

**BRIDGE DECK  
EXPANSION ASSEMBLY  
ON U.S. 20  
IN SIOUX CITY**

**Final Report for  
Iowa DOT Project HR-505A**

**Federal Highway Administration  
Project No. IA-80-03**

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Highway Division



**Iowa Department  
of Transportation**

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Bridge Deck Expansion Assembly  
on US 20  
in Sioux City

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Bridge Deck Joint Seals

BRF-20-1(33) - Woodbury County, US 20 over Missouri River,  
Pier 6 and Pier 7 (1980)

PROBLEM

Expansion joints have always been a problem in the past for the following reasons:

1. They open and allow leakage.
2. They hold debris and dirt.
3. They don't maintain grade and alignment.
4. The joints are noisy under traffic wheel impacts.
5. They receive damage from snowplows.

Drains have been installed and failed due to freezing of rainwater and debris collecting, both of which clog the drains. Also deicing agents have gone through the drain to the area below causing corrosion of the structural steel. Erosion has occurred where water has drained to the area around the piers.

OBJECTIVES

This project was to determine possible construction problems and evaluate the performance of experimental joint seals.

INTRODUCTION

The project plans provided for the installation of two compression type expansion joints, one at pier 6, the other at pier 7. The expansion assembly at pier 7 was to be entirely furnished and installed by the prime contractor. Pier 6 was to be furnished by State of Iowa prime contractor and installed by State of Nebraska prime contractor.

In the competitive bidding process, the ACME Beta expansion device was selected. The expansion device at pier 7 was installed substantially as detailed in the working drawings by Kramer Brothers Construction subcontractor. The only additional work Kramer was required to perform, not preidentified on the working drawings, was to shim the expansion device to the desired grade. The working drawings provided the two continuous welds at the toe and heel of the flange of the channel from the expansion dam. The shims were continuously welded to the bridge stringers and end floor beams where necessary. The expansion dam channels were then welded to the shims or to the bridge structure itself. In the case of pier 6, a slightly more involved process was necessary. The expansion opening between the channel dams

was not sufficient to permit welding to the bridge structure. Therefore, to provide adequate anchorage of the expansion dam to the bridge, a system of shear connectors was substituted. This system of shear connectors was provided for in extra work order #28. In detail, it provided for the application of two rows of 1/2" diameter Nelson studs. The first row was placed on the end diaphragm and stringers immediately behind the expansion device. The second row was placed on the C12 X 20.7 channel. This installation was identical on the Nebraska and Iowa sides of pier 6. A total of 360 studs were thus applied.

## RESULTS

A visual inspection has been conducted every year since the project was constructed. The last visual inspection was made September 18, 1990. There was evidence of leakage at both pier 6 and pier 7. The edge of the top flange of the abutment diaphragm is corroded and paint on the top of the bottom flange is corroded at pier 7. It was noted on earlier inspections the locations of the corrosion is below the areas where the shims were placed during construction to position the joint. Several of the shims were missing at that time.

There was very loud traffic noise at pier 7 with less noise at pier 6.

There was much debris in the joints and the drain areas had much debris that had washed down into them.

There were areas where the joints appeared not to be tight.

The bellows of the device on the Iowa side has a slit about 4 inches long. The expansion device on the Nebraska side has pulled away from the expansion dam as much as 3/4 of an inch. It has lost contact about 50% of its length across the bridge.

## CONCLUSION

This research on bridge deck joint seals supports the following conclusion:

1. The joint performed well for eight years and then failed rapidly during the period from 8-10 years.
2. The ACME-Beta B-520 joints did not perform satisfactorily.