

# CERTIFIED TEST REPORT

## FLEXURAL STRENGTH OF HYDRAULIC-CEMENT MORTARS - *Per ASTM C348* -

Report Number: R-5.10\_02-03-21A\_PS  
Date: April 27, 2021

**REPORT PREPARED FOR:**



Piazza Stoneworks  
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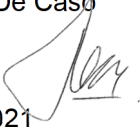

**Quality System:** The Structures and Materials Laboratory (SML) maintains a quality system in compliance with ISO 17025-2017, accredited under International Accreditation Service (IAS), testing laboratory TL-478 and qualified laboratory by the Florida Department of Transportation (FDOT) number ISM028. All the test results presented herein are linked through unbroken chain data. Analyzed data is obtained directly from the recorded raw data during testing, from which the test results are presented. This report contains analyzed tabulated data results.

**Procedures:** All tests and services are done in accordance with the SML Quality Manual (Version 6.0) revised November 30, 2019; relevant standard operating procedures (SOPs); and with the applicable requirements of the reference standard test methods, unless otherwise stated.

**Disclosure:** This document may contain confidential information; please contact an authorized entity prior to distributing. Conclusions reached and opinions offered in this document are based upon the data and information available to at the time of its issue, and may be subject to revision as additional information or data becomes available.

**Test Report**

<b>Controls:</b>	
Superseded Report	New report
Reason for Revision	n/a
Effective Date	April 27, 2021

<b>Test Report Approval Signatures:</b>	
Quality review Approval	<p>I indicate that I have reviewed this Test Report and agree with the contents it presents, and find it meets all applicable laboratory requirements and policies. I approve for its release to the customer.</p> <p>Name: Francisco De Caso Signature:  Date: April 27, 2021</p>
Technical review Approval	<p>I indicate that I have reviewed this Test Report and agree with the technical contents it presents, and find it meets all applicable laboratory requirements and policies. I approve for its release to the customer.</p> <p>Name: Antonio Nanni Signature:  Date: April 27, 2021</p>

## 1. FLEXURAL STRENGTH - ASTM C348

### 1.1. TEST SUMMARY INFORMATION

Test Objective:	Determination of flexural strength of cured mortar specimens.
Sample Under Evaluation:	Piazza Stoneworks bagged dry mix mortar. Refer to Figure 1.1.
Test Standard Method/s:	ASTM C348-20. Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars.
Test Set-up:	Load was applied via a universal test frame using a flexural fixture for a three-point bending configuration. The span length was 120 mm (4.7 inches). Load control rate of 2600 N/min (585 lbf/min) was applied. The maximum load at failure was recorded. Refer to Figure 1.2
Test Location:	Structures and Materials Laboratory at the University of Miami. 1251 Memorial Dr., MEB108 Coral Gables, FL, 33146.
Analyst/s:	Sebastian Garcia-Herreros and Juan Manuel Palacios
Technical Test Record:	TDS_C348_PS-6.
Specimen Dimensions:	Mortar prisms made from Piazza Stoneworks mix with nominal depth (d), breadth (b) and length (l) dimensions equal to 40 x 40 x 160 mm (1.6 x 1.6 x 6.3 in.).
Specimen Preparation:	Mortar mix to fabricate the prism specimens was prepared per manufacturer specifications with a 15% of water by volume. Specimens were cast in rigid (HRB 55) steel molds cast in two layers, tampering in three rounds per ASTM C348.
Sampling Reference:	Provided by the client.
Specimen Conditioning:	Specimens were conditioned in the humidity room for the first 24 hours. Curing continued by submerging specimens in lime-water until test date was reached, per ASTM C348.
Specimen ID:	Specimens are labeled and uniquely identified for quality and traceability using the format M#_X; where M is the tested property (FS-Flexural Strength); # is the curing period (1 for 7 days and 2 for 28 days)and X is specimen repetition number (1 to 5). Refer to Table 1.1.
Test Results:	Flexural strength tests results for 7 and 28 day strength are tabulated in Table 1.2, respectively. Failure mode was a flexural crack at mid-span at the load point, as represented in Figure 1.3.

Table 1.1 – Test matrix

Specimen ID	Material Identification	Curing Period (days)	Cast date (mm.dd.yy)	Test date (mm.dd.yy)
FS1_01 to 05	Piazza Stoneworks	7	03.24.2021	03.31.2021
FS2_01 to 05	dry mix design	28	03.23.2021	04.20.2021

## 1.2. TEST RESULTS

Table 1.2 – Results for flexural strength of mortar specimens with Piazza Stoneworks mix

Specimen ID	Maximum Load		Flexural Strength*		Failure Mode
	<i>P</i>		<i>S<sub>r</sub></i>		
	<i>N</i>	<i>lbf</i>	<i>MPa</i>	<i>psi</i>	
FS1_01	2555	574.4	7.19	1042	Flexural
FS1_02	2515	565.5	7.07	1026	Flexural
FS1_03	2303	517.7	6.48	939	Flexural
FS1_04	2330	523.8	6.55	950	Flexural
FS1_05	2442	548.9	6.87	996	Flexural
<b>Average</b>	<b>2429</b>	<b>546.1</b>	<b>6.83</b>	<b>991</b>	
<i>S<sub>n-1</sub></i>	111	24.9	0.31	45	
<i>CV(%)</i>	4.6	4.6	4.6	4.6	
FS2_01	2852	641.2	8.02	1164	Flexural
FS2_02	2724	612.4	7.66	1111	Flexural
FS2_03	2872	645.7	8.08	1172	Flexural
FS2_04	2962	665.9	8.33	1208	Flexural
FS2_05	3015	677.7	8.48	1230	Flexural
<b>Average</b>	<b>2885</b>	<b>648.6</b>	<b>8.11</b>	<b>1177</b>	
<i>S<sub>n-1</sub></i>	112	25.1	0.31	46	
<i>CV(%)</i>	3.9	3.9	3.9	3.9	

\*Flexural strength,  $S_r$  is defined as  $3PL / 2bd^2$ , where  $P$  is the maximum load applied at mid-span to the specimen,  $L$  is the clear span,  $b$  is the breadth of the specimen and  $d$  is the depth of the specimen.

### 1.3. VISUAL DOCUMENTATION



Figure 1.1 – Casting of specimens using the Piazza Stone mortar mix



Figure 1.2 – Flexural strength test setup

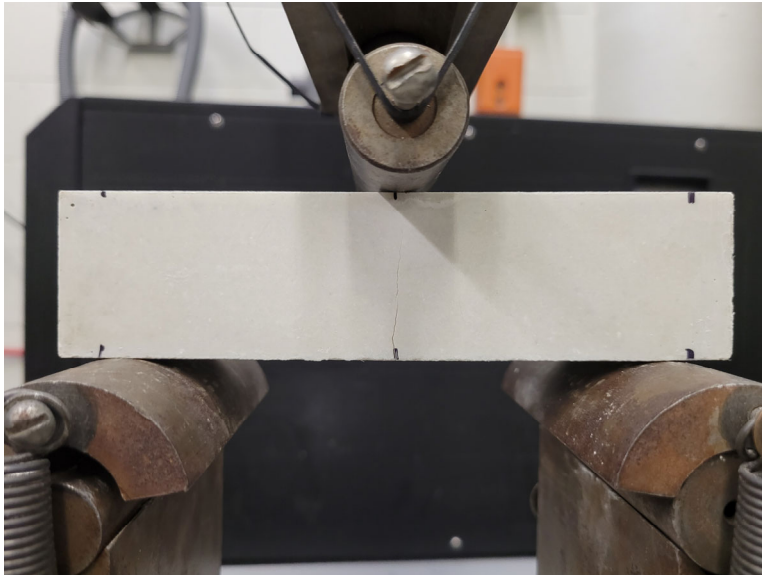


Figure 1.3 – Representative failure mode of flexural strength test

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