



SPECIAL PROVISIONS
FOR
LIGHTWEIGHT BACKFILL

Hardin County
BRFN-065-6(42)--39-42

Effective Date
July 20, 2010

THE STANDARD SPECIFICATIONS, SERIES 2001, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

090074.01 DESCRIPTION.

This work shall consist of furnishing and placing lightweight backfill at the locations shown in the plans in accordance with these specifications and as directed by the Engineer.

090074.02 REFERENCED CODES AND STANDARDS.

ASTM	AASTHO	Specification/Test
C 136	-	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
C 29	-	Standard Test Method for Unit Weight and Voids in Aggregate.
D 698	-	Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft.-lbf/ft ³).
-	T 99-01	Standard Method of Test for Moisture-Density Relations of Soils Using a 5.5 lb Rammer and a 12 inch Drop.
D 3080	-	Standard Test Method for Direct Shear Test of Soils Under Consolidated Drained Conditions.
-	T 104	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
C 131	-	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregates by Abrasion and Impact in the Los Angeles Machine.
C330	-	Standard Specification for Lightweight Aggregates for Structural Concrete.

ASTM	AASHTO	Specification/Test
-	T 291	Standard Method of Test for Determining Water Soluble Chloride Ion Content in Soil.
-	T 290	Standard Method of Test for Determining Water Soluble Sulfate Ion Content in Soil.
-	T 288	Standard Method of Test for Determining Minimum Laboratory Soil Resistivity.
-	T 289	Standard Method of Test for Determining ph of Soil for Use in Corrosion Testing

US Army Corps of Engineering Manual, EM 1110-2-1906 Laboratory Soils Testing, Appendix X, Consolidated Drained Triaxial Test.

090074.03 MATERIALS.

A. General.

Lightweight backfill shall be an approved rotary kiln material meeting the requirements of ASTM C 330. No by-product slags, cinders, or by-products of coal combustion will be permitted. Lightweight backfill shall be non-corrosive and shall have a proven record of durability (magnesium sulfate) as determined in accordance with AASHTO T 104.

The results of the following laboratory tests shall be submitted a minimum of 14 days prior to transporting to the project site.

B. Physical Properties.

1. Gradation. The gradation shall be tested in accordance with ASTM C 136. Gradation shall meet the following requirements:

LIGHTWEIGHT BACKFILL

Sieve Designation	Percentage by Mass (Weight) Passing Square Mesh Sieves
1 inch	100
3/4 inch	90 to 100
3/8 inch	10 to 50
No. 4	0 to 30
No. 200	Less than 3%

2. Density. The dry loose density shall be less than 50 pounds per cubic foot when tested in accordance with ASTM C 29.

The lightweight aggregate producer shall submit verification of a compacted moist density of less than 60 pounds per cubic foot 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).

3. Angle of Internal Friction. The minimum angle of an 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 ASTM 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. Soundness Loss (magnesium sulfate). The maximum soundness loss when tested with 4 cycles of magnesium sulfate shall be 30% as determined in accordance with AASHTO T 104.
5. Abrasion Resistance. The maximum abrasion loss shall be 40% when tested in accordance with ASTM C 131.

C. Electrical and Chemical Properties.

1. Chloride Content. The maximum chloride content shall be 100 ppm as determined in accordance with AASHTO T 291.
2. Sulfate Content. The maximum sulfate content shall be 200 ppm in accordance with AASHTO T 290.
3. Resistivity. The resistivity shall be greater than 3000 ohm-cm when tested in accordance with AASHTO T 288.
4. pH. The pH shall be between 5 and 10 when tested in accordance with AASHTO T 289.

D. Summary.

SUMMARY OF MATERIAL REQUIREMENTS

Aggregate Property	Measuring Method	Test Method	Specification
Gradation	Sieve Analysis	ASTM C 136	See Table (Above)
Compacted In-Place Bulk Density	Density Test (Standard Proctor)	ASTM D 698, AASHTO T 99	< 60 lb/ft ³
Loose Bulk Density	Loose	ASTM C 29	Dry < 50 lb/ft ³
Angle of Internal Friction (Φ)	Direct Shear Test (Consolidated Drained)	ASTM D 3080	>40 degrees
	Triaxial Compression (Consolidated Drained)	Corps of Engineers EM 1110-2-1906	
Abrasion Resistance	Los Angeles Abrasion	ASTM C 131	<40 %
Corrosion to Concrete	Chloride Content	AASHTO T 291	<100 ppm

Aggregate Property	Measuring Method	Test Method	Specification
Corrosion to Concrete	Sulfate Content of Soils	AASHTO T 290	< 200 ppm
Corrosion to Steel	Resistivity	AASHTO T 288	< 3000 ohm-cm
pH	pH Meter	AASHTO T 289	5-10

E. Manufacturers.

The following manufacturers are capable of supplying lightweight backfill that meets these specifications:

Buildex, Inc.
P.O. Box 77
Ottawa, KS 66067-0077
Tel.: 785-242-2177

Glass Mountain Lightweight Aggregate
4603 50th Street
McClellan, CA 95652
Tel.: 916-921-2884
Fax: 916-921-2893

Norlite Corporation
628 S. Saratoga Street
Cohoes, NY 12047
Tel.: 518-235-0030
Fax: 518-235-0233

Requests for substitutions for the above shall be submitted a minimum of 14 days in advance of the bid opening date. Substitutions for the above after award shall be approved by the Engineer.

090074.04 CONSTRUCTION REQUIREMENTS.

Lightweight backfill shall be placed in uniform layers not to exceed 12 inches loose thickness. Each layer shall be compacted using vibratory compaction equipment weighing not more than 12 tons static weight. The actual lift thickness, exact number of passes, and need for vibrating the roller will be determined by the Engineer, depending on the project requirements (i.e., strength, compressibility, unit weight, etc.) and equipment used.

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

The Contractor shall take all necessary precautions during construction activities in operations on or adjacent to the lightweight backfill to ensure that the material is not overcompacted.

Construction equipment, other than for compaction, shall not operate on the exposed lightweight backfill.

090074.05 METHOD OF MEASUREMENT.

The quantity of Lightweight Backfill to be measured for payment will be the number of cubic yards complete and in place in the accepted work.

090074.06 BASIS OF PAYMENT.

The accepted quantity of Lightweight Backfill will be paid for at the contract unit price per cubic yard. Payment will be full compensation for performing the work specified and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work.