

ROAD COMMISSION FOR OAKLAND COUNTY

SPECIAL PROVISION
FOR
**ALKALI SILICA REACTIVITY OF FINE AGGREGATE USED IN
PORTLAND CEMENT CONCRETE**

RCOC/DESIGN:JO/SH

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a. Description

This special provision sets out the requirements for all fine aggregate used in Portland cement concrete (PCC) mixtures to be tested by an independent testing laboratory and determined to be resistant to the potential for deleterious expansion caused by alkali-silica reactivity (ASR). ASR testing is not required for temporary concrete pavements.

All concrete grades, excluding those used for temporary concrete pavements, will require 25 to 40 percent replacement by weight of Portland cement in the concrete mixtures with slag cement (Grade 100 minimum) and/or fly ash.

Except as explicitly modified by this special provision, all materials, test methods, and PCC mixture requirements of the standard specifications and the contract apply.

b. Definition

ASR is a chemical reaction which occurs over time within concrete between highly alkaline cement paste and reactive forms of silica found in some aggregates. In the presence of moisture, an expansive ASR gel is formed which can exert pressure within the concrete, causing random cracking and premature deterioration of the concrete.

c. Laboratory Requirements

The independent laboratory, including all associated testing equipment and staff performing ASR testing of aggregates, must be proficient in ASR testing in accordance with the applicable test methods and procedures. The laboratory must provide documentation to the Regions that they are qualified and proficient to conduct ASR testing in accordance with the required test procedures.

d. Laboratory Testing Requirements

Perform testing on fine aggregate proposed to be used in any PCC Job Mix Formula (JMF). The Contractor must ensure the testing is conducted in accordance with a designated standard test procedure described herein. Test results must conform to the specified criterion for one of the following standard test methods. The Rounding Method described in *ASTM E29* must be used when reporting expansion test results.

1. Method 1

ASTM C1293. Concrete Prism Test. If the expansion of concrete prisms is not greater than 0.040 percent (rounded to the nearest 0.001 percent) after 1 year, the fine aggregate is considered non-deleterious to ASR and may be used in the JMF.

2. Method 2

ASTM C1567. Mortar Bar Test. If no previous test data are available for the fine aggregate that shows it is resistant to ASR using Method 1, above, replace 25 to 40 percent of the Portland cement in the concrete mixture with a supplementary cementitious material (slag cement or fly ash). A blended cement meeting the requirements of *ASTM C595/C595M* containing the above Portland cement and supplementary cementitious material proportions may also be used.

Demonstrate the ability of the supplementary cementitious material to control the deleterious expansion caused by ASR by molding and testing mortar bars in accordance with the standard test method described in *ASTM C1567* using the mix proportions and constituent sources for both the aggregates and the cementitious materials that will be used for the project. Make at least three test specimens for each cementitious materials-aggregate combination. If the average of three mortar bars for a given cementitious materials-aggregate combination produces an expansion less than 0.10 percent (rounded to the nearest 0.01 percent) at 14 days of immersion, the JMF associated with that combination will be considered non-deleterious to ASR. If the average expansion is 0.10 percent (rounded to the nearest 0.01 percent) or greater, the JMF associated with that combination will be considered not sufficient to control the deleterious expansion caused by ASR and the JMF will be rejected.

3. Method 3

ASTM C1260. Mortar Bar Test. If the expansion of the mortar bars is less than 0.10 percent (rounded to the nearest 0.01 percent) at 14 days of immersion, the fine aggregate is considered non-deleterious to ASR and may be used in the concrete without the need for ASR mitigation.

The Engineer will not approve the use of the JMF if the expansion exceeds the threshold limits for the respective *ASTM* test method used. The test results and report are valid for 2 years from the completion of testing.

e. Submittals

A current ASR test report for the fine aggregate proposed to be used in the Job Mix Formula (JMF) must accompany each JMF. Ensure the ASR test report is accompanied by a certification stating which test procedure was followed and that all testing was conducted in accordance with the designated standard test procedure.

f. Measurement and Payment

All materials, labor, equipment, and laboratory facilities necessary to complete the work in accordance with this special provision is included in other contract pay items and no additional compensation will be permitted.