Part 642 – Specifications

Chapter 3 – National Standard Material Specifications

Material Specification 524—Aggregates for Roller Compacted Concrete

A. Scope

This specification covers the quality of aggregate for use in the manufacture of roller compacted concrete (RCC).

B. Quality

Aggregate shall conform to the quality requirements of ASTM C33.

C. Gradation

(1) Aggregate gradation shall be within the limits provided below for the total aggregate weight in a unit volume of RCC. For the sieve sizes shown below that are larger than #4, no more than 20 percent of the total aggregate shall be retained on an individual sieve. For sieve sizes smaller than 3/8 inch, at least 3 percent of the total aggregate shall be retained on each sieve.

Sieve size	Percent passing
2"	100
1-1/2"	85-100
1"	70-100
3/4"	60-84
1/2"	50-70
3/8"	40-60
#4	32-50
#8	26-42
#16	20-35
#30	14-28
#50	8-22
#100	4-15
#200	0-7

(2) Unless otherwise specified, the fines (material passing the #200 sieve) shall have a plasticity index less than four.

(3) Particle shape—The amount of flat and elongated particles with a length-to-width or width-to-thickness ratio greater than 3:1, as determined by ASTM D4791, shall not exceed 25 percent on any individual sieve size group nor a weighted average of 20 percent for all of the sieve sizes in the total gradation.

D. Reactivity with Alkalies

(1) The potential reactivity of aggregates with the alkalies 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 alkalies expressed as sodium oxide.

E. 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 perASTM 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.
    - 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.

F. Acceptance

Aggregates that fail to meet any requirement may be accepted only when the specification for RCC expressly contains either:
  (i) special provisions for acceptance that 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) special provisions for specific mix requirements to compensate for the effects of the deficiencies.

G. Storing and Handling

Aggregates shall be stored in stockpiles at specified storage areas. Separators, such as timbers, boards, or pre-cast concrete panels, shall be used between adjacent stockpiles to prevent the contamination and intermixing of dissimilar materials. The contractor shall be responsible for providing a system that reliably and consistently stockpiles the aggregates and allows the withdrawal of the aggregates from the stockpiles without contamination or segregation. Segregated or contaminated aggregates will not be allowed in production of RCC.