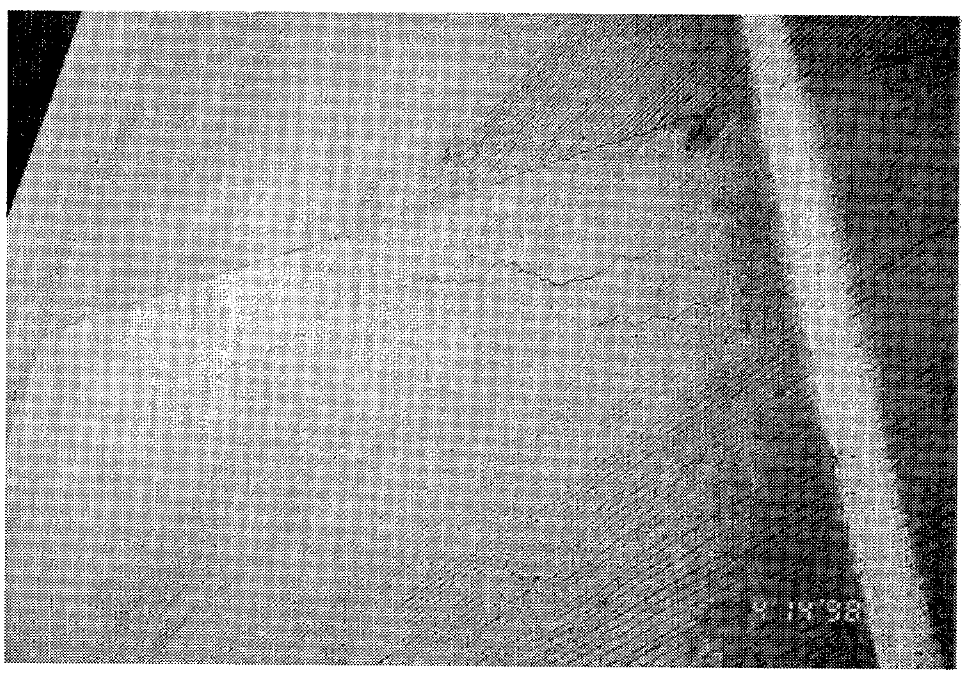


Figure 3.6: Small changes in transverse cracks parallel to bents (April 1998).

In addition to the crack map, the depth of cover for the rebar was checked with a rebar locator. Most of the rebar had the minimum recommended cover depth of 50.8 mm (2 in). The results can be seen in Table 3.1. Note that the northbound lanes had more cover and less cracking.

Table 3.1: Depth of Concrete Cover for Top of Deck

Southbound		Northbound	
Distance	Depth	Distance	Depth
0 m (0 ft)	58.42 mm (2.3 in)	3.66 m (12 ft)	58.42 mm (2.3 in)
3.66 m (12 ft)	55.88 mm (2.2 in)	8.54 m (28 ft)	68.58 mm (2.7 in)
7.32 m (24 ft)	53.34 mm (2.1 in)	13.42 m (44 ft)	71.12 mm (2.8 in)
7.95 m (26 ft)	68.58 mm (2.7 in)	17.08 m (56 ft)	83.82 mm (3.3 in)
17.08 m (56 ft)	68.58 mm (2.7 in)	21.96 m (72 ft)	81.28 mm (3.2in)
20.74 m (68 ft)	50.40 mm (2.0 in)	25.62 m (84 ft)	71.12 mm (2.8 in)
24.40 m (80 ft)	38.1 mm (1.5 in)	30.5 m (100 ft)	71.12 mm (2.8 in)
28.06 m (92 ft)	53.34 mm (2.1 in)	34.16 m (112 ft)	81.28 mm (3.2 in)
34.16 m (112 ft)	60.96 mm (2.4 in)	39.04 m (128 ft)	81.28 mm (3.2 in)
37.82 m (124 ft)	53.34 mm (2.1 in)	42.70 m (140 ft)	91.44 mm (3.6 in)
41.48 m (136 ft)	43.18 mm (1.7 in)	47.58 m (56 ft)	106.68 mm (4.2 in)
45.14 m (148 ft)	66.04 mm (2.6 in)	51.24 m (168 ft)	126.54 mm (5.1 in)
53.38 m (175 ft)	58.42 mm (2.3 in	57.95 m (190 ft)	96.52 mm (3.8 in)
57.04 m (187 ft)	68.58 mm (2.7 in)	61.61 m (202 ft)	91.44 mm (3.6 in)
61 m (200 ft)	68.58 mm (2.7 in)	65.27 m (214 ft)	88.90 mm (3.5 in)
62.83 m (206 ft)	68.58 mm (2.7 in)	68.93 m (226 ft)	66.04 mm (2.6 in)
66.49 m (218 ft)	53.34 mm (2.1 in)	72.59 m (238 ft)	68.58 mm (2.7 in)
73.20 m (240 ft)	50.4 mm (2.0 in)	76.25 m (250 ft)	68.58 mm (2.7 in)
76.86 m (252 ft)	73.66 mm (2.9 in)	79.91 m (262 ft)	73.66 mm (2.9 in)
82.96 m (272 ft)	66.04 mm (2.6 in)	82.96 m (272 ft)	81.28 mm (3.2 in)

3.2 CATCHING SLOUGH BRIDGE INSPECTIONS

Cracking on the top and the bottom of the deck was noticed soon after construction was complete in November 1994. The bridge opened to traffic in March 1995. The Region 3 Bridge Inspector noted "more than normal cracking…" on the 1996 inspection (see Appendix B). In March 1998, the Research Unit, with the help of the Region Bridge Inspector and the bridge designer, made a formal inspection of the deck. A crack map of the top of the deck was made, and photographs of the top and bottom of the deck were taken. A random check for depth of cover over the rebar was also done. The cover depth met the minimum required value of 50.8 mm (2 in).

Cracking on the surface was concentrated at the east end of the bridge. The columns on this end are shorter and, as noted by the bridge designer, Guido Portier, "…all the interior columns are fixed to the superstructure except for bent 4. When spans are restrained and no movement is allowed, the possibility of concrete deck shrinkage will increase. These shrinkage cracks occur when the deck is unable to shorten due to stiffness of the shorter columns. Longer columns are more flexible and allow more shortening of the deck."

Figure 3.7 is a crack map superimposed on the top view of the deck along with a profile view. Note the tallest column at bent 4 is about 13.7 m (45 ft) above the pier. This section had the least cracking. See Appendix A for a detailed crack map. A majority of the cracks had very narrow widths and were difficult to see.

Longitudinal cracking was found on the west end in both the wheel paths and center of the lane. These cracks were narrow and difficult to see. More than normal longitudinal cracking was found near the end on span 3. Both the designer and the inspector recalled problems with equipment at this section during construction. Some of the deck concrete sat for a period of time before the contractor finished placing it. Working the concrete after a partial set can cause it to shrink-crack. Other surface distress included minor spalling and debris, such as wood chips and clamshells in the surface.

Although mapping cracks on the underside of the deck was not done because of the bridge height, photographs were taken. Most of the serious cracking was found near the east end on the bottoms of spans 8 through 11, as seen in Figure 3.8. Large transverse cracks with efflorescence were located near the diaphragms at center span. The taller columns near the west end did not have large visible cracks, as seen in Figure 3.9.

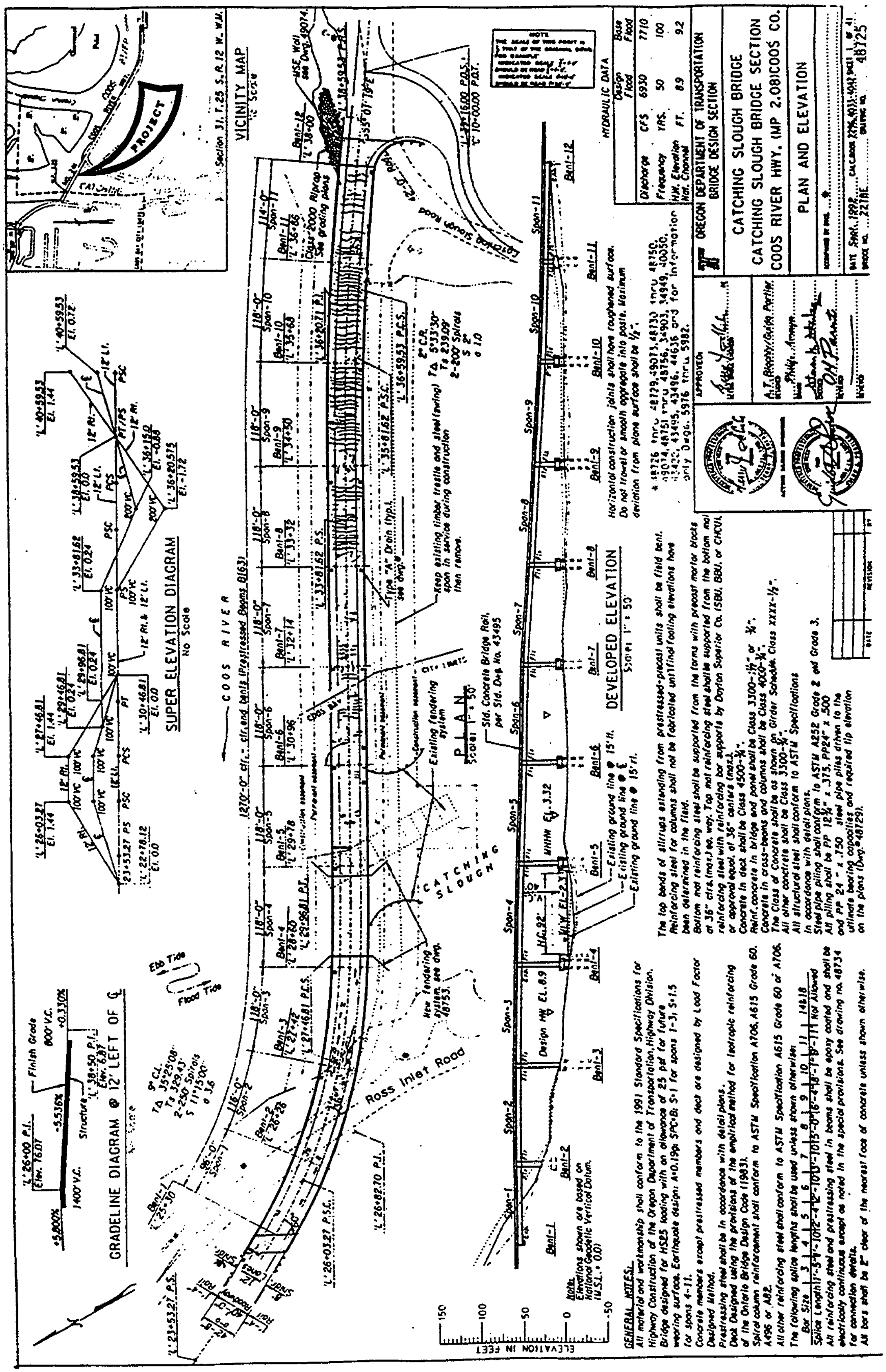


Figure 3.7: Plan and profile of Catching Slough Bridge. The column at bent 4 is about 13.7 m (44 ft 11 in) above the pier.

Figure 3.8: Transverse cracks were found on the bottom of the deck near center of span.

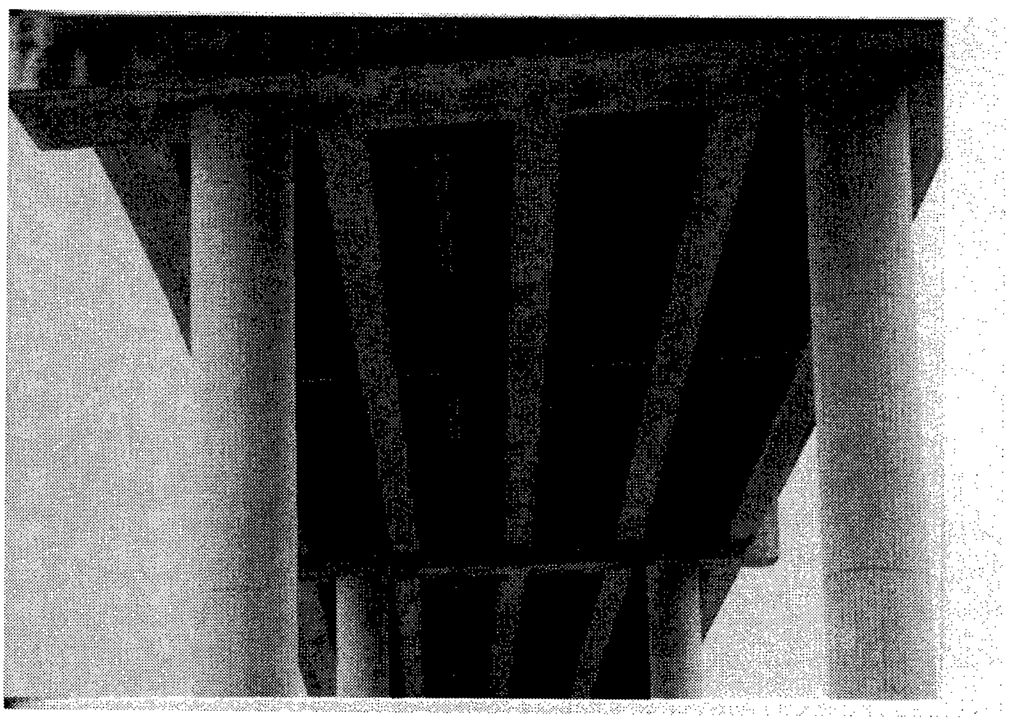


Figure 3.9: Transverse cracking is not found under the deck at the higher section of the structure.

3.3 SANTIAM OVERFLOW NO. 4

The deck of the Santiam Overflow No. 4 was completed in April 1994, and opened to traffic in the spring of 1996. Until the completion of the northbound construction, all Interstate 5 traffic was diverted to the twin, southbound structure over the main channel. Cracking on the top and especially the bottom was noticed soon after construction was complete. Although no formal crack maps were made, the Region Bridge Inspector commented there were "...transverse and longitudinal cracks underside of deck w/ light to moderate efflorescence throughout" (see Appendix B).

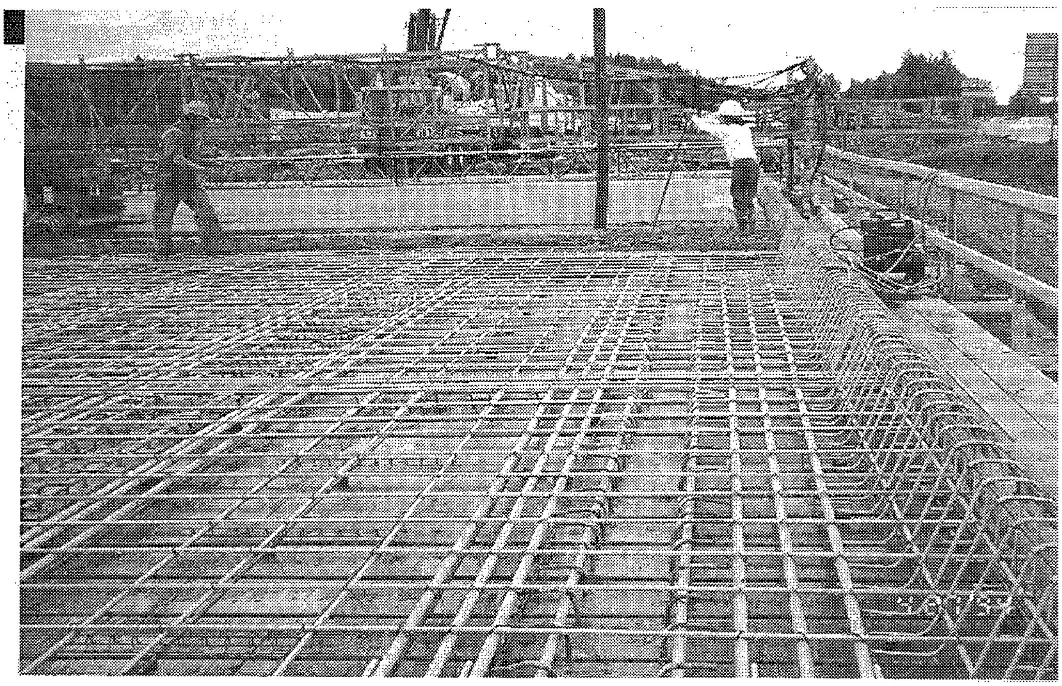


Figure 3.10: The deck of Santiam Overflow No. 4 was placed in April 1994. Note the isotropic layout of the rebar.

On February 26, 1998, the Research Unit, with the help of bridge designer Larry Bush and Region 2 Bridge Inspector Jeff Swanstrom, made a detailed inspection of the deck of Santiam Overflow No. 4. Both the top and bottom of the deck had transverse and longitudinal cracks, as shown in Figures 3.11 and 3.12. The bottom of the deck had large cracks, many even went through the deck. Stains on beams from water running through the cracks were found. A trench was also noted in the sand under the deck, apparently caused by water running from the surface through a large crack in the deck. Cracking on the underside of the deck was found over almost the entire surface with the frequency of cracking greater near the bents

Figure 3.11: Cracking on the top of the deck.

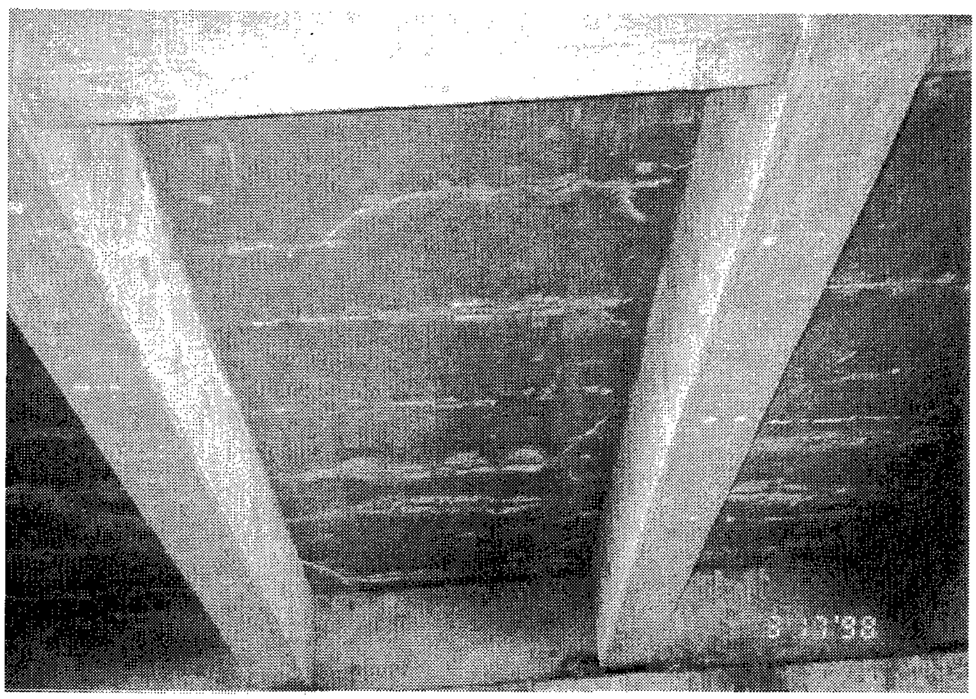


Figure 3.12: Cracks on the bottom of the deck were outlined by efflorescence stains.

4.0 CONCLUSIONS

The three bridges included in this study have all shown distress after construction. On Catching Slough Bridge and USBR Bridge, the cracking does not appear to be serious. However, the cracks found on the Santiam Overflow No. 4 go through the entire deck. Construction practices, not the use of the isotropic reinforcement steel pattern, probably caused the initial cracking. This is apparent from the random cracking found rather evenly spread over the entire top of deck of the Santiam Overflow No. 4.

On Catching Slough Bridge, equipment problems slowed the laydown procedure. Concrete strength and weather problems, discussed in "Concrete Bridge Deck with Isotropic Reinforcing USBR Canal Bridge in Klamath Falls" *(Bush, 1996)*, and depth of cover problems found in the 1998 inspection, have caused much of the damage to the USBR Bridge. Poor construction practice of removing the form too soon is believed to have been a problem for the Santiam Overflow No. 4.

According to a study conducted by J.H. Allen *(Allen, 1991)* these types of cracks could develop into serious problems. The findings from that study indicate that once cracking starts on an isotropic deck, the reduced steel reinforcement is not strong enough to prevent further cracking. Thus, monitoring the three bridge decks should be continued on an annual basis. If crack growth slows or stops, the isotropic steel pattern would be as acceptable as the conventional truss bar system.

5.0 REFERENCES

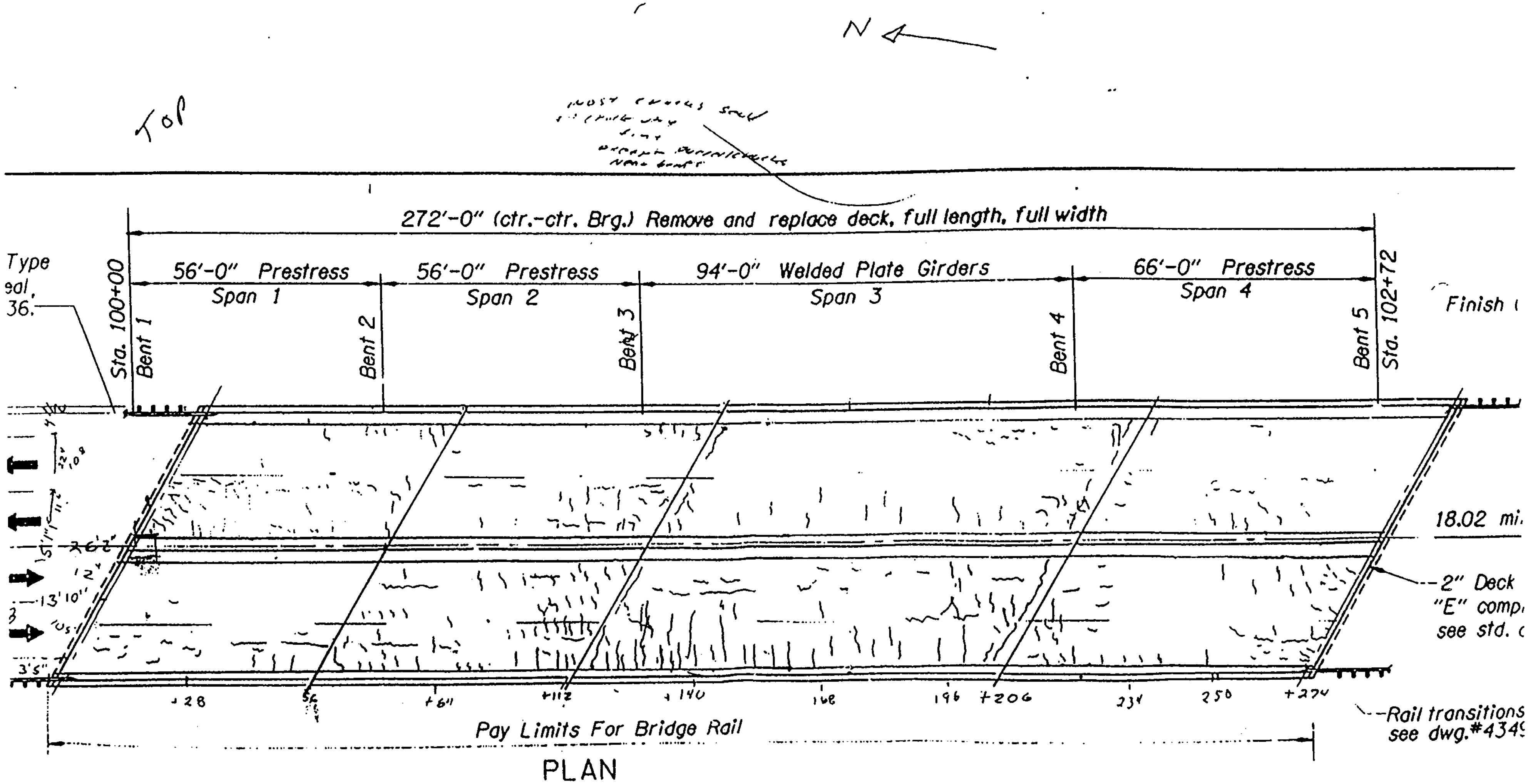
Bush, Larry, "Concrete Bridge Deck With Isotropic Reinforcing USBR Canal Bridge in Klamath Falls", Oregon Department of Transportation (1996).

Fu, Alampalli, and Pezz. "Long-Term Serviceability of Isotropically Reinforced Bridge Deck Slabs" New York Department of Transportation (1991).

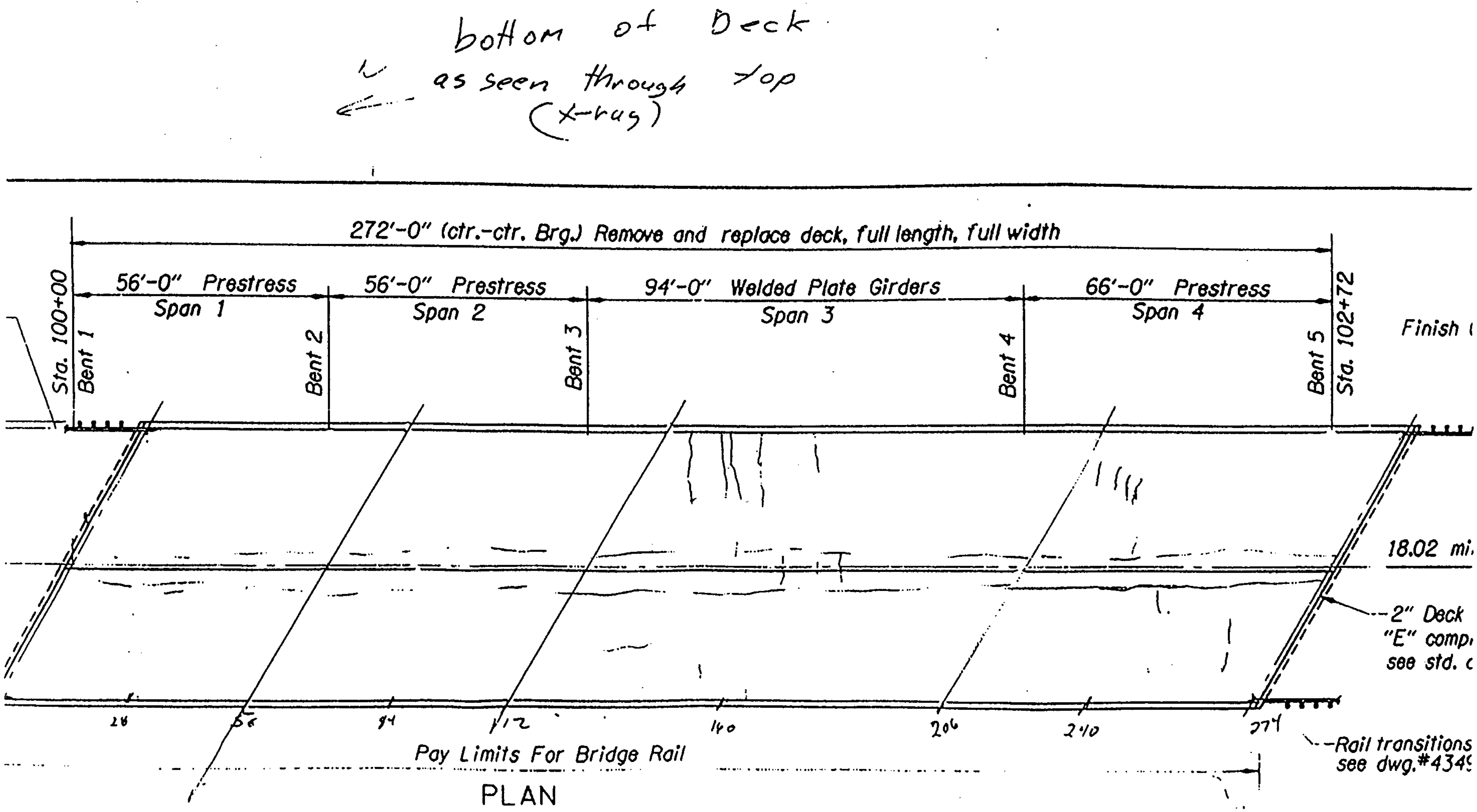
Allen, J.H. "Cracking, Serviceability, and Strength of Concrete Bridge Decks", Transportation Research Report No.1290 (1991).

APPENDIX A:

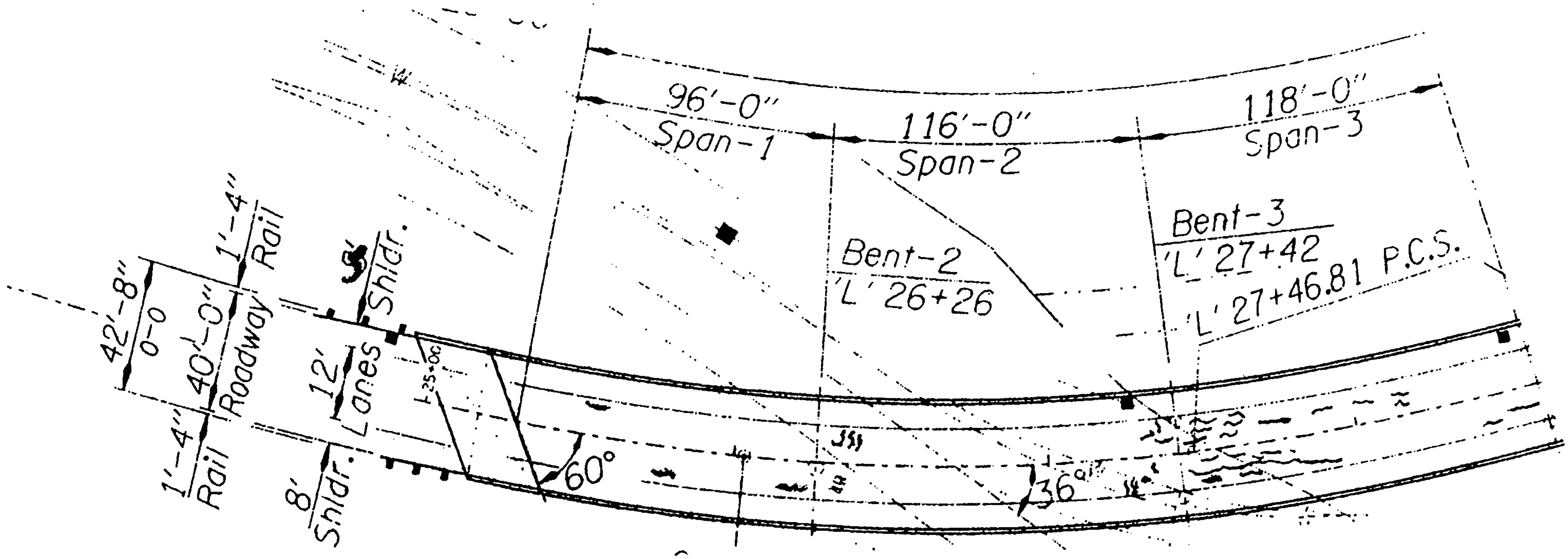
CRACK MAPS



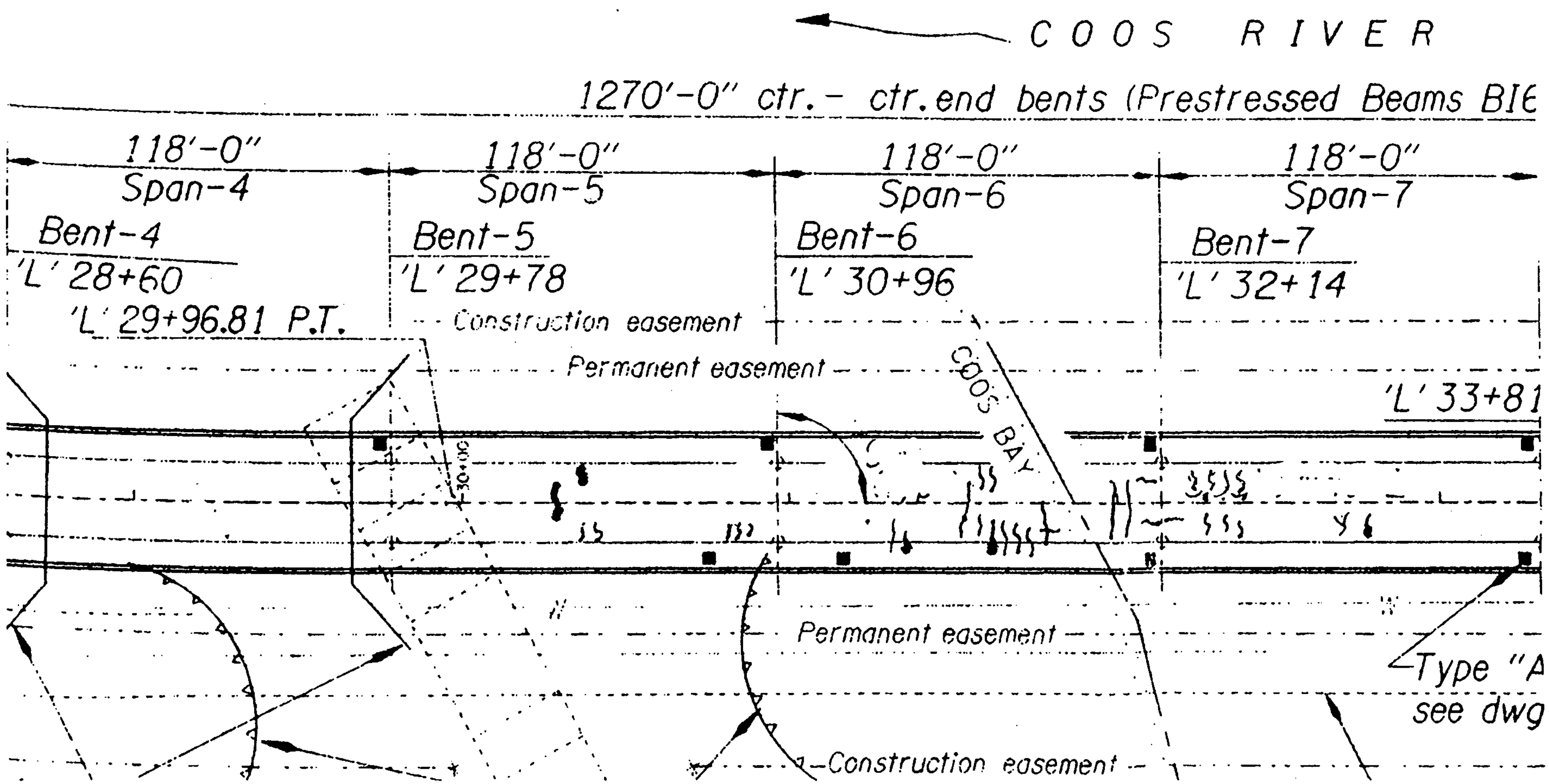
Top view of USBR Deck as seen April 1998.



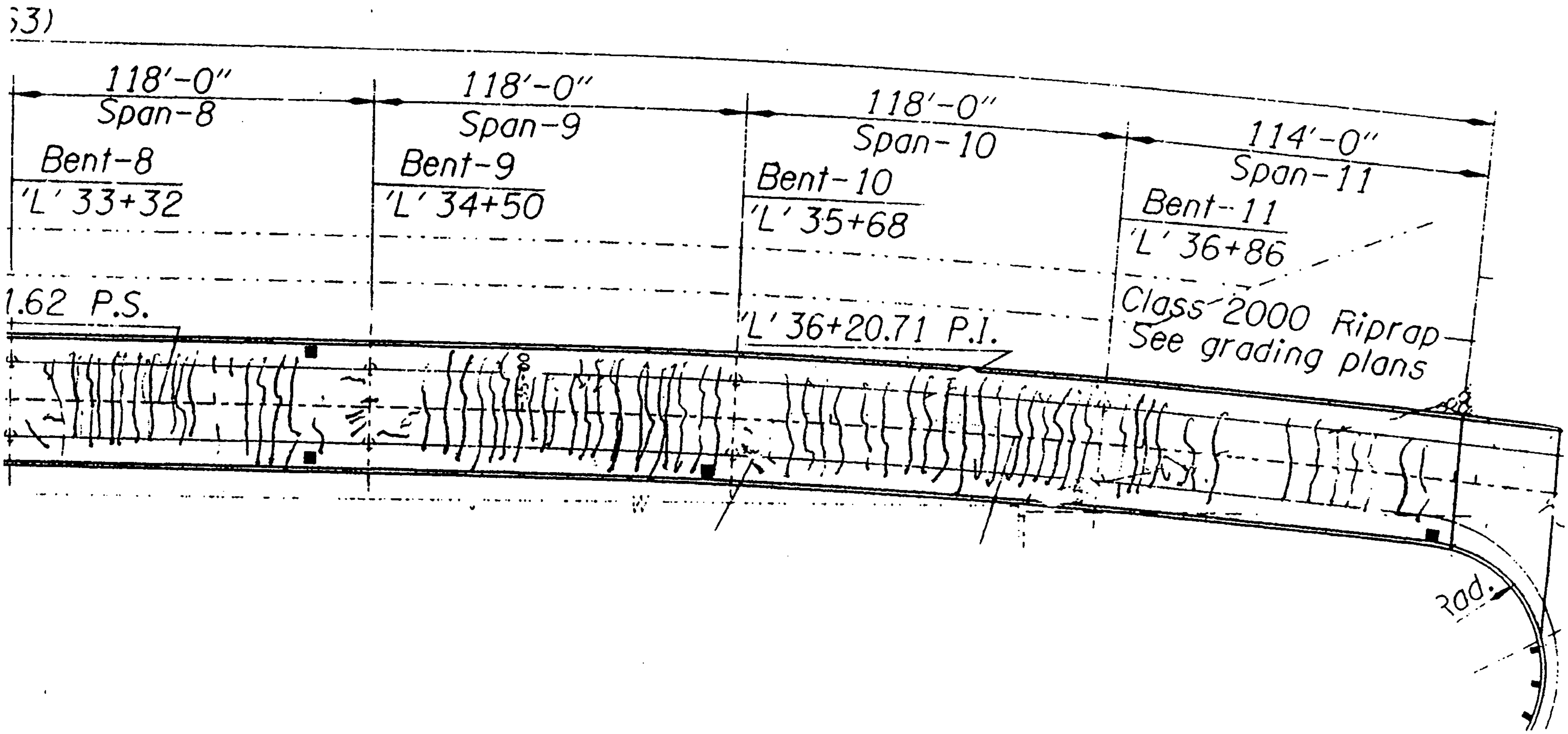
Bottom of USBR Deck as seen April 1998 through the top.



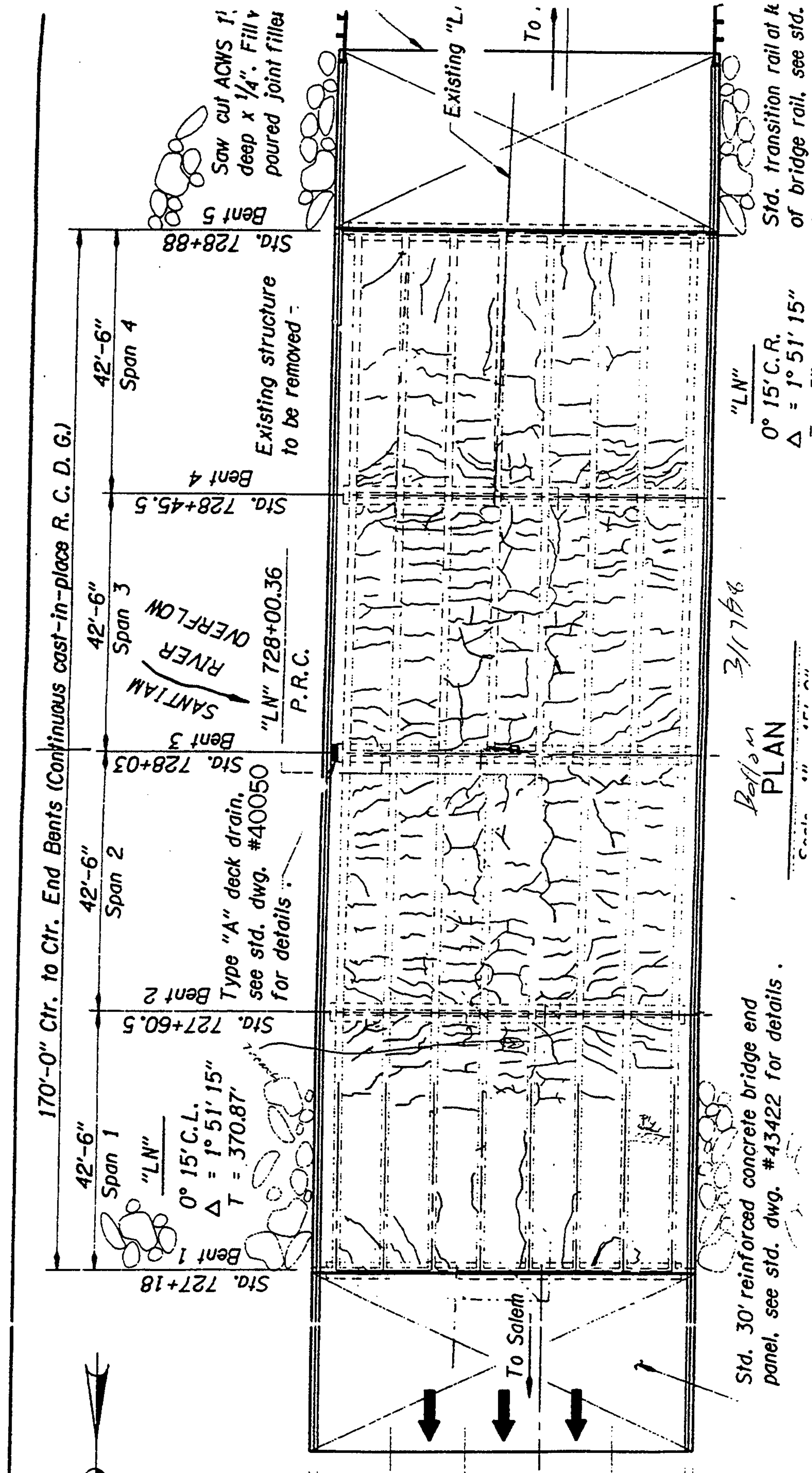
Top view of Catching Slough deck, spans 1 through 3

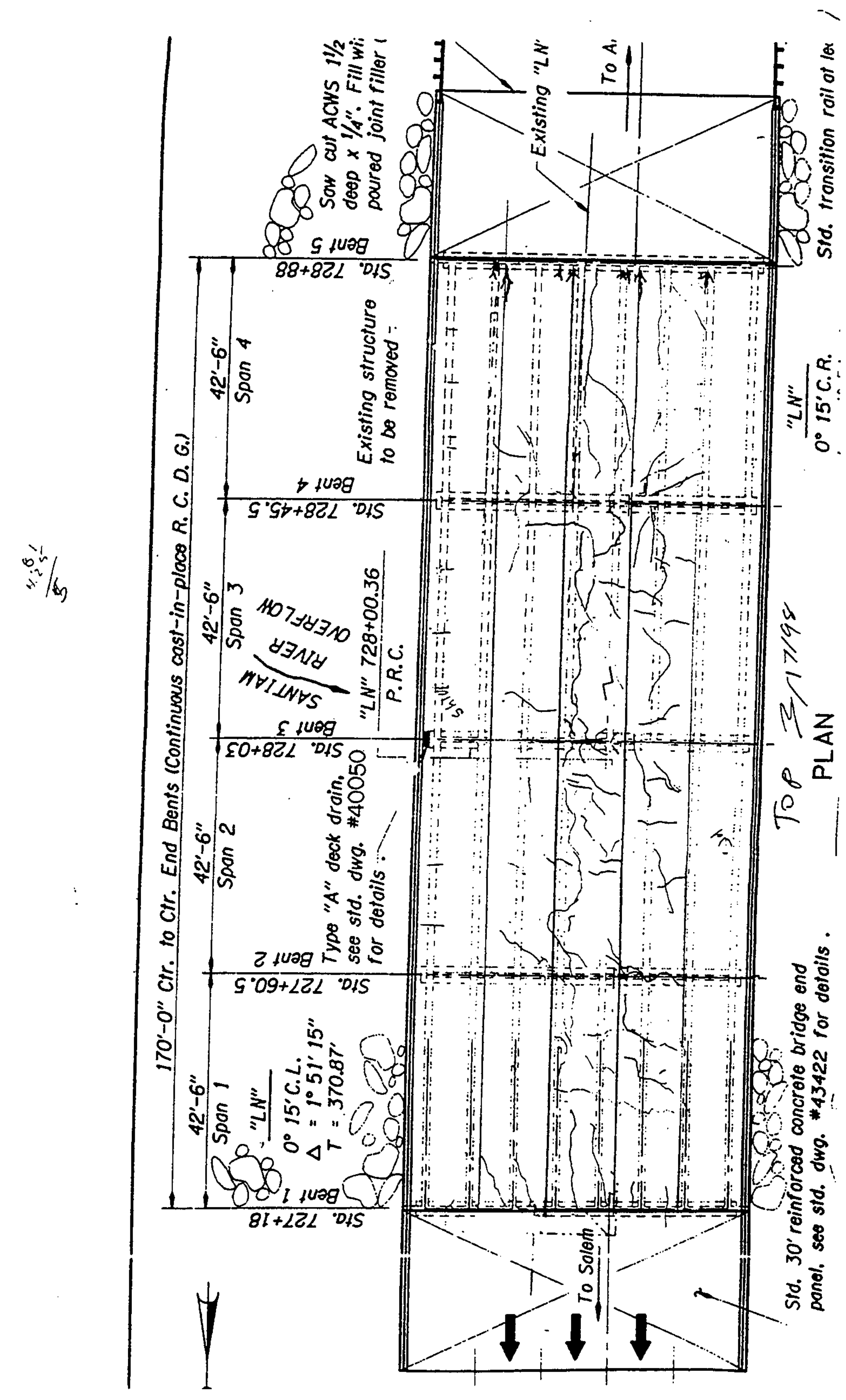


Top view of Catching Slough deck, spans 4 through 7.



Top view of Catching Slough deck, spans 8 through 11.


170'-0" Ctr. to Ctr. End Bents (Continuous cast-in-place R. C. D. G.)
42'-6"
Span 1
42'-6"
Span 2
42'-6"
Span 3
42'-6"
Span 4
"LN"
0° 15' C.L.
Δ = 1° 51' 15"
T = 370.87'
Sta. 727+18
Bent 1
Sta. 727+60.5
Bent 2
Sta. 728+03
Bent 3
Sta. 728+45.5
Bent 4
Sta. 728+88
Bent 5
Type "A" deck drain, see std. dwg. #40050 for details.
SANTIAM RIVER OVERFLOW
"LN" 728+00.36
P.R.C.
Existing structure to be removed.
Existing
"LN"
0° 15' C.R.
Δ = 1° 51' 15"
PLAN
To Salem
Std. 30' reinforced concrete bridge end panel, see std. dwg. #43422 for details.


170'-0" Ctr. to Ctr. End Bents (Continuous cast-in-place R. C. D. G.)
42'-6"
Span 1
42'-6"
Span 2
42'-6"
Span 3
42'-6"
Span 4
Sta. 727+18
Bent 1
Sta. 727+60.5
Bent 2
Sta. 728+03
Bent 3
Sta. 728+45.5
Bent 4
Sta. 728+88
Bent 5
"LN"
0° 15' C.L.
Δ = 1° 51' 15"
T = 370.87'
Type "A" deck drain, see std. dwg. #40050 for details.
SANTIAM RIVER OVERFLOW
"LN" 728+00.36
P.R.C.
Existing structure to be removed.
Saw cut ACWS 1½ deep x ¼". Fill wi
poured joint filler
Existing "LN"
To A
Std. transition rail at le
"LN"
0° 15' C.R.
TOP 3/17/98
PLAN
To Salem
Std. 30' reinforced concrete bridge end panel, see std. dwg. #43422 for details.

APPENDIX B:

REGION BRIDGE INSPECTORS' REPORTS

OREGON DEPARTMENT OF TRANSPORTATION

Page No: 1 Bridge Inspection Report Br No 08345

Br Name(6) USBR CANAL		Insp Date(90) 02 01 97	
(7) US 97 (004)	Rt(5b-e) 21000970	Insp Freq(91) 24	H(122) 4
WearSurf(108) 620	Level of Imp	UW Cond Date(93B) NA	MP(11) 273.71
AC Depth	ConfinedSpace	Inspector 1 No. S0005	Len(49) 272
Temp.Struct(103)	District(2) 11	Inspector 2 No. 000000	Width(52) 62.6
		C-Group R4 Monitor	RType(5a) 1 on

Signature

CONDITION STATUS REPORT File: Region4

NAT BIS	ELE MNT	ELEMENT DESCRIPTION	ENV	TOTAL QUANT	UNIT	% IN 1	EA 2	PONTIS 3	COND 4	5	NBI RAT
58p	112	Concrete Deck-Bare	3	171	CSFt	100	0	0	0		8
58s	102	Concrete-Bridge Railing	3	544	LnFt	100	0	0			
58s	092	Compression Joint Seal	3	140	LnFt	100	0	0			
	SF1	Concrete-Deck Cracking	3	1	Each	100	0	0	0		
	SF2	Concrete-Deck Soffit	3	1	Each	98	2	0	0	0	
59s	095	Elastomeric Bearing	1	30	Each	100	0	0			
59s	096	Move Bearing(Roller,Slider,Etc)	1	10	Each	100	0	0			
59p	007a	St-Exter-Open Girder-Paint A	1	136	LnFt	100	0	0	0	0	8
59p	007b	St-Inter-Open Girder-Paint A	1	408	LnFt	100	0	0	0	0	8
59p	010a	Ext-Concrete-Open Girder	1	408	LnFt	100	0	0	0		8
59p	010b	Int-Concrete-Open Girder	1	1632	LnFt	100	0	0	0		8
59p	035	Concrete-Floor Beam	1	210	LnFt	100	0	0	0		8
59s	155	Steel-Diaphragm-Paint A	3	35	LnFt	100	0	0	0	0	
59s	159	Concrete-Diaphragm	1	14	LnFt	100	0	0	0		
60p	057	P/S Conc-Post,Col/PileExtn(Wet)	1	9	Each	100	0	0	0		8
60p	051	Concrete-End Bent (Dry)	3	2	Each	80	20	0	0		8
				70	LnFt						

OTHER NBI ITEMS

Traffic safety - ADEQUACY
- bridge railings --------- Item 36A : 1
- transitions ------------- Item 36B : 1
- appr. guardrail --------- Item 36C : 1
- appr. guardrail ends ---- Item 36D : 1

Channel & channel protect.- Item 61 : 8
Operational Status--------- Item 41 : A
Bridge posting ------------ Item 70 : 5
Waterway adequacy --------- Item 71 : 8
Approach alignment -------- Item 72 : 7

OTHER OBSERVED CONDITIONS

Deck Wearing Surface ------- : 8
Deck Drains ---------------- : 8
Approach Pavement & Embankmt : 8
Approach Shoulder & Embankmt : 8
Guardrail ------------------ : 8
Debris on Cap/Bearing Area - : 7
High Load Collisions ------- : 00

UNDER CONSTRUCTION

Contract Number :
Widening ------ :
Replacement --- :
New ----------- :

REMARKS

ELEM NO.	BENT/ SPAN	MEMBER ID	C #	DEFICIENCY DESCRIPTION	TEMP REPAIR
112	S 1-4	deck	1	trans and other cracking in deck	
SF2	S 3,4	deck	1	minor shrinkage cracking	
007a	S 3	gird	1	stiffener damage to #1 girder	
007a	S 3	gird	2	crack in web/flng weld at stiff at mid span	

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007b	S 3	gird	1	rat hole, fab. burn hole, @mid sp on all,topand bottom
007b	S 3	gird	2	welds at bottom flange tapers not ground #5
007b	S 3	gird	3	girder sawed and repaired during 1993 redecking
007b	S 3	gird	4	crack in web/flng weld at top, at stiff , mid span
051	B 1,5	joints	1	joint opening blocked by excess conc.

MAINTENANCE RECOMMENDATIONS

ELEM NO.	WORK ORDER	BENT/ SPAN	MEMBER ID	C #	WORK NEEDS LIST	EST COST	ACT COST	COMPLT DATE
112	BR CREW	S1-4	deck	1	seal with methacrylate,drip	001500	000000	000000
007b	BR CREW	S 3	gird	1	use die grind to smooth holes	000000	000000	030195
051	BR CREW	B1,5	joint	1	chip outexcess conc underseal	001600	000000	000000

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Br Name(6) CATCHING SLOUGH		Insp Date(90) 02 96	
(7) HWY 241 COOS R HWY	Rt(5b-e) 41000002	Insp Freq(91) 24	H(122) 241
WearSurf(108) 101	Level of Imp D	UW Cond Date(93B)1995	MP(11) 2.23
AC Depth	ConfinedSpace	Inspector 1 No. S0011	Len(49) 1270
Temp.Struct(103)	District(2) 07	Inspector 2 No.	Width(52) 42.7
		C-Group Monitor	RType(5a) 1 on

Signature Michael Kuffer

CONDITION STATUS REPORT

NAT BIS	ELE MNT	ELEMENT DESCRIPTION	ENV	TOTAL QUANT	UNIT	% IN EA PONTIS COND 1	2	3	4	5	NBI RAT
58p	126	Concrete Deck-Prt w/Coated Bars	2	542	CSFt	100	0	0	0		8
58s	102	Concrete-Bridge Railing	2	2700	LnFt	100	0	0			
58s	105	Strip Seal	2	86	LnFt	100	0	0			
	SF1	Concrete-Deck Cracking	2	1	Each	100	0	0	0		
	SF2	Concrete-Deck Soffit	2	1	Each	60	40	0	0	0	
59s	143	Disk Bearing	2	10	Each	100	0	0			
59p	009a	Ext P/S Concret-Open Girder	2	2562	LnFt	100	0	0	0		8
59p	009b	Int P/S Concret-Open Girder	2	3843	LnFt	100	0	0	0		8
59p	035	Concrete-Floor Beam	2	400	LnFt	100	0	0	0		8
59s	159	Concrete-Diaphragm	2	352	LnFt	100	0	0	0		
60p	047	Conc-Posts,Col/Pile Extn(Dry)	2	20	Each	100	0	0	0		8
60p	051	Concrete-End Bent (Dry)	2	2	Each	100	0	0	0		8
				92	LnFt						
60p	065	Conc-SubmrgdSill,PileCap/Footng	2	7	Each	100	0	0	0		8
65s	100	Concrete-Approach Slab	2	2	Each	100	0	0	0		

OTHER NBI ITEMS

Traffic safety - ADEQUACY
- bridge railings --------- Item 36A : 1
- transitions ------------- Item 36B : 1
- appr. guardrail --------- Item 36C : 1
- appr. guardrail ends ---- Item 36D : 1

Channel & channel protect.- Item 61 : 9
Operational Status--------- Item 41 : A
Bridge posting ------------ Item 70 : 5
Waterway adequacy --------- Item 71 : 9
Approach alignment -------- Item 72 : 8

OTHER OBSERVED CONDITIONS

Deck Wearing Surface ------- : 7
Deck Drains ---------------- : 8
Approach Pavement & Embankmt : 8
Approach Shoulder & Embankmt : 8
Guardrail ------------------ : 8
Debris on Cap/Bearing Area - : 8
High Load Collisions ------- : 00

UNDER CONSTRUCTION

Contract Number :
Widening ------ :
Replacement --- :
New ----------- :

REMARKS

ELEM NO.	BENT/ SPAN	MEMBER ID	C #	DEFICIENCY DESCRIPTION	TEMP REPAIR
126	ALL	DECK	1	THE RIDE IS ROUGH	
126	ALL	DECK	2	MORE THAN NORMAL CRK TOP & BTM	
126	ALL	DECK	3	TRANS. CRKS WITH EFFL. STAINS	
105	ALL	JOINT	1	JOINTS FULL OF DEBRIS ALREADY	

MAINTENANCE RECOMMENDATIONS

OREGON DEPARTMENT OF TRANSPORTATION

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Br Name(6) SANTIAM O'FLOW NO. 4 — Insp Date(90) 04 17 97
(7) INTERSTATE 5 — Rt(5b-e) 11000050 — Insp Freq(91) 24 — H(122) 1
WearSurf(108) 611 — Level of Imp I — UW Cond Date(93B) NA — MP(11) 240.42
AC Depth — ConfinedSpace — Inspector 1 No. S0024 — Len(49) 170
Temp.Struct(103) — District(2) 04 — Inspector 2 No. — Width(52) 62.7
C-Group R2 Monitor — RType(5a) [illegible]on
Signature ______________________

CONDITION STATUS REPORT

NAT BIS	ELE MNT	ELEMENT DESCRIPTION	ENV	TOTAL QUANT	UNIT	% IN EA PONTIS COND 1	2	3	4	5	NBI RAT
58p	112	Concrete Deck-Bare	3	140	CSFt	100	0	0	0		8
58s	102	Concrete-Bridge Railing	3	588	LnFt	100	0	0			
58s	091	Pourable Joint Seal	3	124	LnFt	95	5	0			
	SF2	Concrete-Deck Soffit	3	1	Each	20	78	0	2	0	
59p	010A	Ext-Concrete-Open Girder	3	468	LnFt	98	2	0	0		8
59p	010B	Int-Concrete-Open Girder	3	1404	LnFt	100	0	0	0		8
59s	159	Concrete-Diaphragm	3	715	LnFt	100	0	0	0		
60p	041	Conc-Cap	3	3	Each	100	0	0	0		8
				189	LnFt						
60p	058	Conc-Post,Col/Pile Extensn(Wet)	3	33	Each	100	0	0	0		8
60p	051	Concrete-End Bent (Dry)	3	2	Each	100	0	0	0		8
				124	LnFt						
	SF6	Scour	3	1	Each	100	0	0			
65s	100	Concrete-Approach Slab	3	2	Each	100	0	0	0		

OTHER NBI ITEMS

Traffic safety - ADEQUACY
- bridge railings ---------- Item 36A : 1
- transitions -------------- Item 36B : 1
- appr. guardrail --------- Item 36C : 1
- appr. guardrail ends ---- Item 36D : 1

Channel & channel protect.- Item 61 : 8
Operational Status--------- Item 41 : A
Bridge posting ------------ Item 70 : 5
Waterway adequacy --------- Item 71 : 9
Approach alignment -------- Item 72 : 8

OTHER OBSERVED CONDITIONS

Deck Wearing Surface ------- : 8
Deck Drains ---------------- : 8
Approach Pavement & Embankmt : 8
Approach Shoulder & Embankmt : 8
Guardrail ------------------ : 8
Debris on Cap/Bearing Area - : 8
High Load Collisions ------- : 01

UNDER CONSTRUCTION

Contract Number :
Widening ------ :
Replacement --- :
New ----------- :

REMARKS

ELEM NO.	BENT/ SPAN	MEMBER ID	C #	DEFICIENCY DESCRIPTION	TEMP REPAIR
SF2	ALL	DECK	1	TRANSVERSE AND LONGITUDINAL CRACKS UNDERSIDE OF DECK	
SF2	ALL	DECK	2	W/LIGHT TO MODERATE EFFLORESCENCE THRUOUT.	
010A	EXT.	GIRDER	1	COLLISION DAMAGE FROM EQUIPMENT DURING CONSTRUCTION.	
SF6	SCOUR	HOLE	1	LARGE SCOUR HOLE UPSTREAM BT.2 (NO PROB.)2/96,1/97.	

MAINTENANCE RECOMMENDATIONS

ELEM	WORK	BENT/	MEMBER	C	WORK	EST	ACT	COMPLT

OREGON DEPARTMENT OF TRANSPORTATION
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NO. ORDER SPAN ID # NEEDS LIST COST COST DATE

MEMO:
NOTE: 15 MIN INSP (2 INSP.)
DATA ENTRY 5 MIN.

* ** *** PAINT SYSTEM *** ** *

Type: Prime Int. Top
Steel Tons Visual Last Painted Freq Contract No.
Paint Cond Env Quant Unit 1 2 3 4 5 Prev. Years Painted

Comments

* ** *** LOAD RATING *** ** *

OperRating(64) 2 Type 84 Tons InvRating(66) 2 Type 50 Tons

L.R. Calc. Date
Oper.Rating Factors Posted Loads
Type 3 Config Tons
3S-2 Config Tons
3-3 Config Tons

SPECIAL INSPECTIONS

Frac Crit Insp	Date	NA	Freq
Underwater Insp	Date	NA	Freq
Movable Insp	Date		Freq
Coastal Br Insp	Date		Freq
Major Insp	Date		Freq
Segmental Insp	Date		Freq
Suspension Insp	Date		Freq
ElectroSlagWeld	Date		Freq
Redund Pin & Han	Date		Freq

OTHER INSPECTION ACTIVITIES

Cross Channel Prof	Date	Freq
Deck Survey	Date	Freq
Fatique Prone	Date	Freq
Snooper Insp	Date	Freq
Timber Boring	Date	Freq
Timber Boring(Rev)	Date	
Clearance Measure	Date	
Quality Assurance	Date	
Scour Monitor (113) 3	Date	

'ext Scheduled Routine Inspection 4 17 1999
.quipment Needed

CROSS-CHANNEL

Profile Date : 01 14 1997
Initial Point:
Or: TOP OF RAIL EAST SIDE.

Page Number: 01

Distance	Depth	Location	Distance	Depth	Location
50.5	13.0	BTM.RIPRAP			
73.6	16.6				
116.8	17.1	BTM.STRM.			
146.2	15.8	WATER ELEV.			

146.2	21.8	SCOUR HOLE
136.0		EDGE OF SCOUR
158.2	19.8	" " "
175.2	16.0	BTM.RIPRAP
202.0		