Western Loop Road Retaining Wall
Greensboro, NC

Location: Greensboro, NC

Contractor: Archer Western

Owner: North Carolina Department of Transportation

Wall Designer: Foster Geotechnical, Woodbridge, VA

A new retaining wall built as part of the $116 million North Carolina Department of Transportation (NCDOT) Greensboro western loop project, was constructed using *STALITE* expanded slate lightweight aggregate as a backfill. The project is located just north of West Vandalia Road near the intersection of West Vandalia and Groometown Road. The area where the retaining wall was placed had compressible soils and limited area for over excavation. The combination of site conditions made the use of the lightweight fill an attractive option for the NCDOT. Foster Geotechnical, who designed the wall, said the incorporation of lightweight fill (at the NCDOT's request) into the project was not complicated and they often use lightweight aggregate fill for similar applications over poor soils.

The lightweight aggregate was shipped directly to the project from *STALITE*'s Lightweight Aquadale plant, located just outside of Albemarle, NC. The material had a gradation meeting ASTM C-330 (3/4" to #4) requirements and the damp loose density averaged 53 lb/ft^3 when shipped from the plant. A total of 4200 tons of lightweight aggregate was shipped to the project from December 2004 through June 2005. Below is a chart of typical values for design using lightweight aggregate fill. As you will notice in the chart the lightweight aggregate has several advantages over typical fill. The high internal angle of friction (40°-46°) paired with the lowest maximum compacted in-place density (62 lb/ft^3 wet, 59 lb/ft^3 dry) makes *STALITE* lightweight fill an option in solving many poor soil problems on construction sites.

Aggregate Property	Measuring Method	Test Method	Commonly Used Specifications for ESCSI	*STALITE* Expanded *STALITE* Lightweight Aggregate	Typical Design Value for Ordinary Fills
Soundness Loss	Magnesium Sulfate	AASHTO T 104	< 30%	0.23%	< 6%
Abrasion Resistance	Los Angeles Abrasion	ASTM C 131	< 40%	26%	10-45%
Chloride Content	Chloride Content of Soils	AASHTO T 291	< 100ppm	37 ppm	
Grading	Sieve Analysis	ASTM C 136	Comment No. 1	ASTM C-330	ASTM C 33
Compacted In-Place Bulk Density (Unit Weight)	Density Test	ASTM D-698 Comment 2	< 70 lb/ft^3	62 lb/ft^3 59 lb/ft^3	100-130 lbs/ft^3
Stability (Phi Angle, Φ)	Direct Shear Test Consolidated Drained Triaxial-Consolidated Drained	ASTM D 3080 Comment 3 Corps of Engineers EM 1110-2-1906 Appendix X Comment 3	Comment No. 3	40°-46°	30°-38° (fine sand-sand & gravel)
Loose Bulk Density (Unit Weight)	Loose	ASTM C 29	Dry < 50 lb/ft^3 Saturated < 65 lb/ft^3	48-55 lb/ft^3	89-105 lb/ft^3
pH	pH Meter	AASHTO T 289	5-10	6.95	5-10

Comments
1. Grading: ESCS aggregates are available in a wide variety of grading, therefore it is essential the specifier contact the ESCS supplier for the gradings that are available in a given location. Some common gradings are ¾" to No. 4, ½" to No. 4, 3/8" to No. 8, 3/8" to 0, 2" to ¾", 2" to 0 or blends of these. ESCS aggregate suppliers can be found on ESCSI's website at www.escsi.org. (LINK TO http://www.escsi.org)
2. Several methods have been used to determine the in-place moist bulk density (unit weight) of a given aggregate, therefore contact the ESCS producer for recommendation on local practices.
3. ESCS 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 ESCS 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 the ESCS supplier(s) for specific properties of their materials.

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STRUCTURAL
LIGHTWEIGHT AGGREGATE