

Guide Specifications For Lightweight Geotechnical Applications

Aggregate

Lightweight aggregate shall be Stalite Expanded Slate produced by the rotary kiln process and meeting the requirements of ASTM C 330. Lightweight aggregate shall have a proven record of durability, and be non-corrosive, with the following properties:

Aggregate Physical Properties

- A1 Soundness Loss: The maximum soundness loss shall be 30% when tested, with 4 cycles of Magnesium sulfate, in accordance with AASHTO T 104.
- A2 Abrasion Resistance: The maximum abrasion loss shall be 40% when tested in accordance with ASTM C 131.
- A3 Chloride Content: The maximum chloride content shall be 100 ppm when tested in accordance with AASHTO T 291.
- A4 Grading: Aggregate grading comes in a wide variety of sizes and is specified based on performance needs. Grading shall be tested in accordance with ASTM 136. (See Comment No. 1)

Project Performance Specification

- B1 In-place bulk density (unit weight): The maximum in-place compacted moist density shall be 63 lbs/ft³ when tested in accordance with the method specified by the engineer. (See Comment No. 2)
- B2 Stability (Phi angle, ϕ): The minimum angle of internal friction ϕ shall be 40 degrees when tested in accordance with the method specified by the engineer. (See Comment No. 3)

Construction

- C1 Method of Construction: Lightweight fill shall be placed in uniform layers. The actual lift thickness, and exact number of passes by equipment used will be determined by the engineer, depending on the project requirements (i.e., stability, compaction, density).

In confined areas vibratory plate compaction equipment shall be used (5 hp to 20 hp) with a minimum of two passes in 6" lifts for a 5 hp plate and 12" lifts for a 20 hp plate.

The contractor shall take all necessary precautions when working adjacent to the lightweight fill to ensure that the material is not over compacted. Construction equipment, other than for placement and compaction, shall not operate on the exposed lightweight fill.

- C2 Aggregate loose bulk density (unit weight): The maximum aggregate loose bulk density shall be 55 lbs/ft³ when tested in accordance with ASTM C 29. (See Comment No. 4)

Comments

- 1. Grading: Stalite aggregates typically have the grading 3/4" to No 4 and the above specification applies to that grading.
- 2. Several methods have been used to determine the in-place moist bulk density (unit weight) of a given aggregate. The following methods have been used with proven performance:

- A. The lightweight aggregate producer shall submit verification of a compacted moist density of less than 63 lb/ft³ when measured by a one point proctor test conducted in accordance with a modified version of ASTM D 698 "Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort." Because of the cohesionless nature of coarse lightweight aggregate, the standard shall be modified as follows: The aggregate sample shall be placed in a 0.5 cubic foot bucket at the moisture content that the aggregate will be delivered to the jobsite. The sample shall be placed in three equal layers and compacted by dropping a 5.5 pound rammer from a distance of 12 inches 25 times on each layer (AASHTO T-99 modified as above).

- B. Material shall be compacted to a minimum 65% relative density as determined by ASTM D 4253 and D 4254. Determine the maximum index density and unit weight by using a vibratory table when tested in accordance with ASTM D 4253. The minimum index density and unit weight is determined when aggregate is tested in accordance with ASTM D 4254.

- 3. Stalite Lightweight Aggregate has been tested by both Direct Shear and Triaxial test methods. With either method, the phi angle will vary in both ordinary and Stalite fill, depending on test procedure, aggregate grading, particle angularity, amount of compaction and amount of consolidating stress applied during the test. Design and specify the minimum phi angle appropriate for the project design and material(s) that are contemplated for use in the project. Contact Stalite for specific properties of the material.

Direct Shear: The minimum angle of internal friction shall be tested in accordance with ASTM D 3080 on a saturated representative sample (with particles larger than 0.75 inch removed) and tested in a round or square shear box that is a minimum of 12 inches across. Follow the procedure in D 3080 or shear the box at a rate of 0.01 inches per minute at normal loads of 250, 500 and 1,000 pounds per square foot.

- 4. For quality control and shipment quantities, the purchaser and supplier should agree on a maximum delivered loose bulk density (unit weight).
- 5. To convert bulk density (unit weight) in lb/ft³ to kg/m³, multiply by 16. To convert inches (in) to millimeters (mm) multiply by 25.4.



ROTARY KILN EXPANDED LIGHTWEIGHT AGGREGATE

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