

Executive Summary, Research Readiness Level Assessment, and Technology Transfer

Evaluation of Nebraska's Aggregate Reactivity by the Miniature Concrete Prism Test Method

Research Objectives

- Focused on the testing of coarse limestone aggregate to determine its reactivity.
- Evaluated the AASHTO T380, Miniature Concrete Prism Test (MCPT). Aggregates in Phase II were paired with a Type I/II cement to test their reactivity.
- Evaluated the effectiveness of the mitigation measures taken to eliminate the risk of ASR.
- Assessed the reactivity of aggregates currently used by the Department. The aggregate reactivity for typical aggregates used by NDOT was compared the reactivity of the baseline values found in 2009.

Research Benefits

- Ensured that the same results were obtained from both tests before the final implementation of T380, which would save NDOT significant time in testing.
- Updated aggregate reactivity information means NDOT's ASR mitigation measures could be re-evaluated.

Principal Investigators

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Background

In 2016, NDOT began a two-part study to determine if the reactivity of the aggregates used in Nebraska had changed. The first part of this study involved the implementation of a new test, Standard Method of Test for Potential Alkali Reactivity of Aggregates and Effectiveness of ASR Mitigation Measures (Miniature Concrete Prism Test, MCPT) in accordance with AASHTO T380, to evaluate the reactivity of an aggregate.

The second part of this study concerned the re-evaluation of Nebraska's aggregates to determine if their reactivity level had changed. The current location of Nebraska's aggregate pits used in this evaluation are shown in Figure 1. This part of the study was critical because the legal locations of aggregate pits occasionally had moved; such a move can change the properties of the aggregate's reactivity. The data obtained in this investigation was compared with the baseline data found in the previous 2009 NDOT aggregate study with the C1293 Standard Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction Standards, commonly referred to as the Concrete Prism Test (CPT). With updated aggregate reactivity information, NDOT's ASR mitigation measures could be re-evaluated.

Conclusion

The evaluation of nine different aggregates showed the viability of the T380 test method as an alternative to the standard C1293 test method. The T380 assessed the Alkali-Silica Reaction potential of aggregates with the same reliability as C1293 and correlates well with the C1293 test method. Results are obtained within 56 days by T380 compared to 365 days required by C1293. The T380 method at 56 days appeared to characterize the aggregate reactivity similarly to C1293 for all the aggregates evaluated in this study. Therefore, T380 will be part of the Department test method for approval of interground/blended cements along with the ASTM C1567-Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate.

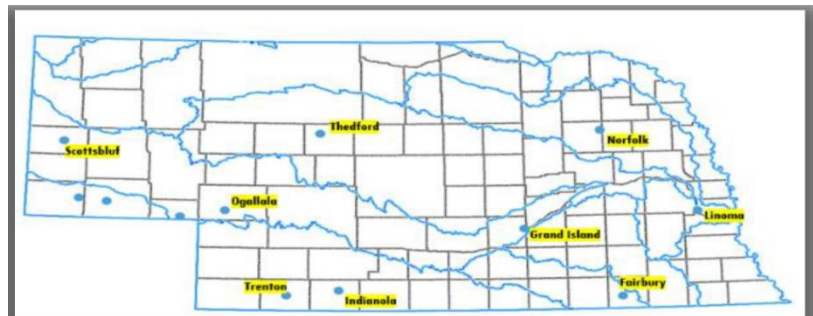


Figure 1. Nebraska aggregate pit locations

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Interested in finding out more?
Final report is available at:
[NDOT Research Website](#)

NDOT Recommendations Based Off Research

The Department has changed the specification for approving IP or IT cements to allow the use of T380 after the Department has completed the test method C1567. Per the specification, the mortar bars shall not exceed 0.10% expansion at 28 days while performing C1567. If the expansion is greater than 0.10% at 28 days while performing C1567, then the interground/blended cements shall be tested in accordance with AASHTO T380 using fine aggregate from an approved Platte River Valley and/or Elkhorn River aggregate source with an expansion not greater than 0.02% at 56 days.

By Wally Heyen, PCC Engineer

Research Readiness Level (RRL) Assessment

RRL 5

Level 5: Implementation

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

Technology Transfer

Presentations

- Presentation to Nebraska and Concrete and Aggregates Association (NC&AA) -2019
- Presentation to Association of General Contractors (AGC) -2019
- Poster Presentation Interground/Blended Cements – National Concrete Consortium Meeting 2019

**This brief summarizes of In-House Research Project
“Evaluation of Nebraska’s Aggregate Reactivity by the Miniature Concrete Prism Test Method”
Nebraska Department of Transportation Research Program**