

## Part 642 – Specifications

### Chapter 3 – National Standard Material Specifications

#### Material Specification 522—Aggregates for Portland Cement Concrete

##### A. Scope

This specification covers the quality of fine aggregate and coarse aggregate for use in the manufacture of Portland cement concrete.

##### B. Quality

Aggregate shall conform to the requirements of ASTM C33 for the specified sizes. Aggregates that fail to meet any requirement may be accepted only when either:

- (i) The specified alternate conditions of acceptance can be proven before the aggregates are used on the job and within a period such that no work under the contract will be delayed by the requirements of such proof or,
- (ii) The specification for concrete expressly contains a provision of special mix requirements to compensate for the effects of the deficiencies.

##### C. Reactivity with alkalis

(1) The potential reactivity of aggregates with the alkalis in cement shall be evaluated by petrographic examination as per ASTM C295, or by the results of previous tests or service records of concrete made from similar aggregates from the same source. The standards for evaluating potential reactivity shall be as described in ASTM C1778

(2) Aggregates indicated by any of the above to be potentially reactive shall not be used except under one of the following conditions:

- (i) Applicable test results of mortar bar tests made according to ASTM Method C 1567 are available which indicate an expansion of less than 0.10 percent at 16 days.
- (ii) The concrete mixture complies with the appropriate testing procedures and mitigations measures established in ASTM C1778.
- (iii) Concrete made from similar aggregates from the same source has been demonstrated to be sound after 3 years or more of service under conditions of exposure to moisture and weather similar to those anticipated for the concrete under these specifications.

(3) Aggregates indicated to be potentially reactive, but within acceptable limits as determined by mortar bar test results or service records, shall be used only with low alkali cement, containing less than 0.60 percent alkalis expressed as sodium oxide.

##### D. Sulfur in Aggregate

(1) There is currently not an ASTM standard on the acceptable level of sulfur in concrete aggregate.

(2) To prevent concrete cracking from iron sulfide expansion, perform petrographic testing per ASTM C295 and use the following limits for sulfur (S) in aggregate based on the American Concrete Institute Technical Paper 113-M31 and the Concrete Society BS EN 12620:

- (i) When S is less than 0.1 percent, the aggregate is acceptable.
- (ii) When S is between 0.1 and 1.0 percent, perform further testing to determine if iron sulfide minerals such as pyrrhotite, gypsum, pyrite, or marcasite are present:
  - If the additional testing shows pyrrhotite, gypsum, pyrite, or marcasite are present, reject the aggregate and use an acceptable aggregate.

## Title 210 – National Engineering Handbook

- If the additional testing shows pyrrhotite, gypsum, pyrite, or marcasite are not present, the aggregate is acceptable.
- (iii) Aggregate with S greater than 1 percent is not acceptable.

### E. Storing and Handling

Aggregates of each class and size shall be stored and handled by methods that prevent segregation of particles sizes or contamination by intermixing with other material.