# BRIDGE DECK EXPANSION ASSEMBLY ON I-380 IN WATERLOO

## Final Report for Iowa DOT Project HR-505B

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Highway Division
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Final Report
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# Bridge Deck Expansion Assembly on I-380 in Waterloo

by
Vernon J. Marks
Research Engineer
515-239-1447
Office of Materials
Highway Division
Iowa Department of Transportation
Ames, Iowa 50010

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DISCLAIMER

## INTRODUCTION

In general, Iowa bridges have demonstrated outstanding longevity and quite often have become functionally obsolete before they deteriorate to a condition requiring rehabilitation. Past designs of longer bridges have included expansion joints to accommodate the thermal lengthening and shortening of the bridge deck. Fifteen years ago most of these expansion joints were open finger joints allowing surface water to pass through them. The winter deicing salts produced chloride brine which when allowed to pass through the open expansion joints caused rapid failure of the protective paint and resulted in substantial corrosion of the structural steel.

In an effort to prevent the deicing salt brine from causing corrosion of the structural steel, designs were changed to require sealed expansion joints. For shorter bridges this was a simple impervious membrane fastened to both sides of the expansion joint. For longer bridges, an elaborate, very expensive sealed expansion assembly is necessary to accommodate the larger movements.

## OBJECTIVE

The objective of this research was to evaluate two experimental Acme MSB neoprene expansion assemblies to identify possible construction problems and to determine the long term performance.

## LOCATION

The two experimental joints were constructed on Black Hawk County project I-380-7(55)315. This was a 1490 foot long curved bridge of ramp H from US 218 southbound to I-380 eastbound on the southeast corner of Waterloo.

## CONSTRUCTION

The plans allowed the contractor an option for the expansion joints. Alternate "A" with 7.8 inches of movement was selected for the two experimental joints at pier 3 and pier 7. These two Acme MSB neoprene expansion assemblies were installed with polyurethane springs instead of the steel leaf springs. They are a joint made up of laminated layers of neoprene expansion materials sandwiched between steel supports. They were installed in December 1982 and there were no construction problems. The bridge was not opened to traffic until 1984.

## EVALUATION

The experimental joints were visually reviewed annually to determine if they would:

1. Prevent leakage.
2. Reject debris and dirt.
3. Maintain grade and alignment.
4. Provide a relatively quiet installation under traffic wheel impacts.
5. Resist damage from snowplows and snow removal activities.

JOINT PERFORMANCE

The first evaluation of the joints was in 1984 after the bridge had been open to traffic. At that time, both joints appeared to be preventing leakage through the seal. The 1985 inspection was made during a rain. The northwest joint showed no sign of leakage. The southeast joint was leaking at the north end which is the low side of the superelevated curve. There was one small I-beam structural steel member under this area that had a small area where the paint had come off and it had rusted. The visual condition of the underside of the joints has changed very slowly since that time. Currently, there is evidence of minor rusting near both of the joints with little or no evidence of rusting 15 feet away from the joint. This would indicate that there may be a very small, slow seepage type of leakage that has allowed some deicing chlorides to come through the joint.

Both joints have been very effective in rejecting debris and dirt. There were no problems of maintaining grade and alignment. These joints produce some noise due to traffic wheel impacts, but compared to other expansion joint assemblies, these joints are relatively quiet. There is no indication of snowplow damage.

Some spalling of the concrete on the top surface of the deck along both sides of both joints appeared about seven years af-

ter construction. Since that time, the spalling has continued to increase.

## CONCLUSIONS

This research on bridge deck expansion assemblies supports the following conclusions:

1. There were no construction problems during installation of the joints.

2. In general, the joint assemblies have performed well with no breakage or structural failure of the joint assembly.

3. There is slow leakage at one joint and indication that there is some slow leakage of both joints.