



April 9, 2009

Mr. Jody Wall
 Carolina Stalite
 P.O. Box 186
 D-Tank, North Carolina 28071

Phone: (704) 279-8614

Subject: **Report of ASTM C 331-05 Standard Specification for Lightweight Aggregates for Concrete Masonry Units on D-Tank Fine Aggregate**
TEC Services Project No.: 05-0514
TEC Services Sample ID: 08-231

Dear Mr. Wall:

Testing Engineering & Consulting Services Inc. (TEC Services) is pleased to present this report of our testing of D-Tank lightweight aggregate submitted to our laboratory. The aggregate was tested in accordance to ASTM C 331 *Standard Specification for Lightweight Aggregates for Concrete Masonry Units* as authorized by the service agreement (TEC-PRO-04-0514) signed by you on March 29, 2005.

This specification covers testing need for lightweight aggregates intended for use in concrete masonry units when a prime consideration is to reduce the density of the units. ASTM C 331-04 states the maximum and minimum requirements in Section 4 *Chemical Composition* and 5 *Physical Properties*.

Summary of Test Results

Section 4 - Chemical Composition	Test Results	ASTM C 331-05 Requirements
Organic Impurities (Color change)	0	3 max
Staining (Stain index)	0	60 max
Loss on Ignition	0.30%	5% max
Section 5 – Physical Properties		
Clay Lumps and Friable Particles (Dry mass)	0.2%	2% max
Bulk Density (Loose)	57 lbs/ft ³	70 lbs/ft ³
Drying Shrinkage at 100 Days	0.07	0.10% max
Popouts	0	0 max
Grading	See Section 5.1.2 Below	
<u>Resistance to Freezing and Thawing</u>	0.9 %	----
Average Cumulative Weight Loss	6.92 g	----
Average Percent Weight Loss	0.76	----

Concrete mixes containing the D-Tank lightweight fine aggregate had to be batched in order to make test samples for drying shrinkage and resistance to freezing and thawing. Table 2 lists the materials used, source and amounts of materials used in the concrete mix.

Concrete Mix Proportions

The concrete was mixed in accordance with ASTM C 192

Table 2. Mix Proportions

Material	Source	Amount (lbs)
Cement	Lafarge	385
Lightweight Aggregate	D-Tank	2310
Water	Lawrenceville City Water	185
Total		2880

Concrete had a slump of 2 inches.

Test Results

Section 4.1.1 Organic Impurities

Requirement - Lightweight aggregate subjected to the test for organic impurities shall not produce a darker color than standard.

Result - D-Tank lightweight aggregate **did not show any color change**.

Section 4.1.2 Staining

Requirement - Lightweight aggregate shall have a stain index of less than sixty.

Result - D-Tank lightweight aggregate showed **no stain** which indicates an index of zero.

Section 4.1.3 Loss on Ignition

Requirement - Lightweight aggregate shall have a loss of ignition not more than five percent.

Result - D-Tank lightweight aggregate had a **loss on ignition of 0.30 percent**.

Section 5.1.1 Clay Lumps and Friable Particles

Requirement- The amount of clay lumps and friable particles shall not exceed two percent by dry mass.

Results- D-Tank lightweight aggregate had **0.2 percent clay lumps** and friable aggregate.

Section 5.1.2 Grading

The grading shall be by mutual agreement between interested parties. The Grading and the suggested range are listed in Table 3:

Table 3. Grading and suggested range

Seive Size	% Retained Each Sieve	% Range Suggested
3/8 in	0	0-2
No. 4	8.7	0-10
No. 8	29.6	15-35
No. 16	22.7	15-35
No. 30	13.6	5-20
No. 50	8.4	5-15
No. 100	6.4	5-15
Pan	10.4	8-20

Section 5.1.4 Bulk Density (Loose)

Requirement- Maximum Bulk density (loose) for fine aggregate is 70 lbs/ft³.

Result- D-Tank lightweight aggregate had an average **bulk density (loose) of 57 lbs/ft³**.

Section 5.2.1 Popouts

Requirement- There shall be no popouts observed after test concrete made with the tested lightweight is subjected to an autoclave in accordance with ASTM C 151.

Result- **No popouts** were observed.

Section 5.2.2 Resistance to Freezing and Thawing

Resistance to freezing and thawing was performed in water in accordance with ASTM C 1262 *Standard Test Method for Evaluating the Freeze-Thaw Durability of Manufactured Concrete Masonry Units and Related Concrete Units* as stated in section 8.2 of ASTM C 331 – 05. Testing was performed on five separate samples. The results from all samples were average to produce a single result.

All samples were cure for 28 day in a 50 percent humidity chamber at a temperature of 72°F prior to testing.

Freeze-Thaw durability results are presented in Table 4.

Table 4. Freeze-Thaw Durability.

Sample ID	Residue Weight grams	Initial Dry Weight grams	Final Dry Weight grams	Percent Weight Loss
05-029-1	9.7	871.0	861.3	1.1
05-029-2	8.2	786.8	778.6	1.0
05-029-3	6.1	749.0	742.9	0.8
05-029-4	5.6	771.4	765.8	0.7
05-029-5	7.5	747.6	740.1	1.0
Average	6.92			0.9

Section 5.2.3 Drying Shrinkage

Two by two by 11 ¼ inch length change beams are moist cure for seven days. An initial reading is taken at seven days then is placed in a 50 percent humidity chamber.

Drying shrinkage shall not exceed 0.10 % when compared to the initial reading at seven day moist cure at one hundred days of Shrinkage results are presented in Table 5.

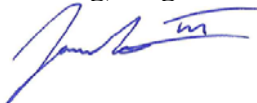
Table 5. Drying Shrinkage at 28 days and 100 days.

Concrete Age	28 Days	100 Days
Curing Method	Air Cured	Air cured
Date	10/26/2008	1/6/2009
Sample ID	Length Change (%)	Length Change (%)
05-029-A	-0.041	-0.064
05-029-B	-0.045	-0.068
05-029-C	-0.044	-0.069
Average	-0.043	-0.067

We appreciate the opportunity to provide our services to you for this project. If you have any questions, please call Trey McCants at (770) 995-8000.

Sincerely,

Testing, Engineering & Consulting Services, Inc.



James G. McCants III
 Staff Chemist



Shawn P. McCormick
 Laboratory Manager