



Date: 06/24/2004

Evaluation of the Corrosion Resistance of Epoxy Coated Dowel Bars

Nebraska Department of Roads

Research Project Title:

Evaluation of the Corrosion Resistance of Epoxy Coated Dowel Bars

**Research Project Number:
R-2004-02**

Locations:

**I-80 Cozad (Built 1989)
I-80 Goehner (Built 1997)
Hwy 2 Syracuse (Built 2000)**

Starting Date: 06/24/2004

Completion Date: 07/06/2004

Principle Investigators:

George Woolstrum
Engineer of PCC & Tests

Lieska Halsey
Research Engineer

Physical Testing:

Mark Burham
Highway Materials & Test Manager

Sample Coring:

Kate Dodson
Highway Materials & Tests Technician III

Diana Evans
Highway Materials & Tests Technician II

!
!
!
!
!

PURPOSE OF THE RESEARCH PROJECT:

Recently, Minnesota DOT determined that they would only use Stainless Steel Dowel Bars in their concrete pavement projects due to the large amount of corrosion they encountered. The objective of this study will be to determine if the epoxy coated dowel bars currently used in Nebraska are serving as a corrosion free device for the expected service life.

DESCRIPTION OF THE PROJECT:

1. Evaluate concrete pavement sections between 4 and 15 years old.
2. Identify reference points of locations that show surface damage at the joints.
3. Identify dowel bar design spacing location for a core extraction.
4. Evaluate dowel bars at locations that cores are taken.
5. Evaluate cored sections of dowel bars for corrosion and service life

OBJECTIVES

The primary objective of this study is to evaluate the performance of epoxy coated dowel bars in the field.

SCOPE OF THE PROJECT

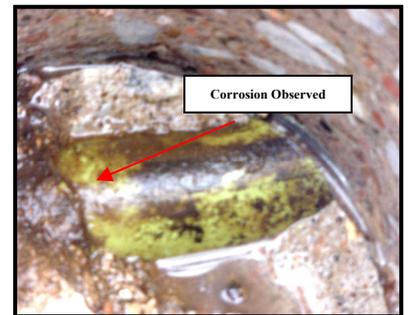
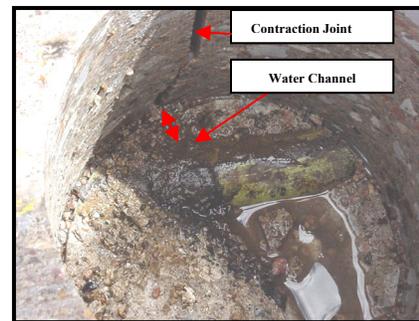
The research project consists of following tasks:

- Task 1: Visual inspection of Cozad, Gohner, and Syracuse projects to identify any possible corrosion on epoxy coated dowel bars
- Task 2: Conduct field and laboratory investigation of these three projects to investigate the level of deterioration within the dowel bars.
 - The field investigation included core extractions and visual inspection
 - The laboratory evaluation consisted of measuring dowel bar surface area loss and the cross section area.
- Task 3: Analysis of the acquired data from the field and laboratory evaluation, and pavement design.
- Task 4: Compare the different project designs.
- Task 5: Prepare a final report to document the entire research project including conclusions and recommendations.

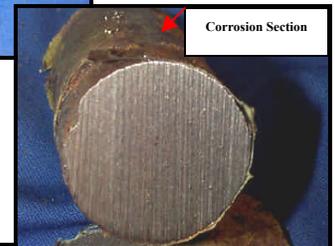
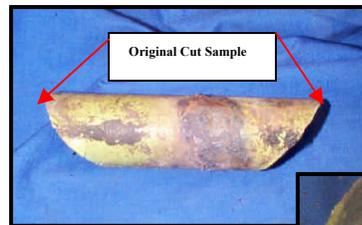
RESULTS OF FIELD AND LABORATORY INVESTIGATION OF DETEREORATION IN DOWEL BARS:

Investigation of I-80 Eastbound near Cozad (Built 1989):

Field Investigation:



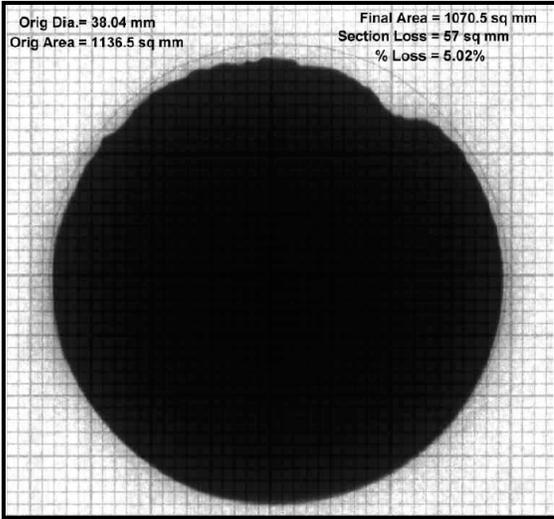
Laboratory Investigation:



Cozad I-80 Eastbound (cont'd)

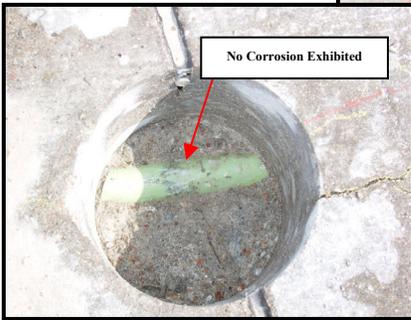
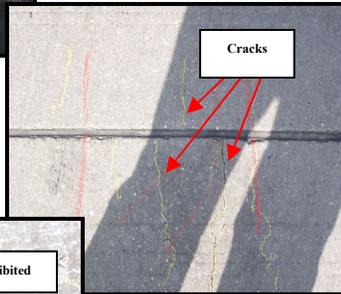
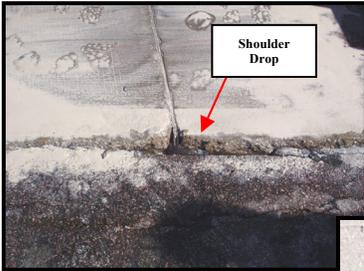
Laboratory Test Results:

Dowel Bar Corrosion at the joints



Investigation I-80 Eastbound near Goehner Built 1997:

Field Investigation:



Laboratory Investigation and Test Results:

Laboratory investigation was not necessary, because the dowel bar did not show any corrosion.

Investigation HYW 2 Westbound near Syracuse (Built 2000)

Field Investigation:



Laboratory Investigation and Test Results:

Laboratory investigation was not necessary, because the dowel bar did not show any corrosion.

CONCLUSIONS AND RECOMMENDATIONS:

The corrosion protection performance of epoxy-coated reinforcing steel (ECR) was evaluated in three concrete pavement sections. The 15 year old project evaluated, displayed surface area loss, indicating corrosion of the rebar. No visible loss of the epoxy coating was evident on Goehner or Syracuse.

The joints in each of the pavements were sawed to a depth of 1/3 of the design thickness to ensure crack formation. The initial 1/8 to 3/16 joint cuts in the two older pavements were widened to 0.4 to 0.6 inches for sealant aspect ratio control. It was observed that water is able to travel through the joints in the space beneath the backer rods. In comparison, the four year old pavement was formed with only a single saw cut which was sealed to full depth with joint sealant. It was noted that the single saw cut with full depth sealant did not provide a channel for water to enter the pavement, and that the water that was observed was due to the type of subgrade and drainage of the pavement.

Damage to epoxy coating was not a significant factor in this investigation, however, the comparison between the two joint designs observed in the field, lead to recommend that NDOR considered implementing only a single saw cut and a full depth sealant recessed 1/4 to 1/2 (in) in future specifications.

The documentation of the field and laboratory evaluations and conclusions is in progress and will be included in the final report.