MARTIN WAY O'XING
CEVA-CRETE
EXPANSION JOINT
SYSTEM, BRIDGE NO. 5/337

WA-RD 349.1

Final Report
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Washington State
Department of Transportation
Washington State Transportation Commission
Transit, Research, and Intermodal Planning (TRIP) Division
in cooperation with the U.S. Department of Transportation
Federal Highway Administration
The study was conducted in cooperation with the U. S. Department of Transportation, Federal Highway Administration.

This final report details the field performance of a Ceva-Crete Expansion Joint system on an I-5 bridge in Olympia, Washington. The Ceva-Crete system employs an elastomeric concrete that is vulcanized in place to handle impact loads on the joint and a low density closed cell material (Evazote 50) that is epoxied to the steel nosing of the joint, to act as the seal.

The performance of the joint system was evaluated after a five year period.
MARTIN WAY O'XING
CEVA-CRETE EXPANSION
JOINT SYSTEM

Bridge No. 5/337

by

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FINAL REPORT

Experimental Project WA 86-03A

Prepared for the Washington State Department of Transportation in cooperation with the United States Department of Transportation Federal Highway Administration
The contents of this report reflect the view of the author(s) who is (are) responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Washington State Transportation Commission, Department of Transportation, or the Federal Highway Administration. This report does not constitute a standard, specification, or regulation.
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INTRODUCTION

Bridge expansion joints pose a special problem in the Washington State Department of Transportation (WSDOT) Bridge Deck Management System. These devices are subject to repeated heavy dynamic loading, and premature failure has occurred in many cases. Delaminations in the deck concrete adjacent to the expansion joints, caused by salt contamination, are common. Construction is also a problem. The ability to place concrete with good consolidation around the expansion joint requires careful quality control in the field. If voids are found in the concrete behind the expansion dam, epoxy injection is necessary to restore the integrity of the joint anchorage.

It is WSDOT policy, as part of the Bridge Deck Management System, to make expansion joints watertight, allowing surface water to run off the deck to the bridge drains. This is to prevent water and contaminants from leaking onto the substructure and causing corrosion and appearance problems.

The Ceva Prefabricated Joint System uses two relatively new products that appear to enhance the service life of the expansion joint and make it watertight: 1.) Ceva-Crete is an elastomeric concrete that is poured-in-place to bond the steel expansion joint system to the deck. The expansion joint system employs a steel nosing, but no reinforcement extends between the elastomeric concrete and the existing deck concrete. The Ceva-Crete is reported to have the ability to resist wear and the impact loads from heavy trucks. The material also resists environmental detriments. 2.) The Evazote 50 expansion joint seal material, which is installed between the steel nosings (see Appendix A), is designed to withstand relatively large repetitive joint movements. Its wear and non-corrosion properties are claimed to be excellent, and it is resistant to oils and greases. Its resilience is reported to cause rocks and dirt to bounce off.

The purpose of this experimental project was to gain knowledge about the effectiveness of the Ceva-Crete Expansion Joint System over time and to gain knowledge about field installation techniques for use on future contracts.
STUDY SITE

Martin Way O'xing 5/337 E & W in the Olympia area was selected as the site for an experimental installation of the Ceva-Crete Expansion Joint System. Both east and west structures were widened and a 1-1/2 inch thick Latex Modified Concrete overlay was installed over the entire deck. The existing and new transverse joints both received a Ceva-Crete Expansion Joint system. A total of 664 lineal feet of transverse joint was installed.

CONSTRUCTION SUMMARY

The project, Sleater Kinney to Martin Way Interchange, included replacement of the existing expansion joints with the Ceva 300 System. As shown in Appendix B, the system consisted of an angle iron nosing, sinusoidal anchoring system of #4 rebar, Ceva-Crete concrete, and an Evazote 50 compression seal. Total contract costs were $105.85 per lineal foot.

A manufacturer’s representative was on the site during all installation of the Ceva 300 Joint System. In most situations, the contractor followed the manufacturer’s advice and directions.

CONCLUSIONS AND RECOMMENDATIONS

The inspection form "Bridge Deck Joint Device Performance Record" from the FHWA Experimental Project No. 5, Bridge Deck Expansion Joints (Appendix D) was used to rate the final inspection of the joint. Also shown is the evaluation procedure used in the FHWA project. The evaluation is based on a visual inspection.

The Evazote 50 expansion seal was debonding from the steel nosing in some areas. The seal had surface wear in the wheel paths and seemed to be loosing its resiliency.

There is a loud metal clanging noise on one bridge as traffic passes over the joint. The metal nosing is probably banging on the sinusoidal rebar due to a weld
failure between the metal nosing and the sinusoidal rebar. This would have to be verified by a much more in-depth inspection.

An underside inspection of the joints showed water stains on the concrete where the joints were leaking. The metal nosing and the elastomeric concrete appeared to still be in good condition.

The overall rating of the joints was 2.57, which is less than a poor rating of 3.5 per the FHWA evaluation procedures. The 2.57 rating is also less than the 3.68 average rating for compression seals in the FHWA report.

In December 1992, WSDOT surveyed the other Departments of Transportation by AASHTO electronic mail in regard to the performance of the Evazote 50 material. Half of the respondents indicated a problem with the material debonding from the header. The Evazote 50 material was also installed by WSDOT in 1987 on the Lake Valley Road O.C., Bridge No. 90/124N. Considerable debonding and water leakage is evident. When compared to other bridge deck joint devices listed in the FHWA report, this system does not appear to be a better system.
Appendix A
Manufacturer Recommended Installation Procedures
INSTALLATION PROCEDURE FOR CEVA CRETE ELASTOMERIC CONCRETE AND EXPANSION JOINT

1. Set up necessary traffic control.

2. Saw cut new asphalt to exact plan dimensions checking both width and depth against contract documents or to "sound" concrete. Remove all waste asphalt keeping vertical edge neat.

3. Place Ceva 300 System into saw cut area.

4. Level and set joint opening as per plan specification making sure spacer bolts are tightly fastened. (Angle iron might shift during first stages of installation if spacer bolts are not tightly secured.)

5. Sandblast all surfaces of steel, concrete, and asphalt against which Elastomeric Concrete is to be placed. Remove all loose material.

6. Prepare the primer by mixing one part "A" to one part "B", then add 20% Xylene, then mix well and brush. (Note: Approximately 1/2 gallon of "A" with 1/2 gallon of "B" and 20% Xylene will prime all needed surfaces of a 40 foot joint. Rubber gloves should be worn by all persons working with or near the material.)

7. Prime vertical edge and steel areas to be in contact with Elastomeric Concrete. Existing horizontal concrete surface not to be primed.

8. Mix 2 1/2 gallons "A" with 2 1/2 gallons "B" in a clean 5 gallon pail until there is no marbling effect in the material. This should take about five minutes with a good drill or paddle.

9. Put one five gallon pail with aggregate into your mixer. A smaller electric type mixer will work better than a large concrete mixer. After putting in the one pail of aggregate, add the mixed Ceva Resin. Next, add another five gallon pail of aggregate. You will now have one part mixed resin to two parts aggregate. (5 gallons to 10 gallons.) On cool or windy days, warm the aggregate to an average mixing temperature of 110-120°F, and Resin to 80-90°F before mixing to aid in the ease of mixing. Outer edge of aggregate pail will be much warmer than center of pail. Average temperature should be 110°F-120°F. This can be done in the heating chamber on the job. Allow the material to mix in the
mixer until there is no "dry" aggregate. The Ceva Mix should be uniformly black before dumping into a wheel barrow. Be sure the primer has been properly applied as stated in Note 7 above.

10. Dump the properly mixed Ceva Crete into the prepared area behind the expansion joint, making sure that it is thoroughly packed under all steel areas and anchors (i.e., using piece of rebar) trowel smooth. (Approximate pot life on mixed Ceva Crete is 20–30 minutes.)

11. Continue with additional batches of Ceva Crete to fill void area.

12. Place heating chamber over entire poured joint and heat to an average temperature of 150°–170°F for a minimum of 2 hours.

13. Let Ceva 300 Joint System cool for 1 hour before resuming traffic flow.
Appendix B
Plan and Installation Details
NEW JT.
For details not shown, see below.

Top of New Conc. Deck

EXISTING JT.

SECTION THRU DECK JOINT

Sinusoidal Anchoring System #4 Rebar

Eva Por Bonder

NEW JT.

Top of exist Conc. Deck

1½" min.

Exist. Comp. Seal to be removed

*Exist Joint varies from 1" to 1½" @ 60°*

*¾" Open H (norm)*

*Remove Exist. Conc. Cevo-Crete++*

*Cevo-Crete Primer or approved equal.*

*Cevo-Crete***

Lates Modified Concrete Overlay

1½" min.

178° @ 10°

1½" @ 60°

13¼" (Norm)

6" (Norm)

NEW JT.

4½"

+2" 2" +2½" Angle

4½" min.

6°

2½" min.

1½°

Evaart 50 Corp. Seal

Install m/pory on each side

(2½" wide, 12" deep, Uncomp)

*Supplied by seal manufacturer.*
Appendix C
Bridge Plan
Appendix D

Bridge Deck Joint Device

Performance Record
<table>
<thead>
<tr>
<th>Location (SIA)*</th>
<th>Was NEEP Project?</th>
<th>ADTT (Trucks)</th>
<th>Spans No.</th>
<th>Total Length Ft.</th>
<th>Age Years</th>
<th>Skew Angle Degrees</th>
<th>Contributing Length Feet</th>
<th>Theoret. Mov'n'nt Inches</th>
<th>Make Model</th>
<th>Date of Install</th>
<th>Location P (Pier)</th>
<th>Location A (Abut.)</th>
<th>Eng. Est. of Unit Cost in Place: $/LinFt</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
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<tr>
<td>08100 A</td>
<td>No</td>
<td>6200</td>
<td>3</td>
<td>276</td>
<td>5</td>
<td>45</td>
<td>376</td>
<td>1/2</td>
<td>Ceva</td>
<td>7/88</td>
<td>P, A</td>
<td>$160</td>
<td>4.0 3.0 4.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
<td>F</td>
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<tr>
<td>08100 B</td>
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<td>6200</td>
<td>3</td>
<td>281</td>
<td>5</td>
<td>45</td>
<td>281</td>
<td>1/2</td>
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<td>4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
<td>F</td>
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**Remarks, Additional Info., Recommendations:**

*Note: Use Bridge Inventory Identification
EVALUATION PROCEDURES

Each bridge deck expansion joint was evaluated and rated for the following categories:

A. General Appearance
B. Condition of Anchorage
C. Debris Accumulation
D. Watertightness
E. Surface Damage
F. Noise Under Traffic
G. Ease of or Need for Maintenance

A numerical rating system, ranging from 0 to 5, was developed and was assigned to each category by the State personnel conducting the evaluation. Each State participating in the project was furnished a description of each numerical rating for the corresponding category. A rating of 5 indicates nearly new condition or no problems while a rating of zero indicates a complete failure of the particular category. The descriptions for the rating criteria are attached to this report.

The average ratings listed in Tables 8-11 can be classified by using the following general condition criteria:

Poor < 3.50
Fair 3.50 to 3.89
Satisfactory 3.90 to 4.29
Good 4.30 to 4.69
Excellent > 4.70
Appendix E
Final Inspection Photographs
Ceva-Crete Expansion Joint System

at End Pier
Close-Up of
Ceva-Crete Expansion Joint System
at End Pier
Ceva-Crete Expansion Joint System

at Intermediate Pier
Close-Up of
Ceva-Crete Expansion Joint System
at Intermediate Pier