Appendix F: Implementation Plan
Improving guidance of AASHTO R 80/ASTM C1778 for Alkali-Silica Reactivity (ASR) Potential and Mitigation

Appendix F of *NCHRP Research Report 1083: Alkali-Silica Reactivity Potential and Mitigation: Test Methods and State of Practice* (NCHRP Project 10-103).

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IMPLEMENTATION PLAN

IMPROVING GUIDANCE OF AASHTO R 80/ASTM C1778 FOR ALKALI-SILICA REACTIVITY (ASR) POTENTIAL AND MITIGATION

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1. Objective of the Implementation Plan

The results of this research will not be considered successful unless they are put into practice by the various local, state, and federal agencies of transportation that see the benefits of designing concrete mixtures to avoid ASR, thereby increasing the service life of our transportation infrastructure. Accordingly, the research team will target the nature and scope of the project deliverables to the audiences most likely to use each deliverable.

The products expected from this research project will take several forms. The primary form of the background scientific results (laboratory, field, etc.) will be a technical research report. This report will be written so that major results are easily found and understood by both practitioners and researchers. The report will be comprehensive and provide a complete overview of the research, the findings, and the recommendations resulting from the research. As such, these sorts of results will be implemented through traditional methods of technology transfer (i.e., the review and understanding of newly developed technical literature, peer reviewed journal articles, conference proceedings, presentations at national and international conferences).

The key project deliverables for this project include:

1. A final report that documents results, summarizes findings, and draws conclusions;
2. Recommendations for revised or new test methods;
3. Recommended revisions to AASHTO R 80 and ASTM C1778 and their referenced material standards;
4. An extensive database fully documenting information from field-exposure blocks and laboratory testing in an easily usable format and made available on the project webpage; and
5. A draft TRNews article highlighting the products of this research and their implementation.

The implementation plan presented herein aims to efficiently and rapidly implement the above deliverables into state highway practice in order to extend the service life of structures potentially susceptible to alkali-silica reaction (ASR). This implementation plan concisely details the implementation leadership team and the implementation approach, including specific tasks and activities to implement new, revised, and improved test methods, specifications, and recommended practices.

1.1. Implementation Leadership Team

The research team for this project is actively involved in ASTM activities related to alkali-silica reaction, including ASTM C1778, and as such, a key component of the implementation plan is to actively engage research team members in brining forward any recommendations for revised or new test methods and revisions to recommended practice. The research team has only minimally been involved in AASHTO R 80 activities, but as part of the implementation plan, we plan to become more actively involved in the AASHTO process through the relevant AASHTO Highway Subcommittee (e.g., Highway Subcommittee on Materials). There are significant revisions to ASTM C1778 and AASHTO R 80 that are proposed for implementation, and given the similarities between the two standards, the implementation of revised or new test methods and test limits will essentially be identical whether being implemented into ASTM C1778 and AASHTO R 80. All revisions to ASTM or AASHTO test methods or standards are contained as an appendix to the final project report and written in a format consistent with revisions to such tests and standards.

1.2. Assumptions/Constraints/Risks

The primary assumption of this implementation plan is that the deliverables from this project can be implemented through targeted, specific revisions to existing tests, standards, and recommended practices. These revisions are designed to improve the current state of the practice and to increase the service life of transportation infrastructure using reactive aggregates. The guidance developed under this project is based on the data and information available today, but as long-term data from this and other projects becomes available, our future guidance will be revised and informed based on new data. As such, it is important to recognize and convey to others that guidance related to ASR will continue to evolve as our collective understanding improves.

The unique nature of this project was to focus on more realistic concrete mixtures that would better reflect field practice rather than accelerated mixtures with unrealistically high alkali loadings. It is expected that the true impact of this project may take quite a few more years, as the inherent goal of the project directly equates to longer times to failure (e.g., expansion and cracking). The guidance to date has been based primarily on high-alkali mixes, and the data generated under this project (over 450 exposure blocks placed on eight different sites throughout the United States and Canada), coupled with other ongoing work on ASR, will provide a much-improved understanding of the reaction, itself, and how to prevent it in new concrete construction.

2. Implementation Description

The research team has generated specific project deliverables aimed at rapid implementation, including recommended revisions of existing tests and standards as appendices to the final project report. The research team recognizes that some training may be required related to any new methods or procedures, and in the final report, the research team anticipates preparing an outline of suggested "implementation tactics" to help ensure that the results are put to use. These tactics may include presentations to FHWA and AASHTO member departments, recommendations for revisions to current NHI training courses/materials, and informational presentations before regional or national transportation conferences or committees. Working examples will be developed to facilitate a step-by-step example of both the prescriptive and performance-based approaches to preventing ASR.

2.1. Major Tasks

The major tasks aimed at implementing project deliverables includes the following

- Revisions to test methods and test limits
- Revisions to preventive measures approaches (prescriptive)
- Revisions to AASHTO R 80 and ASTM C1778, including incorporation of revised newly-recommended test methods.

The implementation path will be governed by specific ASTM or AASHTO committee, subcommittee, or groups. Because the underlying recommended practices (ASTM C1778 and AASHTO R 80) includes the application of revised and new test methods, it is important to work in parallel in both the revising or adopting of test methods while concurrently working on the recommended practices that cite such test methods.

2.2. Target Audience

The target audience for the findings of this research are incredibly broad as ASR can affect nearly every structure that is exposed to the environment. In particular the audience would include: AASHTO Subcommittee on Materials (SOM), ASTM C09, ACI (201, 221, 301, 318, 350), FHWA, RILEM, all State DOTs, concrete, aggregate, cement and ready-mix concrete producers and owners of transportation structures (e.g. pavements, bridges, ports, airports) and other important concrete structures including dams, foundations, mass concrete, critical structures, etc.

2.3. Additional Support

In order to implement critical project deliverables, additional support shall be requested from various AASHTO and ASTM members, project panel members, and other stakeholders. It is intended for the project deliverables to facilitate efficient and rapid implementation in highway practice, but assistance from state highway agencies will also be critical to implementation. For most rapid implementation, it is recommended that states currently using AASHTO R 80 be targeted first as revisions are easier to implement than new standards or recommended practices.

2.4. Evaluation and Monitoring

This project will have maximum impact only it is implemented and monitored. Generating as much data as possible on bridges and pavements following the current or revised standards will serve as the long-term database that will ultimately serve as the basis for comparison. The blocks cast under this project will take several years to cause expansion, depending on location, and this data will widen our understanding of low-alkali mixes more representative of transportation infrastructure.

3. Final Deliverables

The final deliverables for this project include:

1. A final report that documents results, summarizes findings, and draws conclusions;
2. Recommendations for revised or new test methods;
3. Recommended revisions to AASHTO R 80 and ASTM C1778 and their referenced material standards;
4. An extensive database fully documenting information from field-exposure blocks and laboratory testing in an easily usable format and made available on the project webpage; and
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