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(10) VENDOR'S NAME S G & H			
(11) AR# / REQUESTOR AR1837575	(12) LOG-IN DATE 0 1 0 8 1 3	(15) 1 <input checked="" type="checkbox"/> APPROVED 2 <input type="checkbox"/> APPROVED, SUBMIT REVISED DOC.	(13) <input checked="" type="checkbox"/> CHECK ELEC. MECH. S MECH. STRUCT INST. PIPING
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COMPLETE REISSUE

REVISION 001 CHANGES THE AGGREGATE SOURCE LOCATION FROM PLACITAS QUARRY TO SANTA ANA QUARRY. THE SOURCE OF THE AGGREGATE SAMPLE WAS ERRANTLY IDENTIFIED AS PLACITAS. SEE PAGE 6 FOR EXPLANATION.

Date: 17 September 2012

Prepared by: Daniela M. Mauro

Material: Aggregate Test: SGH C295
(modified)

Verified by: Mauro J. Scali

Approved by: Said Bolourchi

Project: 120766 – Examination of Aggregate Samples from New Mexico by the University of Texas, in Support of the On-Going Evaluation the Impact of ASR, Seabrook Nuclear

Subject: Examination of Placitas aggregate sample from Lafarge Aggregates, Bernalillo, NM, for comparison to concrete aggregate used during construction of concrete structures at Seabrook Station, Seabrook NH.

SAMPLE DESCRIPTION

The test sample was identified as Placitas Aggregate from an operating quarry of Lafarge Aggregates located in Bernalillo, New Mexico. The sample was submitted by NextEra Energy – Seabrook to Simpson Gumpertz & Heger Inc. (SGH) on 13 July 2012. Reportedly, the aggregate sample was obtained from the Lafarge aggregate quarry.

The objectives of our petrographic examination and evaluation of the aggregate was to compare the mineralogy and representative rock types in the Lafarge aggregate to aggregate previously examined and identified by SGH in concrete core samples from NextEra – Seabrook Station [1].

TEST DESCRIPTION

We conducted a petrographic examination on the submitted aggregate sample in accordance with applicable sections of ASTM C295 – Petrographic Examination of Aggregates for Use in Concrete. However, due to limitations in the overall mass of the sample, we were not able to conduct a full petrographic examination in accordance with all of the procedures and reporting requirements of ASTM C295. The requirements for conducting ASTM C295 on a coarse aggregate include the examination and evaluation of a 45 kg sample. The total mass of the submitted aggregate sample was approximately 1 kg.

We conducted a general visual examination on the Placitas aggregate and selected a total of twenty particles (based on differences in particle size, shape, and color) as being representative of the various rock types in the sample. From the twenty aggregate particles, we selected nine pieces as having distinctive mineralogy and/or representative of a general rock class or specific rock type.

We prepared ultrathin (25 to 30 μm) sections from representative portions of each of the nine selected aggregate particles.

We conducted a sieve analysis in accordance with SGH C136 – Sieve Analysis of Fine and Coarse Aggregate on the remainder of the aggregate sample. The purpose of sieve analysis was to separate individual aggregate particles into specific particle sizes in order to conduct our petrographic examination and to compare the overall aggregate grading to the requirements outlined in Table 2 of ASTM C33 – Standard Specification for Concrete Aggregates.

GENERAL DESCRIPTION OF SUBMITTED AGGREGATE SAMPLE

The Lafarge Placitas aggregate sample consisted of 278 individual particles representing approximately 1,070 grams of material. Reportedly, Lafarge classifies the aggregate as No. 57 stone. The individual aggregate particles are subround to subangular in shape and include individual particles of aggregate, as well as approximately 1.4 grams of minus 100 mesh sized aggregate dust. All of the aggregate particles are coated with a layer of fine aggregate dust. The gradation of the submitted aggregate, as shown in Table 1 below, meets the requirements for No. 57 stone, as outlined in Table 2 of ASTM C33.

Table 1 – Sieve Analysis Results

Sieve	Mass on Each Sieve (g)	Individual Percent Retained	Percent Passing	ASTM C33 NO. 57 Stone Percent Passing
1	0.00	0.0	100.0	95 – 100
3/4	132.00	12.6	87.4	
1/2	575.05	55.0	32.4	25 – 60
3/8	273.20	26.1	6.3	
No.4	64.10	6.13	0.14	0 – 10
No. 8	0.02	0.0	0.12	0 – 5
No.16	0.02	0.0	0.12	
Pan	1.28	0.12		

RESULTS

We used the results of our petrographic examination to determine the general classification of the aggregate particles as well as the specific rock types present in the Placitas aggregate. On a macroscale, the aggregate represents a natural gravel containing dark grey-green to black aggregate particles, as well as pink to dark red, and beige to brown colored aggregate. The individual aggregate particles exhibit a dull, and opaque to sub-translucent appearance. All of the particles are coated with a layer of fine aggregate dust. On fractured surfaces, as well as the exterior weathered surfaces of washed particles, we observe individual mineral crystals or a fine grained, dull to sub-translucent and unidentifiable ground mass with occasional visible individual mineral crystals.

The Placitas aggregate includes rock types in each of the general classifications of igneous, sedimentary, and metamorphic rock. The rock type and name for each of the nine selected aggregate particles are shown in Table 1 below:

Table 2 – Rock Name and Type of Aggregate Particles

Particle ID	Approximate Particle Size	General Class	Name
1	3/4	Igneous (Volcanic)	Felsite (dacite)
2	3/8	Igneous (Volcanic)	Felsite (rhyolite)
3	1/2	Sedimentary	Sandstone
4	3/4	Igneous (Volcanic)	Felsite (rhyolite/augite)
5	1/2	Sedimentary	Chert
6	3/4	Metamorphic	Hornfel
7	3/8	Igneous (Volcanic)	Felsite (rhyolite/augite)
8	1/2	Igneous (Volcanic)	Felsite (trachyte)
9	3/8	Sedimentary	Conglomerate

Table 2 shows the proportional composition of the Placitas aggregate sample, as identified by petrographic examination.

Table 3 – Proportion of Rock Class in the Placitas Aggregate

Rock Class	Number of Particles	Proportion
Igneous Rock (granite, massive quartz, dacite, rhyolite, and trachyte)	163	58.6%
Sedimentary Rock (sandstone, chert, and conglomerate)	22	7.9%
Metamorphic Rock (Hornfel)	93	33.5%

COMMENTS AND FINDINGS

The Placitas aggregate sample includes potentially ASR reactive rock constituents and minerals, including chalcedonic chert, volcanic glass, and strained quartz.

By comparison, the coarse aggregate in the Seabrook Station concrete core samples [2 – 4] included crushed particles of reactive low-grade metamorphic chlorite schist and nonreactive hornfel (Photo 1). Schists are classified as medium grade metamorphic rock, with the parent rock being most often of sedimentary origin, such as shale or mudstone.

There are similarities and differences between the Placitas aggregate and the coarse aggregate used during construction of concrete structures at Seabrook Station. These similarities and differences include the following:

The Placitas aggregate contains subround to subangular particles of natural gravel, while the Seabrook concrete aggregate consists of a crushed stone. This difference in particle shape and angularity may result in differences in particle packing, water demand, and quality of paste-to-aggregate (P/A) bond strength. The Placitas and Seabrook aggregates both contain a mixture reactive and nonreactive rock and/or mineral assemblages. The types of potentially reactive materials in the Placitas aggregate are expected to be faster reacting and may experience greater long-term reactivity than those in the Seabrook Station aggregate.

Both aggregate sources contain hard, abrasion resistant aggregate that is uniformly graded.

Aside from the higher potential for ASR reactivity in the Placitas aggregate and the difference in particle angularity, the Placitas and Seabrook Station aggregates are similarly hard and abrasion resistant, suggesting that they are comparable in physical properties.

REFERENCES

1. Simpson Gumpertz & Heger Inc., Document No. 120109-RPT-01, Revision 0, dated 4 April 2012.
2. Simpson Gumpertz & Heger Inc., Document No. 110594-RPT-02, Revision 0 dated 31 January 2012.
3. Simpson Gumpertz & Heger Inc., Document No. RPT-100502-2, Revision 0 dated 4 August 2010.
4. Simpson Gumpertz & Heger Inc., Document No. RPT-100502-4 Revision 0 dated 4 August 2010.

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Photo 1

Magnified (4X) image of the polished cross-section in Core Section EFW-1P from Seabrook Station [1] showing reactive coarse-aggregate (schist) particle (red arrow), as well as a nearby nonreactive hornfel particle (yellow arrow). The scale is for information purposes only.

5-F7

Vassallo, Theodore

From: Deschenes, Dean J. [dean.deschenes@utexas.edu]
Sent: Monday, January 07, 2013 2:08 PM
To: Vassallo, Theodore
Cc: Bayrak, Oguzhan; Simons, John (jsimons@mpr.com)
Subject: MPR 0326-0063: Lafarge Coarse Aggregates.
Attachments: CA_Lafarge_Santa Ana.pdf

Hi Ted,

Lafarge operates a number of quarries and aggregate distribution centers near Bernalillo, New Mexico. The No. 6 coarse aggregate purchased for trial batching and proposed for use in full-scale batching is quarried from the Santa Ana Pit and was distributed to us through the Placitas Pit/Sales Yard (hence the confusion). I have attached the ASTM C33 worksheet from Lafarge for your information. I previously forwarded this information to you in July and had improperly labeled it as "Placitas."

¾" Crushed No. 6
Source Pit: Santa Ana
Product Code: AG1323

Lafarge Placitas Aggregates
148 East I-25 Frontage Road
Bernalillo, NM 87004
(505) 867-5110
35.3311 Lat. -106.5058 Long.

Lafarge Santa Ana Aggregates
336 East I-25 Frontage Road
Bernalillo, NM 87004
(505) 867-6345
35.3550 Lat. -106.4953 Long.

I apologize for the confusion.

Regards,

Dean.

Ferguson Structural Engineering Laboratory
The University of Texas at Austin
10100 Burnet Road, Building 177
Austin, Texas 78758

512.436.3326



Product Quality Assurance Department
3700 Singer, Suite C Albuquerque, NM 87109

**REPORT of AGGREGATE
PHYSICAL PROPERTIES**



Material: 3/4" Crushed
 Period: 01/04/12 - 01/04/13
 Source Pit: Santa Ana
 Product Code: AG1323
 Agency Specification: D 448, Size # 6
 Product Description: Crushed, graded, coarse aggregate.

Project No: 12002
 Lab No.: A1203-0005
 Sample Date: 04-Jan-12
 Report Date: 31-Jan-12
 Reviewed by: *John J. Watson*

SIEVE ANALYSIS		
ASTM C136		D 448 Size #6 Band
Sieve Size	Accum. % Passing	
450 mm (18")		
375 mm (15")		
300 mm (12")		
250 mm (10")		
225 mm (9")		
200 mm (8")		
150 mm (6")		
125 mm (5")		
100 mm (4")		
75.0 mm (3")		
63.0 mm (2-1/2")		
50.0 mm (2")		
37.5 mm (1-1/2")		
25.0 mm (1")	100	100
19.0 mm (3/4")	99	90-100
12.5 mm (1/2")	22	20-55
9.5 mm (3/8")	6	0-15
6.3 mm (1/4")		
4.75mm (No. 4)	2	0-5
2.36 mm (No. 8)		
2.00 mm (No. 10)		
1.18mm (No.16)		
0.600 mm (No.30)		
0.425mm (No. 40)		
0.300mm (No. 50)		
0.180mm (No. 80)		
0.150mm (No.100)		
0.075mm (No. 200)	1.2	
ASTM C117		
Moisture Content, %		
ASTM C566		
Fractured Face, %	98	2FF
Fineness Modulus (FM)		

TEST RESULTS				
Standard	PHYSICAL PROPERTIES	Results	Specification	Lab of Record
ASTM C 29	Unit Weight & Voids	Unit Weight, lbs./cu.ft.=	93.6	Lafarge 04-Jan-12
		Voids, %=	42.9	
		Rodded	Rodded	
ASTM C 127	Coarse Specific Gravity & Absorption	Bulk Specific Gravity (dry)=	2.633	Lafarge 04-Jan-12
		Bulk Specific Gravity, SSD=	2.651	
		Apparent Specific Gravity=	2.680	
		Absorption, %=	0.7	
ASTM C 128	Fine Specific Gravity & Absorption	Bulk Specific Gravity (dry)=		
		Bulk Specific Gravity, SSD=		
		Apparent Specific Gravity=		
		Absorption, %=		
ASTM D 2419	Sand Equivalent	Sand Equivalent, %=		
ASTM D 4791	Flat & Elongated	Flat & Elongated, %=	11	Lafarge 04-Jan-12
		Ratio=	3:1	
ASTM C 131	L. A. Abrasion	Small Coarse Loss, %=	22	Lafarge 04-Jan-12
		Grading/ Revs.=	B / 500	
ASTM C 535	L. A. Abrasion	Large Coarse Loss, %=		
		Grading/ Revs.=		
ASTM C 88	Soundness	Coarse Soundness Loss, %=	5.1	Lafarge 04-Jan-12
		Magnesium No. of Cycles=	5	
	Soundness	Fine Soundness Loss, %=		
ASTM C 142	Clay/Friable Particles	Coarse Aggregate, %=		max 2.0
		Fine Aggregate, %=		
AASHTO TP58-00	Micro-Deval	% Loss: Grading:		
ASTM C 123	Lightweight Pieces	Coarse Aggregate, %=		0.5 Max
		Fine Aggregate, %=		
	NMDOT Aggregate Index	Coarse Aggregate, %=	10.7	Lafarge 04-Jan-12
ASTM D 1557	Compaction Modified Effort	Optimum Moisture, %=		
		Max. Density, lbs./cu.ft.=		
ASTM D 4318	Liquid Limit, Plastic Limit & Plasticity Index	Liquid Limit=		
		Plastic Limit=		
		Plasticity Index=		