EXPERIMENTAL FEATURES PROJECTS

Category 2

E X P E R I M E N T A L D E C K J O I N T S E A L S

INTERIM REPORT

OREGON STATE HIGHWAY DIVISION
Research Section

July 17, 1974

EXPERIMENTAL DECK JOINT SEALS

Interim Report

Introduction

In 1971, the Oregon State Highway Division began to participate in the National Experimental and Evaluation Program (NEEP) Project No. 11 - Development of Watertight Bridge Deck Joint Seals. The purpose of this program was to evaluate several new proprietary bridge deck expansion joint seals which were claimed to prevent unsightly and structural damaging moisture leakage.

A work plan was developed whereby inspections were to be made at final inspection when the structure was completed, at six months after installation and annually thereafter for a minimum of three years. The latter requirement was changed to two annual inspections, specifically during the months of January and July. This change ensured inspections during extreme weather conditions.

The performance of the joints was rated in four general areas:

1. Did the joint leak?
2. Was the joint damaged?
3. Was the joint noisy under traffic?
4. What was the rideability quality?

Observations and Conclusions

Generally speaking, the single neoprene compression joint seals supplied by both Acme Highway Products Corporation and the D. S. Brown Company and as shown on the attached detail sheet have performed very satisfactorily. Almost all joints have had no leakage and have given a smooth quiet ride. In one instance, leakage has

been reported at an angle point in the sidewalk and in one other case moisture was detected at a location where the seal had been depressed 1-3/4 in. below the top of the deck. It appears this type of joint seal is adequate when designed and installed properly.

Some problems have been noted with the modular neoprene joint seals. Reports have indicated that several of the multiple units are noisy, due to the spacer bar striking the support bar under vehicular traffic. In one instance the spacer bar was bent apparently due to being hit by a snow plow blade. The installation of a modular seal containing 8 cells continued to be troublesome. The hold-down system, developed to lessen the noise by means of a flat spring under the joint, required repairs because several hold-down bolts and springs were missing and had to be replaced. Under traffic, the hold-down system tends to work loose causing frequent maintenance.

At two locations, one containing a double unit and the other a triple unit, sanding material was reported to cause the seals to depress and deform allowing moisture to pass.

For the most part, leakage has not been a problem, but design improvements will have to be made to lessen the noise problem before the modular system will be completely acceptable.

Reports on the Transflex joints have generally indicated negative qualities. Some joints were reported noisy while some were reported noisy and leaking. In one instance, the joint was hit by a snow plow blade, but this was due to poor installation.

Because of the problems associated with the Transflex joints, very limited use is planned. Any design or installation improvements, or suggestions by the manufacturer, will be investigated, however.

All Wabo-Maurer seals including single and multiple cell units and also the strip seal type were reported to have no leaks and all gave smooth quiet rides. Continued use of the Wabo-Maurer deck joint seals is planned.

A cost comparison of the different deck joint seals could not be made since they were not a separate bid item. The cost of the seals was included in the bid price of concrete. An effort will be made on future contracts to obtain cost data.

It is the intention of the Highway Division to continue the inspection and evaluation of deck joint seals for the final report due July 1, 1976.

Attached is a summary showing individual deck joint seal performance.

July 17, 1974

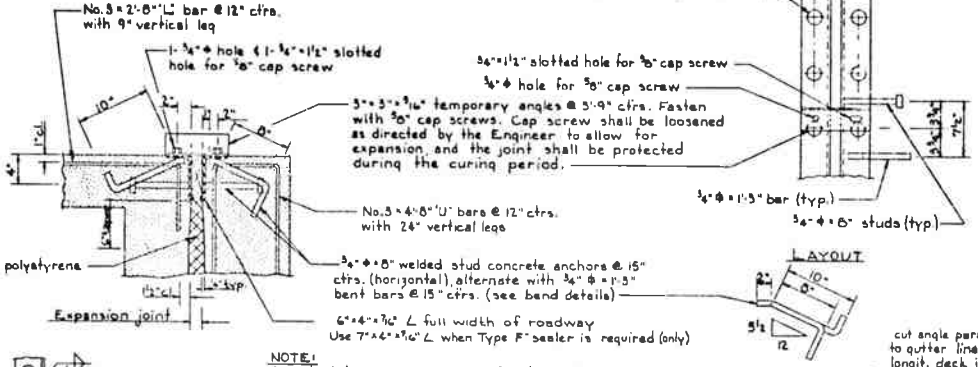
BRIDGE DECK JOINT SEALS SUMMARY

Structure	Location	Type of Seal	Remarks
Willamette River Bridge at Albany #9806	Abt. 2	Single Seal	Smooth ride, quiet, no leaks.
	Pier 7	Multiple Seal 3 Unit	Smooth ride, no leaks, noisy due to deflecting I bars. Very noticable under heavy traffic.
Johnson Road #9736	Bent 2	Multiple Seal 2 Unit	Smooth ride, quiet, no leaks.
	Bent 4	Multiple Seal 2 Unit	Smooth ride, quiet, no leaks.
Tualatin River Bridge NB and SB #9737 & #9737A	Bent 4	Multiple Seal 2 Unit	Slightly noisy and minor leaking. Sanding material has caused the neoprene seal to depress and deform letting moisture pass. Top of joint is 1/2 in. to 1-1/2 in. below deck in wheel tracks.
L's O'xing #9743B	Bent 5	Multiple Seal 3 Unit	Slightly noisy and minor leaking. Sanding material has caused the neoprene seal to depress and deform letting moisture pass. Top of joint is 1/2 in. to 1 in. below deck in wheel tracks.
Sunset Avenue #9723	Abt. 1	Single Seal Type D	Smooth ride, quiet. Leak at the angle point in the sidewalks.
	Abt. 2	Single Seal Type D	Smooth ride, quiet. Leak at the angle point in the sidewalks.
West Linn Bridge #9403	Pier 3	Transflex 400	Smooth ride, noisy, joint leaks due to distortion of seal. Edges of sections are tending to pull away from each other.
	Pier 6	Multiple Seal 8 Unit	Smooth ride, noisy, no leaks. Hold-down bolt and spring are missing. Needs repairs.

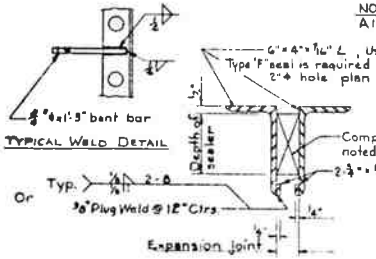
Structure	Location	Type of Seal	Remarks
Eagle Creek Viaduct #9382	Bent 8	Finger Plates with Trough	Smooth ride, quiet, no leaks.
Frazier Street #9535	Near Bent 2	Multiple Seal 2 Unit	Smooth ride, quiet, no leaks. Steel separation bar is bent slightly, hit by snow plow - higher than armored corners.
	Near Bent 3	Single Seal Type E	Smooth ride, quiet, little leakage.
OreDell O'xing #8431A	Bent 1	Single Seal Type F	Smooth quiet ride, no leaks.
	Bent 4	Single Seal Type F	Smooth quiet ride, no leaks.
Wallowa Lake EB and WB #9632	Bent 4	Multiple Seal 2 Unit	Smooth quiet ride, no leaks.
McAlister Lane #9634	Abt. 1	Transflex 200	Smooth ride, quiet, seal leaks.
	Abt. 2	Transflex 200	Smooth ride, quiet, seal leaks.
Union Junction Interchange WB #9635	Bent 5	Finger Plates with Trough	Smooth ride, quiet, trough system successful.
Great Northern RR O'xing #9692	Bent 1	Single Seal Type E	Smooth ride, quiet, no leaks.
Riverside Drive #9693	Bent 1	Multiple Seal 2 Unit	Smooth ride, quiet, no leaks.

Structure	Location	Type of Seal	Remarks
Siletz River Bridge #9906	Abt. 1	Transflex 200A	Rough ride and noisy due to abrupt change in grade.
	Near Pier 1	Transflex 400A	Rough ride and noisy due to abrupt change in grade.
Snake River Bridge #4412A	Pier 4	Wabo-Maurer SB-400	Smooth ride, quiet, no leaks.
Campbell Street Bridge #9515	Bent 2	Single Seal Type F	Rough ride and noisy due to seal being 1 in. below top of AC. No leaks.
	Bent 3	Single Seal Type F	Rough ride and noisy due to seal being 1 in. below top of AC. No leaks.
Campbell Street Bridge #9515A	Bent 2	Single Seal Type F	Rough ride and noisy due to seal being 1 in. below top of AC. No leaks.
	Bent 3	Single Seal Type F	Rough ride and noisy due to seal being 1 in. below top of AC. No leaks.
Union Junction Interchange EB #9635A	Bent 1	Single Seal Type F	Smooth ride, quiet, no leaks.
Cove Avenue Bridge #9633	Bent 2	Single Seal Type F	Smooth ride, quiet, no leaks.
	Bent 4	Single Seal Type F	Smooth ride, quiet, joint leaks. Seal has been depressed 1-3/4 in. below top of deck.
South Santiam River Bridge (Sanderson) #1771A	Pier 2	Wabo-Maurer D-520 2 Unit	Smooth ride, quiet, no leaks.
	Pier 5	Wabo-Maurer D-260 Single	Smooth ride, quiet, no leaks.

Structure	Location	Type of Seal	Remarks
Santiam River Bridge (Continued)	Pier 8	Single Seal Type F	Smooth ride, quiet, no leaks.
92nd Avenue O'xing #9711 and #9711A	Bent 1	Wabo-Maurer D-260 Single	Structure not completed.
	Bent 4	Wabo-Maurer D-260 Single	Structure not completed.
Goshen O'xing #6836A	Bent 5	Transflex 150A	Smooth quiet ride. Some seal leakage. Movement under traffic rotates exterior edges of seal.
First to Seventh Viaduct #9600	Bent L3	Triple Wabo-Maurer D-780	Smooth ride, quiet, no leaks.
	Bent JF5	Double Wabo-Maurer D-520	Smooth ride, quiet, no leaks.
	Bent WN5	Double Wabo-Maurer D-520	Smooth ride, quiet, no leaks.
	Bent JF5 (6th off)	Single Wabo-Maurer D-260	Smooth ride, quiet, no leaks.
	Bent JF7	Single Wabo-Maurer D-260	Smooth ride, quiet, no leaks.
	Bent WN7	Single Wabo-Maurer D-260	Smooth ride, quiet, no leaks.
	Bent JF9	Double Wabo-Maurer D-520	Smooth ride, quiet, no leaks.

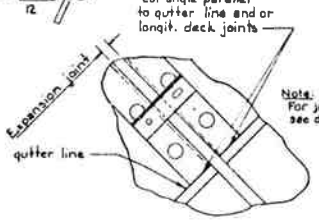


NOTE:
All steel to be A.S.T.M. Specification A36



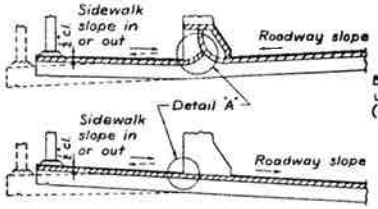
TYPICAL WELD DETAIL

JOINT WITH ARMORED CORNER
Scale: 3" = 1'-0"



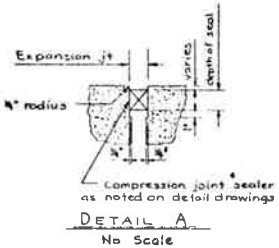
DETAIL AT GUTTER

ARMORED CORNER DETAILS
Scale: 1½" = 1'-0" (except as noted)

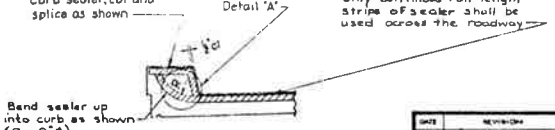


Bend joint sealer up into parapet (R = 9"±)

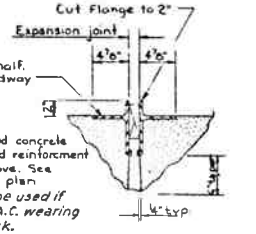
SEALER AT (TYPE G) PARAPET
No Scale



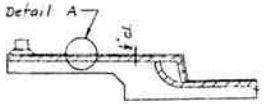
DETAIL A
No Scale



SEALER AT (2 TUBE) CURB
No Scale

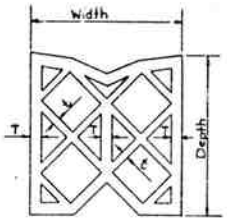


PAVING DAM DETAILS
Scale: 1½" = 1'-0"



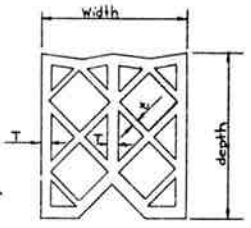
SEALER AT SIDEWALKS
No Scale

Note: Details for sidewalks are similar to those for parapets & curbs unless shown otherwise.

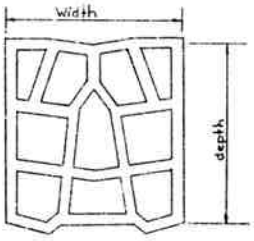


ALTERNATE 1 BRIDGE SEAL

DIMENSIONS FOR ALTERNATE 1 BRIDGE SEAL				
TYPE	WIDTH	DEPTH	THICKNESS T	
B	1⅞" +0.156" -0.063"	2" ±0.062"	1/16" +0.031" -0.016"	½" +0.016" -0.032"
C	2" +0.156" -0.063"	2 1/16" ±0.062"	1/16" +0.031" -0.016"	3/32" +0.031" -0.016"
D	2¼" +0.218" -0.088"	2 3/16" +0.187" -0.109"	3/16" +0.032" -0.016"	3/32" +0.032" -0.016"
E	3" +0.250" -0.101"	3 13/32" ±0.1875"	3/16" +0.047" -0.016"	⅛" +0.032" -0.016"
F	4" +0.313" -0.127"	4 25/32" ±0.250"	¼" +0.047" -0.032"	3/16" +0.032" -0.016"



TYPES B AND C



TYPES D, E AND F

ALTERNATE 2 BRIDGE SEAL

DIMENSIONS FOR ALTERNATE 2 BRIDGE SEAL				
TYPE	WIDTH	DEPTH	THICKNESS T	
B	1⅞" +0.156" -0.063"	1 3/16" ±0.062"	5/64" +0.031" -0.016"	5/64" +0.016" -0.032"
C	2" +0.156" -0.063"	2" ±0.062"	3/32" +0.031" -0.016"	3/32" +0.031" -0.016"

			JOINT LIMITS	
			MINIMUM*	MAXIMUM**
D	2½" +0.1875" -0.0	2 5/8" ±0.125"	1"	2 1/8"
E	3" +0.1875" -0.0	3 1/4" ±0.1875"	1 1/4"	2 1/2"
F	4" +0.250" -0.0	4 3/8" ±0.1875"	1 3/4"	3 3/8"

* Minimum dimension – Force (lbs./Ln. Inch) shall not exceed 50 lbs./Ln. inch.

** Maximum dimension – Force (lbs./Ln. Inch) shall not be less than 10 lbs./Ln. inch

Web and Shell Tolerance not needed as Force-Deflection criterion assures tolerances within parameter of movement Category

DATE	REVISION
6-1-70	Note Revision
2-1-72	Sealer at Sidewalks
2-7-73	added note
7-1-73	Curb, parapet, see details

DATE	REVISION
9-27-66	Width Option
5-29-68	Detail 'A'
6-1-68	Alternate 2 Bridge Seal
9-24-68	Joint Sealer Splice
9-24-68	Dimensions
01-70	Alternate 2 Bridge Seal

APPROVED: [signature] BRIDGE ENGINEER

DESIGNED GDR DRAWN CHECKED CALC. BOOK

OREGON STATE HIGHWAY DEPARTMENT
BRIDGE DIVISION

STANDARD EXPANSION JOINT DETAIL

WITH AND WITHOUT ARMORED CORNERS

DATE April 7, 1967 SHEET OF

BRIDGE NO. STANDARD DRAWING NO. 22970