

(E) Toughness (Resistance to Abrasion)

The maximum percentage loss of course aggregate for asphalt surface treatment when tested in accordance with AASHTO T 96 is 55%.

(F) Blending of Aggregates

Blending of 2 or more aggregates will not be permitted regardless of the origin of the aggregates if any one of the aggregates fails to meet the requirements for soundness or resistance to abrasion.

(G) Weight of Slag

The minimum weight of crushed slag is 70 lb/cf as determined in accordance with AASHTO T 19.

1012-3 BLOTTING SAND

Blotting sand is fine aggregate consisting of natural sand, commercial sand, manufactured sand, coarse screenings, or other inert material having similar characteristics. Subarticles 1012-2(D) and 1012-2(F) will be applicable to blotting sand. Adequately clean the fine aggregate so it is free from sticks, roots, visible lumps of clay or other unsatisfactory material before use.

1012-4 LIGHTWEIGHT AGGREGATE

Lightweight aggregates used in asphalt surface treatments shall be produced by the rotary kiln process and shall come from an approved Department source meeting applicable requirements of Section 1005 and 1006. The aggregate shall meet Table 1012-8 and AASHTO M 195 with the exception of Sections 3, 6, 8 and any other references to concrete samples or concrete strength.

| TABLE 1012-8 LIGHTWEIGHT AGGREGATE PHYSICAL PROPERTIES | | |
|-------------------------------------------------------------------|------------------------------------------|-------------------------|
| Property | Specification (maximum limit) | Test Method |
| Sodium Sulfate Soundness | 5% | AASHTO T 104 |
| Los Angeles Abrasion | 45% | AASHTO T 96 (B grading) |
| Percent Absorption | 10% | AASHTO T 19 |
| Micro-Deval | 18% | AASHTO T 327 |

SECTION 1014**AGGREGATE FOR PORTLAND CEMENT CONCRETE****1014-1 FINE AGGREGATE****(A) General**

Use fine aggregate from sources participating in the Department's Aggregate QC/QA Program as described in Section 1006. A list of sources participating in the Department's QC/QA Program in North Carolina and adjoining states is available from the Materials and Tests Unit.

Use fine aggregate consisting of natural sand or manufactured sand having clean, durable, hard, uncoated particles, or other inert materials having similar characteristics. Produce manufactured sand from fractured stone material. Use fine aggregate free from dirt, wood, paper, burlap and all other foreign material.

To permit excess water to drain and the moisture content to become uniform, stockpile the aggregates either at the producer's plant or at the batch plant site for at least 24 hours before use in the concrete. Build open stockpiles of fine aggregate at the batch plant on concrete surfaces. Do not add new material to the stockpile during the 24 hour period.

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1 When the aggregates have a low and uniform moisture content and the consistency of the
2 concrete can be satisfactorily controlled without stockpiling the aggregates for 24 hours,
3 the minimum stockpiling period may be reduced or waived entirely by the Engineer.

4 The Department's list of approved sources of fine aggregate shows the target fineness
5 modulus of each aggregate as established by the producer. Do not use fine aggregate
6 with a fineness modulus that varies more than 0.2 from the target value until the concrete
7 mix proportions are adjusted.

8 **(B) Soundness**

9 When subjected to 5 cycles of the soundness test, the weighted average loss shall not be
10 more than 15%.

11 **(C) Deleterious Substances**

12 Determine the percentage of deleterious substances (clay lumps and friable particles) in
13 accordance with AASHTO T 112. The amount of deleterious substances shall not exceed
14 2.0% by weight for natural sand or 1.0% by weight for manufactured sand.

15 **(D) Organic Impurities**

16 The color of each source of fine aggregate will be determined annually in accordance
17 with AASHTO T 21. Should the fine aggregate show a darker color than samples
18 previously approved from the same source, withhold its use until tests have been made to
19 determine the quality of the sand.

20 **(E) Mortar Strength**

21 Mortar made with the fine aggregate shall have a compressive strength at the age of
22 3 and 7 days using Type III Portland cement, or 7 and 28 days using Type I or II Portland
23 cement, of not less than 95% of that developed by a comparison mortar. Make the
24 comparison mortar with the same cement, graded Ottawa sand with a fineness modulus of
25 2.40 ± 0.05 , and the same water-cement ratio and consistency as the test mortar. Test the
26 mortar strength in accordance with AASHTO T 106.

27 Fine aggregate that fails the mortar strength may be used with the approval of the
28 Engineer, provided that when it is tested in concrete cylinders the compressive strength of
29 the concrete at 14 days is equal to or greater than the strength of cylinders made with
30 an identical mix using an acceptable sand.

31 **(F) Gradation**

32 Natural sand shall meet the gradation for standard size No. 2S fine aggregate.
33 Manufactured sand shall meet the gradation for standard size No. 2MS fine aggregate.

34 **(G) Blending Fine Aggregate**

35 Blending fine aggregates to obtain the required gradation will be permitted if test results
36 of each aggregate meet the durability requirements and test results of the combination
37 indicate acceptable quality. Blend aggregates by weighing them separately at the time of
38 batching or by other means acceptable to the Engineer.

39 When natural sand is blended with natural sand, the blend shall meet the gradation for
40 No. 2S fine aggregate. When manufactured sand is blended with natural sand or with
41 manufactured sand, the blend shall meet the gradation for No. 2MS fine aggregate and
42 neither component shall exceed the gradation limits on the No. 200 sieve shown in
43 Table 1005-2.

1 1014-2 COARSE AGGREGATE**2 (A) General**

3 Use coarse aggregate from sources participating in the Department's Aggregate QC/QA
4 Program as described in Section 1006. A list of these sources in North Carolina and
5 adjoining states is available from the Materials and Tests Unit in Raleigh.

6 Use coarse aggregate that consists of crushed stone, crushed or uncrushed gravel, crushed
7 air-cooled blast furnace slag or other inert materials that have similar characteristics.
8 Wash all coarse aggregate for Portland cement concrete to remove clay, loam, dust and
9 similar adherent materials unless otherwise permitted by the Engineer in writing. Keep
10 coarse aggregate free from dirt, wood, paper, burlap and all other foreign material.

11 To permit excess water to drain and the moisture content to become uniform, stockpile
12 the aggregates either at the producer's plant or at the batch plant site for at least 24 hours
13 before use in the concrete. Build open stockpiles of coarse aggregate at the batch plant
14 on concrete surfaces. Do not add new material to the stockpile during the 24 hour period.
15 Where the aggregates have low and uniform moisture content and the consistency of the
16 concrete can be satisfactorily controlled without stockpiling the aggregates for 24 hours,
17 the minimum stockpiling period may be reduced or waived entirely by the Engineer.

18 Do not mix coarse aggregate from different sources or use it in alternate batches except
19 where permitted by the Engineer in writing. Blending of coarse aggregates to obtain the
20 required gradation will be permitted if the different sizes are from the same source.
21 Blend coarse aggregates by weighing them separately at the time of batching or by other
22 means acceptable to the Engineer.

23 (B) Soundness

24 When subjected to 5 cycles of the soundness test, the weighted average loss shall not
25 exceed 15%. For concrete with a 28 day design compressive strength greater than
26 6,000 psi, the loss shall not exceed 8%.

27 (C) Deleterious Substances

28 Determine the percentage of deleterious substances (clay lumps and friable particles) in
29 accordance with AASHTO T 112. The amount of deleterious substances shall not exceed
30 3.2% by weight.

31 (D) Resistance to Abrasion

32 The percentage of wear of crushed stone or gravel shall not exceed 55%. For concrete
33 with a 28 day design strength greater than 6,000 psi, the wear shall not exceed 40%.

34 (E) Aggregate Sizes**35 (1) General**

36 Use standard size No. 57, No. 67, or No. 78M coarse aggregate in Portland cement
37 concrete unless otherwise indicated.

38 (2) Latex Modified Concrete

39 Use standard size No. 78M coarse aggregate in latex modified concrete.

40 (3) Prestressed and Precast Concrete

41 Use standard size No. 67 or No. 78M coarse aggregate in prestressed and precast
42 concrete.

43 (4) Use of More Than One Size

44 All concrete used in a single component of any structure shall be made with the same
45 size aggregate.

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- 1 (5) Portland Cement Concrete Pavement
- 2 Use standard size No. 57, No. 57M, No. 67 or No. 78M coarse aggregate in concrete
- 3 for Portland cement concrete pavement unless otherwise specified by the Engineer.
- 4 (6) Sand Lightweight Concrete
- 5 Use the following gradation for the lightweight coarse aggregate

| TABLE 1014-1 GRADATION FOR LIGHTWEIGHT COARSE AGGREGATE | |
|--------------------------------------------------------------------|--------------------------------------------------------------|
| Sieve Size | Passing Square Opening Sieves (Percent by Weight) |
| 1" | 100 |
| 3/4" | 90 - 100 |
| 3/8" | 10 - 50 |
| No. 4 | 0 - 15 |

- 6 (7) Drilled Pier Concrete
- 7 Use standard size No. 78M coarse aggregate in Drilled Pier concrete.

**SECTION 1016
SELECT MATERIALS**

1016-1 DESCRIPTION

Select material is suitable material classified by gradation and performance characteristics as shown in this section. Use select material called for on the contract.

1016-2 USES

Select material may be specified for use in:

- | | |
|-------------------------|--------------------------------|
| Subgrade | Slope and shoulder embankment |
| Backfill in undercut | Rock embankment in open water |
| Core material | Material placement over fabric |
| Foundation conditioning | Pipe backfill |

With written approval and without additional compensation, a higher class of material may be substituted than stated in the contract.

1016-3 CLASSIFICATIONS

CLASS I

Class I select material is silty or clayey soil material meeting AASHTO M 145 for soil classification A-4. Soil materials which meet AASHTO M 145 for soil classifications A-2, A-5, A-6 and A-7 are acceptable provided such materials do not have a LL greater than 50, nor a PI of less than 7 or greater than 20.

CLASS II

Type 1 Select Material

Type 1 select material is a fine aggregate material consisting of crushed stone screenings (washed or unwashed) meeting the gradation in Table 1016-1.