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 1012-5
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. When the aggregates have a low and uniform moisture content and the consistency of the concrete can be satisfactorily controlled without stockpiling the aggregates for 24 hours, the minimum stockpiling period may be reduced or waived entirely by the Engineer.

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

(B) Soundness

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

(C) Deleterious Substances

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

(D) Organic Impurities

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

(E) Mortar Strength

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

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

(F) Gradation

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

(G) Blending Fine Aggregate

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

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

1014-2 COARSE AGGREGATE

(A) General

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

Use coarse aggregate that consists of crushed stone, crushed or uncrushed gravel, crushed air-cooled blast furnace slag or other inert materials that have similar characteristics. Wash all coarse aggregate for Portland cement concrete to remove clay, loam, dust and similar adherent materials unless otherwise permitted by the Engineer in writing. Keep coarse 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 coarse aggregate at the batch plant on concrete surfaces. Do not add new material to the stockpile during the 24 hour period. Where the aggregates have low and uniform moisture content and the consistency of the concrete can be satisfactorily controlled without stockpiling the aggregates for 24 hours, the minimum stockpiling period may be reduced or waived entirely by the Engineer.

Do not mix coarse aggregate from different sources or use it in alternate batches except where permitted by the Engineer in writing. Blending of coarse aggregates to obtain the

required gradation will be permitted if the different sizes are from the same source. Blend coarse aggregates by weighing them separately at the time of batching or by other means acceptable to the Engineer.

(B) Soundness

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

(C) Deleterious Substances

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

(D) Resistance to Abrasion

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

(E) Aggregate Sizes

(1) General

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

(2) Latex Modified Concrete

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

(3) Prestressed and Precast Concrete

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

(4) Use of More Than One Size

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

(5) Portland Cement Concrete Pavement

Use standard size No. 57, No. 57M, No. 67 or No. 78M coarse aggregate in concrete for Portland cement concrete pavement unless otherwise specified by the Engineer.

(6) Sand Lightweight Concrete

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

(7) Drilled Pier Concrete

Use standard size No. 78M coarse aggregate in Drilled Pier concrete.