

SECTION 105

FINE AGGREGATE FOR USE IN PORTLAND CEMENT CONCRETE

105.1 DESCRIPTION

- A. General:** The fine aggregate shall consist of natural sand or, subject to approval, other inert materials with similar characteristics; or combinations having hard, strong, durable particles.

Fine aggregate from different sources shall not be mixed or stored in the same pile or used alternately in the same class of construction or mix, without permission from the Engineer.

B. Related Work:

Section 40	Portland Cement Concrete Pavement
Section 50	Precast Concrete
Section 55	Cast in Place Concrete Structures
Section 56	Class M6 Concrete for Curb & Gutter and Flatwork
Section 58	Concrete Box Culvert
Section 60	Concrete Curb and Gutter
Section 61	Concrete Sidewalk, Curb Ramps and Detectable Warning Surfaces
Section 62	Drop Inlets
Section 63	Storm Sewer Junction Boxes and Manholes
Section 107	Coarse Aggregate for Use in Portland Cement Concrete
Section 200	Controlled Low Strength Material
Section 203	Submittals

105.2 MATERIALS

- A. Deleterious Substances:** The amount of deleterious substances shall not exceed the following limits by dry weight:

Clay lumps.....	0.5%
Coal and lignite.....	0.3%
Particles Less Than 1.95 Specific Gravity.....	1.0%
Other deleterious substances (such as alkali, mica, coated grains, soft and flaky particles).....	1.0%

The maximum amount of all deleterious substances listed above shall not exceed 2.0% by dry weight.

- B. Soundness:** When the fine aggregate is subjected to 5 cycles of the sodium sulfate soundness test, the weighted loss shall not exceed 10% by weight.

When Class M6 concrete fine aggregate is subjected to 5 cycles of the sodium sulfate soundness test, the weighted loss shall not exceed 12% by weight.

A satisfactory soundness record for deposits from which material has been used in concrete for five years or more may be considered as a substitute for performing the sodium sulfate soundness test.

- C. Organic Impurities:** The fine aggregate shall be free from injurious amounts of organic impurities. Aggregates subjected to the colorimetric test for organic impurities and producing a color darker than the standard number 3 shall be rejected.

Should the aggregate show a darker color than samples originally approved for the work, the aggregate shall not be used until tests have been made to determine whether the increased color is indicative of an injurious amount of deleterious substances.

- D. Alkali-Silica Reactivity (ASR) Requirements:** When specified in the plans, the following items shall apply.

Fine aggregates from sources that have not been tested by the SD DOT shall be submitted to the City for ASR testing 30 days prior to performing the concrete mix design.

ASR testing shall be performed in accordance with ASTM C1260, except that the gradation of the material used for testing shall be as produced from the source. The fine aggregate shall be sampled in the presence of a City representative.

Fine aggregate with a 14 day expansion value below 0.250 shall require Type II cement with a fly ash content of 20 to 25% in the concrete mix. Fine aggregate with a 14 day expansion value of 0.250 or greater shall require Type II cement with a fly ash content of 25% in the concrete mix. Fine aggregate with a 14 day expansion value of 0.400 or greater shall not be used.

When more than one source of fine aggregate is blended to meet the gradation specifications, the expansion value of the blended sands will be used. Blended sources will be treated as a new source. The Contractor is responsible to submit the blended samples for testing 30 days prior to performing the concrete mix design.

- E. Gradation:** Fine aggregate shall be well graded from coarse to fine and shall conform to the following gradation requirements:

Table 1

Sieve Size	Percent Passing
3/8 inch	100
#4	95 – 100
#8	80 -100
#16	50 – 85
#30	25 - 60
#50	5 – 30
#100	0 – 10

The fine aggregate will have no more than 45% passing any sieve and retained on the next consecutive sieve of those shown in Table 1.

The percentage of material passing the No. 200 sieve shall be such that the composite mixture of fine and coarse aggregate will conform to the provisions of Section 107.

Fine aggregate failing to pass the minimum requirement for material passing the No. 50 or the No. 100 sieve may be used provided a satisfactory inorganic fine material is added during production to correct for the deficiency in gradation.

Blending of fine aggregate will only be allowed to correct for gradation. All fine aggregate sources shall meet the quality requirements individually prior to blending. The Engineer shall be contacted prior to the blending of fine aggregates. The blending process shall be by an approved method that can accurately control the amount of each individual fine aggregate. The blending process shall be approved prior to starting.

- F. Uniformity of Grading:** The gradation requirements given in Section E represent the extreme limits which will determine suitability for use from the source(s) of supply. The gradation will be uniform and not subject to the extreme percentages of gradation specified above. For the purpose of determining the degree of uniformity for the proposed source(s), a target Fineness Modulus (FM) value will be set based upon the gradation, or combined gradation if more than one source is used, established during mix design.

The FM requirements do not apply to fine aggregate for low slump dense concrete and Class M6 concrete.

1. For all portland cement concrete except concrete paving conforming to Section 40, and Class M6 concrete; the following will apply:

Fine aggregate shall maintain a FM within ± 0.20 from the target FM value. For determining the FM variation from the target FM value, the average of the 5 most recent FM tests will be used. Until 5 FM tests have been made; base the variation on the first FM test, then on the average of all previously run FM tests. If the FM falls outside this limit, the City must be notified. A new or adjusted mix design may be reviewed or provided.

2. For portland cement concrete paving conforming to Section 40, the following shall apply:

The fine aggregate target FM value established by the mix design will be set within the wide band limits of 2.40 to 3.10 (wide band).

A 0.20 variation (narrow band) from the established FM target value will be allowed provided the narrow band FM test results are within the wide band limits.

G. Sampling and Testing:

Sampling SD 201
 Gradation SD 202
 Particles Less Than 1.95 Specific GravitySD 208
 Soundness Test (sodium sulfate solution, five cycles) SD 220
 Organic Impurities AASHTO T 21
 Clay Lumps AASHTO T 112
 Uniformity of Grading (Fineness Modulus)AASHTO M 6

*all tests beginning with "SD" refer to South Dakota Department of Transportation Materials Manual test number

105.3 METHOD OF MEASUREMENT

Fine aggregate for use in portland cement concrete or similar uses will not be measured separately, but shall be incidental to the various bid items.

105.4 BASIS OF PAYMENT

Fine aggregate for use in portland cement concrete or similar uses will not be paid separately, but shall be incidental to the various bid items.

END OF SECTION