Executive Summary, Research Readiness Level Assessment, and Technology Transfer

Evaluation of Tie-Bar Anchoring Methods: Non-Shrink Grout vs. Epoxy

Research Objectives

The purpose of this investigation was to verify whether or not non-shrink grout provides suitable strength in repairs and provide a recommendation for construction specification.

Research Benefits

Investigated and assessed the strength of non-shrink grout and epoxy anchored tie-bars in PR projects.

Principal Investigators

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Background

Tie bars are epoxy coated steel bars that connect the longitudinal joints in concrete pavement and prevent faulting and joint separation between lanes. They can be placed into the plastic concrete or inserted after curing by drilling and anchoring with epoxy or non-shrink grout. The specification for the tie bars requires the use of a No. 5 bar, 18 inches long and shall meet ASTM A775 / A775M [1], Section 1020.The Nebraska Department of Transportation "Standard Specifications for Highway Construction," (Section 603.03) requires contractors to mechanically insert tie bars into the face of pavements during construction. Tie bars are also used during the construction of pavement repairs. In 2015, Nebraska Department of Transportation Materials & Research Divisions (M&R) conducted research to determine the best method for inserting tie-bars. In the study, M&R conducted a survey to evaluate placement and testing requirements of other agencies and compared different methods and materials for installing tie-bars. The materials for anchoring tie-bars were not investigated.

Conclusion

The testing performed at Jersey barrier using non-shrink grout failed to achieve the required 12,000 lbs. of strength. The pull-out tests on the 18-in. bars fixed with epoxy showed that epoxy adequately achieved the required strength at 24-hours. The pulls on the PR-embedded bars also achieved the required strength by 24-hours. In these specimens, the concrete failed before the epoxy bond.

The non-shrink grout pull-out tests were conducted at 24-hours and 96-hours. All of the grout samples de-bonded at strengths below the required 12,000 lbs.

**Please see the tables in the final report for more information on load and strength.*

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Interested in finding out more?
Final report is available at:
NDOT Research Website

Recommendations Based Off of Research

Based on the results of the pull-out test, NDOT will require epoxy to be used when inserting tie-bars in hardened Concrete for both new construction and pavement repairs per the Standard Specifications for Highway Construction.

By Wally Heyen, PCC Engineer

Research Readiness Level (RRL) Assessment

RRL 5

Level 5: Standard Practice

Research/Technology fully implemented and understood. No follow-up is necessary.

This brief summarizes of In-House Research Project
"Evaluation of Tie-Bar Anchoring Methods: Non-Shrink Grout vs. Epoxy"
Nebraska Department of Transportation Research Program