

APPENDIX A

CONCRETE CORE SAMPLING AND LABORATORY TESTING

Concrete Cores

Core Code:

For Example: 9B9-2

#1 Number stands for the Buttress Number. _____

#2 The Letter shows if the Core is on the End (E)
or on the side of the Buttress (B), Generator
Room (GR), Turbine Room (TR). _____

#3 The last number represents the Bay number. _____

#4 If the last number is followed by a Dash and a
Number that shows the second or third Core on
the same side of the Buttress. _____

Concrete Core List

Total Cores (22)

- (12E)
- (12B11)
- (11E)
- (11B10)
- (10E)
- (10B10)
- (10B9)
- (9B9-1)
- (9B9-2)
- (9E-1)
- (9E-2)
- (9B8-1)
- (9B8-2)
- (9B8-3)
- (8B8-1)
- (8B8-2)
- (8E)
- (8TR)
- (8GR)
- (7TR)
- (7GR)
- (7E)

Concrete Core Locations

Core Code:

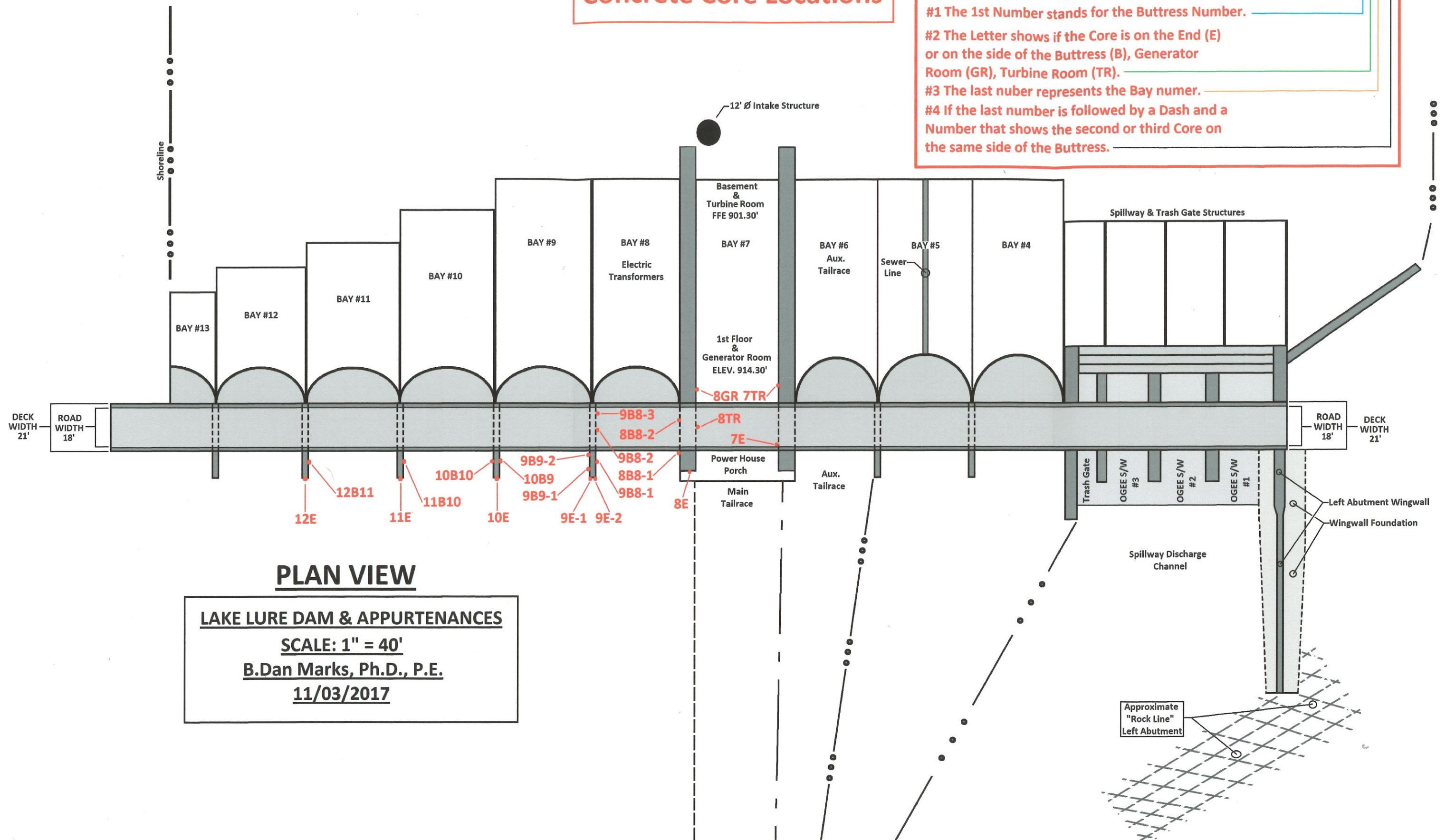
#1 The 1st Number stands for the Buttress Number.

#2 The Letter shows if the Core is on the End (E) or on the side of the Buttress (B), Generator Room (GR), Turbine Room (TR).

#3 The last nubur represents the Bay numer.

#4 If the last number is followed by a Dash and a Number that shows the second or third Core on the same side of the Buttress.

For Example: 9B9-2



PLAN VIEW

LAKE LURE DAM & APPURTENANCES

SCALE: 1" = 40'

B. Dan Marks, Ph.D., P.E.

11/03/2017



November 16, 2017

Marks Enterprises of NC, PLLC
1 Palatka Street
Arden, NC 28704

Attention: Dr. B. Dan Marks, Ph.D.

Reference: **Laboratory Testing Services**
Lake Lure Dam
Lake Lure, NC
S&ME Project No. 3743-17-046

Dear Dr. Marks:

S&ME, Inc. has completed the laboratory testing of the 17 concrete core specimens received on November 1, 2017. The testing was performed as outlined in the Laboratory Testing Service Order Agreement between Marks Enterprises of NC, PLLC and S&ME, Inc. dated August 28, 2017. The work was authorized by you on September 3, 2017. Laboratory tests were as assigned by you when the specimens were delivered to our laboratory on November 1, 2017.

Results from the following tests are included in this submittal:

- ◆ ASTM C42-16, Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
- ◆ ASTM C39-17b, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
- ◆ ASTM C496-17, Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens

S&ME is pleased to provide Marks Enterprises with these laboratory testing services. Please contact us if you have questions concerning this testing. We look forward to our continued working relationship with you.

Sincerely,

S&ME, Inc.

Jason B. Burgess, P.E. (Tennessee)
Project Engineer

Jeffery A. Abston, P.E. (Tennessee)
Project Manager

Attachments

**Attachment I – Compressive Strength Testing of Concrete Core
Samples (ASTM C42 & C39)**



Materials Test Report

S&ME, Inc. - Knoxville 1413 Topside Road Louisville, TN 37777

Client:	Marks Enterprises of NC, PLLC	Material:	Concrete Core Samples
Project:	Laboratory Testing for Lake Lure Dam	Source:	Project Site
S&ME Project No.	3743-17-046	Placement Date:	Not Provided
S&ME Report Date:	11/16/2017	Date Received:	11/1/2017
		Tested Date:	11/8/2017

Compressive Strength Testing of Concrete Core Samples (ASTM C42 & C39)

Sample Location No.	7E	8GR	12E
Length before capping (in)	6.00	7.40	7.30
Length after capping (in)	6.15	7.60	7.45
Average Diameter (in)	3.72	3.72	3.72
Cross-Sectional Area (in ²)	10.87	10.87	10.87
Length-to-diameter ratio (L/D)	1.65	2.04	2.00
L/D Correction Factor	0.97	1.00	1.00
Direction of load application with respect to horizontal plane of the concrete as placed	Not Provided	Not Provided	Not Provided
Time when tested	8:10 AM	8:15 AM	8:20 AM
Nominal maximum size of coarse aggregate	Not Provided	Not Provided	Not Provided
Density (pcf)	140	150	128
Ultimate Compressive Load (lbs)	35,287	39,127	44,263
Compressive Strength (psi)	3,150	3,600	4,070

Note: Coring date was not provided. Compressive strength testing performed on cores in the as-received condition as requested.



Materials Test Report

S&ME, Inc. - Knoxville 1413 Topside Road Louisville, TN 37777

Client:	Marks Enterprises of NC, PLLC	Material:	Concrete Core Samples
Project:	Laboratory Testing for Lake Lure Dam	Source:	Project Site
S&ME Project No.	3743-17-046	Placement Date:	Not Provided
S&ME Report Date:	11/16/2017	Date Received:	11/1/2017
		Tested Date:	11/8/2017

Compressive Strength Testing of Concrete Core Samples (ASTM C42 & C39)

Sample Location No.	7TR	9B81	9B92
Length before capping (in)	7.40	7.35	7.30
Length after capping (in)	7.60	7.50	7.45
Average Diameter (in)	3.73	3.72	3.71
Cross-Sectional Area (in ²)	10.93	10.87	10.81
Length-to-diameter ratio (L/D)	2.04	2.02	2.01
L/D Correction Factor	1.00	1.00	1.00
Direction of load application with respect to horizontal plane of the concrete as placed	Not Provided	Not Provided	Not Provided
Time when tested	8:25 AM	8:30 AM	8:35 AM
Nominal maximum size of coarse aggregate	Not Provided	Not Provided	Not Provided
Density (pcf)	145	145	143
Ultimate Compressive Load (lbs)	43,649	34,737	39,709
Compressive Strength (psi)	3,990	3,200	3,670

Note: Coring date was not provided. Compressive strength testing performed on cores in the as-received condition as requested.



Materials Test Report

S&ME, Inc. - Knoxville 1413 Topside Road Louisville, TN 37777

Client:	Marks Enterprises of NC, PLLC	Material:	Concrete Core Samples
Project:	Laboratory Testing for Lake Lure Dam	Source:	Project Site
S&ME Project No.	3743-17-046	Placement Date:	Not Provided
S&ME Report Date:	11/16/2017	Date Received:	11/1/2017
		Tested Date:	11/8/2017

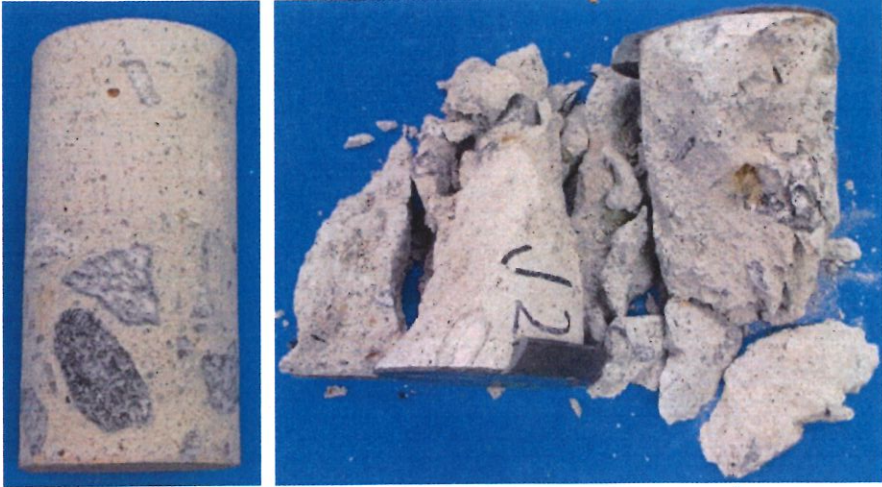
Compressive Strength Testing of Concrete Core Samples (ASTM C42 & C39)

Sample Location No.	9E1	10E	10B9
Length before capping (in)	6.00	7.35	7.40
Length after capping (in)	6.15	7.50	7.55
Average Diameter (in)	3.69	3.71	3.71
Cross-Sectional Area (in ²)	10.69	10.81	10.81
Length-to-diameter ratio (L/D)	1.67	2.02	2.04
L/D Correction Factor	0.97	1.00	1.00
Direction of load application with respect to horizontal plane of the concrete as placed	Not Provided	Not Provided	Not Provided
Time when tested	8:40 AM	8:45 AM	8:50 AM
Nominal maximum size of coarse aggregate	Not Provided	Not Provided	Not Provided
Density (pcf)	143	139	140
Ultimate Compressive Load (lbs)	41,808	26,757	20,480
Compressive Strength (psi)	3,790	2,480	1,890

Note: Coring date was not provided. Compressive strength testing performed on cores in the as-received condition as requested.

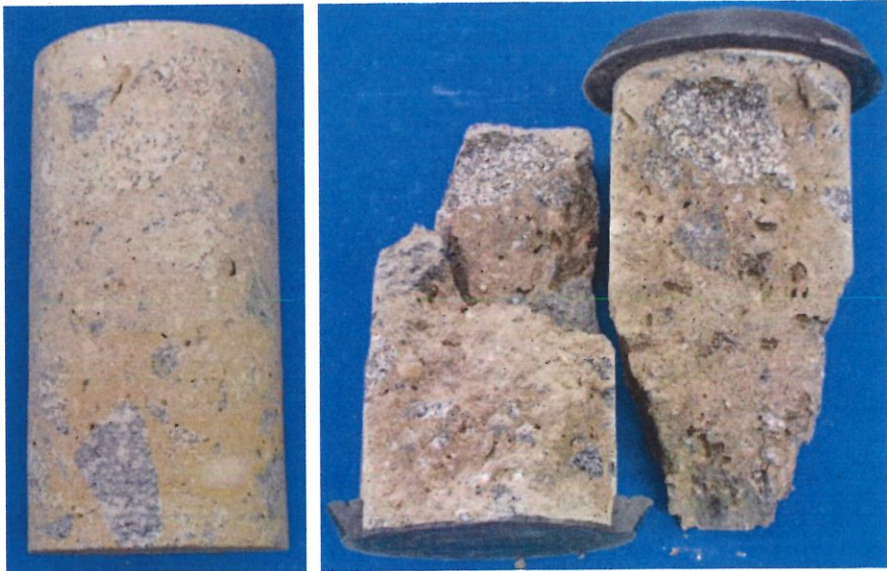
 		Date: 11/8/2017
		Photographer: Ben Painter
1	Location / Orientation	7E
	Remarks	Compressive Strength of Drilled Concrete Cores Specimen Before / After (ASTM C42)

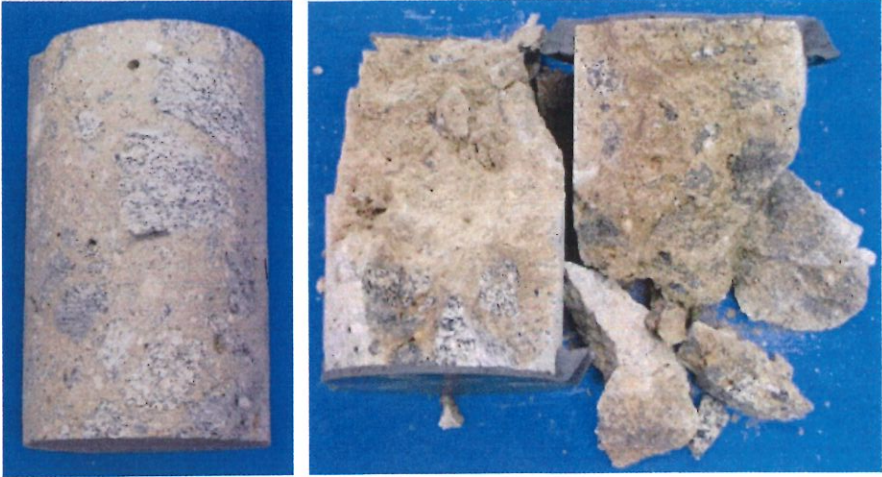
 		Date: 11/8/2017
		Photographer: Ben Painter
2	Location / Orientation	8GR
	Remarks	Compressive Strength of Drilled Concrete Cores Specimen Before / After (ASTM C42)

		Date: 11/8/2017
		Photographer: Ben Painter
3	Location / Orientation	12E
	Remarks	Compressive Strength of Drilled Concrete Cores Specimen Before / After (ASTM C42)

		Date: 11/8/2017
		Photographer: Ben Painter
4	Location / Orientation	7TR
	Remarks	Compressive Strength of Drilled Concrete Cores Specimen Before / After (ASTM C42)

		Date: 11/8/2017
		Photographer: Ben Painter
5	Location / Orientation	9B81
	Remarks	Compressive Strength of Drilled Concrete Cores Specimen Before / After (ASTM C42)

		Date: 11/8/2017
		Photographer: Ben Painter
6	Location / Orientation	9B92
	Remarks	Compressive Strength of Drilled Concrete Cores Specimen Before / After (ASTM C42)

		Date: 11/8/2017
		Photographer: Ben Painter
7	Location / Orientation	9E1
	Remarks	Compressive Strength of Drilled Concrete Cores Specimen Before / After (ASTM C42)

		Date: 11/8/2017
		Photographer: Ben Painter
8	Location / Orientation	10E
	Remarks	Compressive Strength of Drilled Concrete Cores Specimen Before / After (ASTM C42)

		Date: 11/8/2017
		Photographer: Ben Painter
9	Location / Orientation	10B9
	Remarks	Compressive Strength of Drilled Concrete Cores Specimen Before / After (ASTM C42)

Attachment II – Splitting Tensile Strength of Concrete (ASTM C496)

**SPLITTING TENSILE STRENGTH OF CONCRETE
(ASTM C496)**



S&ME, Inc. - Knoxville 1413 Topside Road, Louisville, TN 37777

Client:	Marks Enterprises of NC, PLLC	Report Date:	November 16, 2017
Project Name:	Laboratory Testing for Lake Lure Dam	Test Date(s):	11/10/17 - 11/15/17
Project Location:	Lake Lure Dam	Tested By:	BKP
Project No.:	3743-17-046	Reviewed By:	JBB

Boring ID	Sample Number	Test Depth (ft)	Specimen Properties ^{1,2}			Maximum Load (lbs)	Results ³ (psi)
			Diameter (in)	Length (in)	Unit Weight (pcf)		
8E	N/A	N/A	3.72	7.4	149	23,389	540
8TR	N/A	N/A	3.73	7.5	149	26,957	615
9B82	N/A	N/A	3.72	7.4	148	17,429	405
9B91	N/A	N/A	3.71	7.5	143	15,885	365
10B10	N/A	N/A	3.71	7.6	144	22,264	505
9E2	N/A	N/A	3.72	7.5	143	20,876	475
11E	N/A	N/A	3.72	7.5	137	18,910	430
11B10	N/A	N/A	3.72	7.5	138	12,806	290

- NOTE 1: Unit weight determined in the as-received condition by taking dimensional measurements (ASTM C496-17 Section 8.2), determining mass, and performing calculations.
- NOTE 2: Please see photo page for relationship between core diameter and aggregate size.
- NOTE 3: Splitting tensile strength testing performed on cores in the as-received moisture condition as requested.

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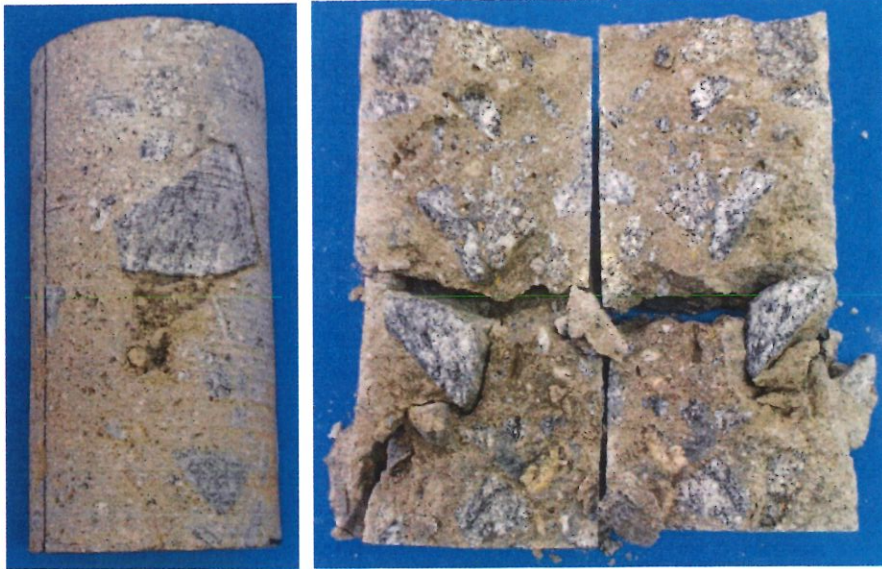
1	Location / Orientation	8E	Photographer: Ben Painter	Date: 11/15/2017
	Remarks	Splitting Tensile Strength of Concrete Core Specimen Before/After (ASTM C496)		




2	Location / Orientation	8TR	Photographer: Ben Painter	Date: 11/15/2017
	Remarks	Splitting Tensile Strength of Concrete Core Specimen Before/After (ASTM C496)		




		Date: 11/15/2017
		Photographer: Ben Painter
3	Location / Orientation	9B82
	Remarks	Splitting Tensile Strength of Concrete Core Specimen Before/After (ASTM C496)

		Date: 11/15/2017
		Photographer: Ben Painter
4	Location / Orientation	9B91
	Remarks	Splitting Tensile Strength of Concrete Core Specimen Before/After (ASTM C496)

5	Location / Orientation	10B10	Photographer: Ben Painter	Date: 11/15/2017
	Remarks	Splitting Tensile Strength of Concrete Core Specimen Before/After (ASTM C496)		




6	Location / Orientation	9E2	Photographer: Ben Painter	Date: 11/15/2017
	Remarks	Splitting Tensile Strength of Concrete Core Specimen Before/After (ASTM C496)		




 		Date: 11/15/2017
		Photographer: Ben Painter
7	Location / Orientation	11E
	Remarks	Splitting Tensile Strength of Concrete Core Specimen Before/After (ASTM C496)

 		Date: 11/15/2017
		Photographer: Ben Painter
8	Location / Orientation	11B10
	Remarks	Splitting Tensile Strength of Concrete Core Specimen Before/After (ASTM C496)

senting each class of concrete shall be equal to or greater than the specified strength, f'_c , and not more than 10 percent of the strength tests shall have values less than the specified strength.

(d) When it appears that the laboratory-cured specimens will fail to conform to the requirements for strength, the Building Official shall have the right to order changes in the concrete sufficient to increase the strength to meet these requirements. The strengths of any specimens cured on the job are intended to indicate the adequacy of protection and curing of the concrete and may be used to determine when the forms may be stripped, shoring removed, or the structure placed in service. When, in the opinion of the Building Official, the strengths of the job-cured specimens are excessively below those of the laboratory-cured specimens, the contractor may be required to improve the procedures for protecting and curing the concrete.

(e) In addition, when concrete fails to conform to the requirements of (c) or when tests of field-cured cylinders indicate deficiencies in protection and curing, the Building Official may require tests in accordance with "Methods of Securing, Preparing and Testing Specimens from Hardened Concrete for Compressive and Flexural Strength" (ASTM C 42) or order load tests as outlined in Chapter 2 for that portion of the structure where the questionable concrete has been placed.

505—Splitting tensile tests of concrete

(a) To determine the splitting ratio, F_{sp} , for a particular aggregate, tests of concrete shall be made as follows:

1. Twenty-four 6 x 12-in. cylinders shall be made in accordance with "Method of Making and Curing Concrete Compression and Flexure Test Specimens in the Laboratory" (ASTM C 192), twelve at a compressive strength level of approximately 3000 psi and twelve at approximately 4000 or 5000 psi. After 7 days moist curing followed by 21 days drying at 73 F and 50 percent relative humidity, eight of the test cylinders at each of the two strength levels shall be tested for splitting strength and four for compressive strength.

2. The splitting tensile strength shall be determined in accordance with "Method of Test for Splitting Tensile Strength of Molded Concrete Cylinders" (ASTM C 496), and the compressive strength in accordance with "Method of Test for Compressive Strength of Molded Concrete Cylinders" (ASTM C 39).

(b) The ratio, F_{sp} , of splitting tensile strength to the square root of compressive strength shall be obtained by using the average of all 16 splitting tensile tests and all eight compressive tests.

CHAPTER

601—Preparation of

(a) Before concrete is placed, the spaces to be filled shall be thoroughly wetted or oiled, and the concrete shall be thoroughly clean of ice and snow.

(b) Water shall not be added to concrete after it is placed unless permitted by the Building Official.

(c) All laitance and other weak material shall be removed from hardened concrete before new concrete is placed.

602—Mixing of concrete

(a) All concrete shall be mixed in accordance with the proportions of the materials and the method of mixing specified on the recharged.

(b) For job-mixed concrete, the approved type. The concrete shall be mixed in accordance with the manufacturer's instructions after all materials are in place.

(c) Ready-mixed concrete shall be mixed in accordance with the requirements of "Concrete" (ASTM C 191).

603—Conveying*

(a) Concrete shall be conveyed by methods approved by the Building Official.

(b) Equipment for conveying concrete shall be of a type that will maintain a continuous flow of concrete without segregation of materials.

604—Depositing*

(a) Concrete shall be deposited in its final position to avoid segregation. The concrete shall be carried to its final position by plastic and flows ready.

*Detailed recommendations for "Depositing and Placing Concrete" (ACI 308R-90).

