



April 9, 2024

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**Evaluation of Holcim 'Pump Blend' Aggregate  
ASTM C330 Qualification  
CTLGroup Project No. 201412**

Dear Ken:

As requested, CTLGroup has conducted testing for qualification of lightweight aggregate per ASTM C330, *Standard Specification for Lightweight Aggregates for Structural Concrete*. The supplied material was identified by you as 'pump blend aggregate.'

The scope of work included testing aggregate samples and concrete specimens in accordance with ASTM C330, which included the following tests (with modifications as specified in ASTM C330, if applicable):

- ASTM C136, *Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates*
- ASTM C114, *Standard Test Methods for Chemical Analysis of Hydraulic Cement*
- ASTM C40, *Standard Test Method for Organic Impurities in Fine Aggregates for Concrete*
- ASTM C29, *Standard Test Method for Bulk Density (Unit Weight) and Voids in Aggregate*
- ASTM C142, *Standard Test Method Clay Lumps and Friable Particles in Aggregates*
- ASTM C641, *Standard Test Method for Iron Staining Materials in Light-weight Concrete Aggregates*
- ASTM C127, *Standard Test Method for Relative Density (Specific Gravity) and Absorption of Coarse Aggregate*
- ASTM C151, *Standard Test Method for Autoclave Expansion of Hydraulic Cement*
- ASTM C39, *Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens*
- ASTM C567, *Standard Test Method for Determining Density of Structural Lightweight Concrete*
- ASTM C496, *Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens*
- ASTM C157, *Standard Test Method for Length Change of Hardened Hydraulic-Cement, Mortar, and Concrete*
- ASTM C666, *Standard Test Method for Resistance of Concrete to Standard Freezing and Thawing*

Concrete mixing and specimen fabrication were conducted in accordance with ASTM C192, *Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory*. Other than the provided lightweight combined coarse and fine aggregate, CTLGroup used laboratory stocked portland cement, coarse aggregate, and admixtures for batching concrete.

Upon completion of physical and chemical property testing, the lightweight aggregate material was soaked in water for 72 hours prior to concrete batching to achieve a wet condition. Following this, the additional water was allowed to drain from the aggregate container over a period of 24 hours. The wet aggregate was then thoroughly blended, and a test sample was procured and tested for determining the total moisture content. The recorded total moisture content and the absorption capacity of aggregate, estimated through ASTM C128 testing, were used to determine the actual water content required for batching concrete through appropriate moisture corrections. The total amount of potable water was adjusted during mixing to achieve the desired slump as required by ASTM C330 standard.

One 2x2x11.25-in. nominal prism and three 3x3x11.25-in. nominal prisms were fabricated for autoclave expansion and shrinkage tests, respectively. In addition, three 3x3x11.25-in. nominal prisms were fabricated for freeze-thaw testing per ASTM C666. Three 4x8-in. nominal concrete cylinders were fabricated for compressive strength, and eleven 6x12-in. nominal concrete cylinders were fabricated to evaluate tensile strength and equilibrium density of concrete. The quantities of different materials used to produce concrete mixture are presented in Table 4. More details on the concrete mixture design are provided in the attached test reports.

**Table 1. Mix Proportions (SSD Condition)**

<b>Ingredient</b>	<b>Quantity</b>
Type 1L Cement, lb/yd <sup>3</sup>	564
Holcim Lightweight Pump Blend Aggregate, lb/yd <sup>3</sup>	1262
3/8" Gravel, lb/yd <sup>3</sup>	1123
Water, lb/yd <sup>3</sup>	280
Resulting w/cm ratio	0.50

## TEST RESULTS

### Physical and Chemical Property Tests

The results of aggregate specific tests are presented in Table 2. Results of ASTM C136 (summarized in the attached report) indicated that the provided aggregate met the grading requirements of '9.5 mm to 0' combined coarse and fine aggregate reported in Table 1 of ASTM C330.

**Table 2. Summary of 'Pump Blend' Aggregate Test Results**

Test	Description	Test Result	ASTM C330 Limit	Requirement Met?
ASTM C40	Organic Impurities, liquid color	Lighter than No. 1	Lighter than No. 1	Yes
ASTM C641	Staining Stain Index	20	60 Maximum	Yes
ASTM C114	Loss on Ignition, %	1.2	5% Maximum	Yes
ASTM C142	Clay Lumps and Friable Particles, %	1.1	2% Maximum	Yes
ASTM C29	Loose Dry Bulk Density, lb/ft <sup>3</sup>	65	65 lb/ft <sup>3</sup> Maximum	Yes
ASTM C127	Specific Gravity (SSD)	1.86	--	--
ASTM C127	Absorption, %	20.4	--	--

### Hardened Concrete Property Tests

A summary of the tests results conducted on hardened concrete are presented in Table 3. As indicated earlier, the test procedures adopted for evaluating different concrete properties were modified, if needed, per ASTM C330.

**Table 3. Hardened Concrete Properties**

Property	Test Result	ASTM C330 Limit	Requirement Met?
ASTM C567 Equilibrium Density, lb/ft <sup>3</sup>	111.0	115 Maximum	Yes
ASTM C39 Compressive Strength, psi	6,400	4000 Minimum	Yes
ASTM C496 Splitting Tensile Strength, psi	460	330 Minimum	Yes
ASTM C157 Shrinkage, %	0.05	0.07 Maximum	Yes
ASTM C151 Autoclave Expansion, %	No pop outs	No pop outs	Yes
ASTM C666 Freeze-thaw Resistance, RDM	<i>Pending</i>	Satisfactory Performance	<i>Pending</i>

## CONCLUSION

**The results of the testing program indicate that the lightweight 'pump blend' aggregate, supplied by Holcim, met all limit requirements specified for physical and chemical property tests listed in ASTM C330.** The provided aggregate complies with the size range '9.5 mm – 0' reported in Table 1 of ASTM C330.

Concrete specimens produced using lightweight 'pump blend' aggregate were evaluated for equilibrium density (ASTM C567), compressive strength (ASTM C39), splitting tensile strength (ASTM C496), pop outs (ASTM C151), freeze-thaw resistance (ASTM C666), and drying shrinkage (ASTM C157). Autoclave expansion of concrete prism specimens indicated no pop outs, indicating that concrete containing C330 Blend aggregate met the pop out requirement of ASTM C330. The calculated compressive and splitting tensile strength values were also higher than the minimum limit values imposed by ASTM C330. The calculated shrinkage at a drying age of 28 days was well below the maximum limit specified by ASTM C330. ASTM C666 testing is currently in progress and an amended version of this letter will be issued as soon as this testing is complete.

## DISCLAIMER

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## CLOSING

Thank you for having CTLGroup assist you on this project. Should you have any questions, please call or email.

Sincerely,  
CTLGroup



**Pavan Vaddey, PhD, PE**  
Engineer  
Concrete and Cement-Based Materials  
[PVaddey@CTLGroup.com](mailto:PVaddey@CTLGroup.com)  
Phone: (541) 602-5859

Attachments: ASTM C192 summary sheet and test reports (12 pages)



**ASTM C192 Mixture Summary**

CTLGroup Concrete Mixture ID:		C330 - Fine	
Client Aggregate ID:		Pump Blend Aggregate	
Date Fabricated:		February 29, 2024	
Material	Product	SG	lbs/yd <sup>3</sup> (SSD)
Cement	LafargeHolcim, Type 1L, Ste. Genevieve, MO - Lab Stock	3.15	564
Fine Aggregate	Fine Lightweight Aggregate, Utelite, Coalville, UT	1.86	1262
Coarse Aggregate	3/8" Gravel, Eau Claire, WI - Lab Stock	2.64	1123
Water	Potable, Mount Prosepect, IL	1.00	280
<i>w/cm (not including water in admixtures)</i>			0.50
Paste Content Volume (including air), %			34.2
Chemical Admixtures	Product	SG	fl oz/cwt
Air-Entraining Admixture	Master Air AE200	1.01	0.4
High-Range Water Reducer	Master Glenium 7620	1.08	3.7

Target Properties		Design Properties		
Target Slump, in.		3.00 ± 1.00		
Design Air Content, %		6.0 ± 1.0%		
Fresh Concrete Properties	Test Method	Test Results		
Slump	ASTM C143	2.00		
Plastic Air Content, %	ASTM C173	8.0		
Temperature, °F	ASTM C1064	72.0		
Fresh Density, lb/ft <sup>3</sup>	ASTM C138	120.9		
Hardened Concrete Performance	Test Method	Curing	Age	Test Results
Calculated Equilibrium Density, lb/ft <sup>3</sup>	ASTM C567	--	Per ASTM C567	111.0
Compressive Strength, psi	ASTM C39	100% RH, 73°F	28 days	6,400
Splitting Tensile Strength, psi	ASTM C496	100% RH, 73°F	28 days	460
Drying Shrinkage, %	ASTM C157/ASTM C330	73°F/100% RH 7d, 100°F/32% RH 28d drying	35 days	0.05
Popouts	ASTM C151/ASTM C330	73°F/100% RH 1d	--	No Popouts

ASTM C330 Specification Requirements for Lightweight Aggregate [Client ID: Closed Cell Aggregates (C330 Blend)]				
Property	Test Method	ASTM C330 Requirement	Result	Pass? (Y = Yes, N = No)
Organic Impurities	ASTM C40	No darker color upon test	No Impurities	Y
Staining	ASTM C641	Stain Index of 60 or less	20	Y
Loss on Ignition	ASTM C114	No greater than 5%	1.16%	Y
Clay Lumps and Friable Particles	ASTM C142	No greater than 2% by dry mass	1.10%	Y
Loose Bulk Density	ASTM C29	No greater than 65 lbs/ft <sup>3</sup>	65 lbs/ft <sup>3</sup>	Y

ASTM C330 Specification Requirements for Concrete Testing				
Property	Test Method	ASTM C330 Requirement	Result	Pass? (Y = Yes, N = No)
Compressive Strength	ASTM C39 / ASTM C330	No less than 4000 psi at 28 days	6400 psi	Y
Splitting Tensile Strength	ASTM C496 / ASTM C330	No less than 330 psi at 28 days	460 psi	Y
Drying Shrinkage	ASTM C157 / ASTM C330	No greater than 0.07% at 28 days dry	0.05%	Y
Popouts	ASTM C151 / ASTM C330	No Popouts	No Popouts	Y
Freeze-thaw Resistance	ASTM C666 / ASTM C330	Satisfactory Performance	Pending	Pending

**Notes:**

- 1) This report may not be reproduced except in its entirety. The report refers specifically to the tested specimens.
- 2) Concrete test specimens were fabricated by CTLGroup using lab-stocked materials and light weight aggregate provided by the client.
- 3) **THIS REPORT IS NOT INTENDED FOR CONSTRUCTION OR SUBMITTAL**

Client: **Holcim Lightweight Aggregates I Utelite Plant**  
 Project: **ASTM C330 Qualification**  
 Contact: **Ken Nunley**  
 Date Reported: **March 15, 2024**

CTLGroup Project No: **201412**  
 CTLGroup Project Manager: **P. Vaddey**  
 Technician: **T. Hercules**  
 Approved: **J. Rose**

**ASTM C136 — Standard Test Method for Sieve Analysis of Fine and Coarse Aggregate**

Client Sample ID	Pump Blend Aggregate
CTLGroup Sample ID	5725902
Sample Source	Holcim Lightweight Aggregates I Utelite Plant
Aggregate Type	Combined Coarse and Fine
Weight of Oven Dry Sample, g	740.83

Sieve Size	ASTM C330 9.5 mm to 0				
	Retained on Individual Sieve, grams	Retained on Individual Sieve, %	Cumulative Retained on Sieve, %	Cumulative Passing Sieve, %	Cumulative Passing Limits, %
1/2"	0.0	0.0	0	100	100
3/8"	9.0	1.2	1	99	90 - 100
#4	182.2	24.6	26	74	65 - 90
#8	157.1	21.2	47	53	35 - 65
#16	137.5	18.6	66	34	--
#30	107.3	14.5	80	20	--
#50	66.0	8.9	89	11	10 - 25
#100	35.1	4.7	94	6	5 - 15
#200	22.8	3.1	97	3.2	0 - 10
Pan	23.2	3.1	100	0	--

- Notes:**
1. This report may not be reproduced except in its entirety.
  2. The results refer specifically to the submitted sample.
  3. The test sample was received on February 20, 2024.
  4. Testing was conducted on March 15, 2024. The sieves with size openings smaller than US Size #16 were not considered for testing.
  5. The retained weight on pan includes fines obtained from ASTM C117 testing.

**ASTM C142 — Standard Test Method for Clay Lumps and Friable Particles in Aggregates**

Client Sample ID	Pump Blend Aggregate
CTLGroup Sample ID	5725902
Sample Source	Holcim Lightweight Aggregates I Utelite Plant

<b>Clay Lumps and Friable Particles</b>	<b>1.1%</b> See Note 5
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3. The test sample was received on February, 20, 2024.
4. Testing was conducted on March, 1, 2024.
5. The tested aggregate was a combination of coarse and fine aggregate. The reported test value corresponds to the aggregates falling in the size range of 3/8" to #16 sieves.

Client: **Holcim Lightweight Aggregates I Utelite Plant**  
 Project: **ASTM C330 Qualification**  
 Contact: **Ken Nunley**  
 Date Reported: **February 26, 2024**

CTLGroup Project No: **201412**  
 CTLGroup Project Manager: **P. Vaddey**  
 Technician: **T. Hercules**  
 Approved: **J. Rose**

**ASTM C128 — Standard Test Method for Density, Relative Density (Specific Gravity),  
and Absorption of Fine Aggregate**

Client Sample ID	Pump Blend Aggregate
CTLGroup Sample ID	5725902
Sample Source	Holcim Lightweight Aggregates I Utelite Plant

Relative Density (Specific Gravity) at OD <sup>1</sup>	1.55
Relative Density (Specific Gravity) at SSD <sup>2</sup>	1.86
Apparent Relative Density (Apparent Specific Gravity)	2.26

<sup>1</sup> *Oven Dry*

<sup>2</sup> *Saturated-Surface Dry*

Oven-Dry (OD) Density	96.5 lb/ft <sup>3</sup>
Saturated Surface Dry (SSD) Density	116.0 lb/ft <sup>3</sup>
Apparent Saturated Surface Dry (SSD) Density	141.0 lb/ft <sup>3</sup>

Absorption, %	20.4%
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3. The test sample was received on February, 20, 2024.
4. Testing was conducted from February, 20, 2024 to February, 24, 2024.
5. Density was calculated on the basis of water at 75°F.





Client: **Holcim Lightweight Aggregates I Utelite Plant**  
Project: **ASTM C330 Qualification**  
Contact: **Ken Nunley**  
Date Reported: **February 26, 2024**

CTLGroup Project No: **201412**  
CTLGroup Project Manager: **P. Vaddey**  
Technician: **T. Hercules**  
Approved: **J. Rose**

**ASTM C29 — Bulk Density ("Unit Weight") and Voids in Aggregates**

Client Sample ID	Pump Blend Aggregate
CTLGroup Sample ID	5725902
Sample Source	Holcim Lightweight Aggregates I Utelite Plant
Aggregate Type	Combined Coarse and Fine
Procedure	Shoveling
Size of Measure	0.50 ft <sup>3</sup>
<b>Bulk Density</b>	<b>65 lbs/ft<sup>3</sup></b>

**Notes:**

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2. The results refer specifically to the submitted samples.
3. The test sample was received on February, 20, 2024.
4. Testing was conducted on February, 21, 2024.

Client: **Holcim Lightweight Aggregates I Utelite Plant**  
Project: **ASTM C330 Qualification**  
Contact: **Ken Nunley**  
Date Reported: **February 26, 2024**

CTLGroup Project No: **201412**  
CTLGroup Project Manager: **P. Vaddey**  
Technician: **T. Hercules**  
Approved: **J. Rose**

**ASTM C40 — Organic Impurities in Fine Aggregates for Concrete**

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<b>Client Sample ID</b>	Pump Blend Aggregate
<b>CTLGroup Sample ID</b>	5725902
<b>Sample Source</b>	Holcim Lightweight Aggregates I Utelite Plant

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<b>Sample Reduction Method</b>	Splitter
<b>Procedure</b>	Standard Color Solution

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<b>Organic Color Plate No. 1</b>	
<b>Results</b>	<b>Does Not Contain Injurious Organic Impurities</b>

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Test Results Interpretation (per Section 11.1):  
*When a sample subjected to this procedure produces a color darker than the standard color, Circular Disk No. 14 or Organic Plate No. 3 (Gardner Color Standard No. 14), the fine aggregate under test shall be considered to possibly contain injurious organic impurities. It is advisable to perform further tests before approving the fine aggregate for use in concrete.*

**Notes:**

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2. This report represents specifically to the sample provided.
3. The test sample was received on February, 20, 2024.
4. Testing was conducted on February, 22, 2024.

Client: **Holcim Lightweight Aggregates I Utelite Plant**  
Project: **ASTM C330 Qualification**  
Contact: **Ken Nunley**  
Date Reported: **February 26, 2024**

CTL Project No: **201412**  
CTL Project Mgr.: **P. Vaddey**  
Technician: **T. Hercules**  
Approved: **J. Rose**

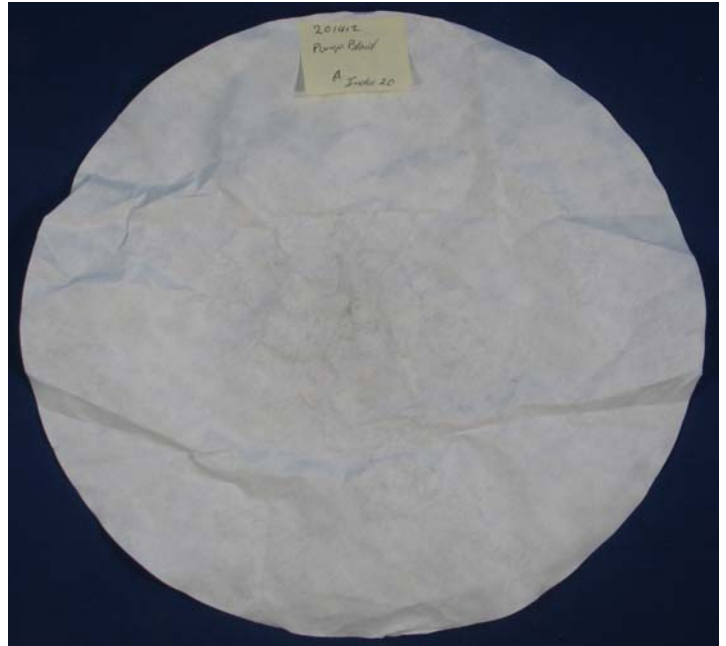
**REPORT of ANALYSIS**

**ASTM C641, Standard Test Method for Iron Staining Materials in Lightweight Concrete Aggregate**

Client Sample Identification	Pump Blend Aggregate
CTLGroup Sample Identification	5725902
Sample Source	Holcim Lightweight Aggregates I Utelite Plant
Procedure	Visual Procedure

**Stain Index**

**20**



**Notes:**

1. Results refer specifically to the sample submitted.
2. Visual rating based on standard index images presented in ASTM C641.
3. This report may not be reproduced except in its entirety.

Client: **Holcim Lightweight Aggregates I Utelite Plant**  
Project: **ASTM C330 Qualification**  
Contact: **Ken Nunley**  
Date Reported: **March 14, 2024**

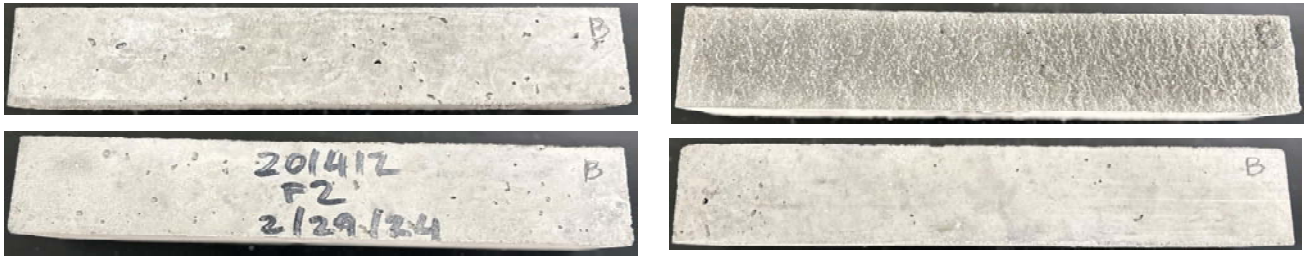
CTL Project No: **201412**  
CTL Project Mgr.: **P. Vaddey**  
Technician: **M. Baig**  
Approved: **J. Rose**

**REPORT of ANALYSIS**

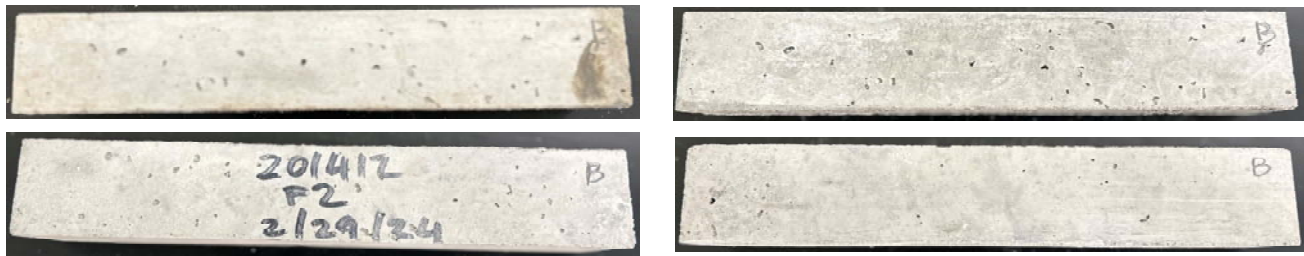
**ASTM C330/ASTM C151, Test for Popout Materials**

Client Mixture Identification	N/A
CTLGroup Mixture Identification	C330 - Fine
Aggregate Sample Source	Holcim Lightweight Aggregates I Utelite Plant
Aggregate Description	Coarse Aggregate
<b>Result</b>	<b>No Popouts Observed</b>

**Specimen surfaces before Autoclave Testing**



**Specimen surfaces after Autoclave Testing**



**Notes:**

1. Test specimen was fabricated in accordance with ASTM C330. Test specimen was a 2x2x11.25-in. nominal prism.
2. Autoclave testing was performed in accordance with ASTM C151.
3. Results refer specifically to the aggregate sample submitted.
4. This report may not be reproduced except in its entirety.



Client: **Holcim Lightweight Aggregates I Utelite Plant**  
Project: **ASTM C330 Qualification**  
Contact: **Ken Nunley**  
Report Date: **March 11, 2024**

CTL Project No.: **201412**  
CTL Project Mgr.: **P. Vaddey**  
Technician: **G. Neiweem**  
Approved by: **J. Rose**

**ASTM C567**  
**Standard Test Method For Determining Density of Structural Lightweight Concrete**

**Mixture ID: C330 - Fine**

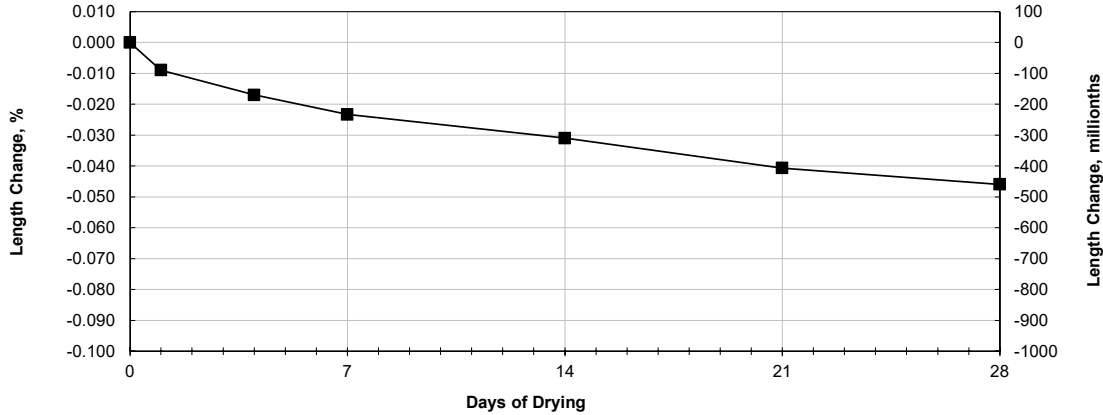
Sample	Mass of Oven Dry Cylinder, lbs	Mass of Saturated Surface-Dry Cylinder, lbs	Apparent Mass of Suspended- Immersed Cylinder, lbs	Measured Oven-Dry Density, lb/ft <sup>3</sup>	Calculated Equilibrium Density, lb/ft <sup>3</sup>
C330 - A	21.6	24.6	12.2	108.0	111.0
C330 - B	21.5	24.5	12.1	108.5	111.5
C330 - C	21.5	24.5	12.2	108.2	111.2
<b>Average (Rounded to the nearest 0.5 lbs/ft<sup>3</sup>)</b>				<b>108.0</b>	<b>111.0</b>

**Notes:**

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2. Specimens were cast by CTLGroup with materials provided by others.

**ASTM C157/C157M as Modified by ASTM C330**  
**Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete**

**Mix ID: C330 - Fine**



Date	Age, days	Days of Drying	Condition	Comparator Measurement, in.			Length Change, %			Average, %	Length Change, millionths			Average, millionths
				A	B	C	A	B	C	A	B	C		
3/7/2024	7	0	Start dry	0.0645	0.1038	0.1159	0.000	0.000	0.000	<b>0.000</b>	0	0	0	<b>0</b>
3/8/2024	8	1	Dry	0.0634	0.1030	0.1151	-0.011	-0.008	-0.008	<b>-0.009</b>	-110	-80	-80	<b>-90</b>
3/11/2024	11	4	Dry	0.0627	0.1021	0.1143	-0.018	-0.017	-0.016	<b>-0.017</b>	-180	-170	-160	<b>-170</b>
3/14/2024	14	7	Dry	0.0621	0.1014	0.1137	-0.024	-0.024	-0.022	<b>-0.023</b>	-240	-240	-220	<b>-233</b>
3/21/2024	21	14	Dry	0.0613	0.1007	0.1129	-0.032	-0.031	-0.030	<b>-0.031</b>	-320	-310	-300	<b>-310</b>
3/28/2024	28	21	Dry	0.0603	0.0999	0.1118	-0.042	-0.039	-0.041	<b>-0.041</b>	-420	-390	-410	<b>-407</b>
4/4/2024	35	28	Dry	0.0599	0.0993	0.1112	-0.046	-0.045	-0.047	<b>-0.046</b>	-460	-450	-470	<b>-460</b>

**Notes:**

- Specimens were fabricated by CTLGroup in accordance with the requirements of ASTM C330.
- Test specimens were 3x3x11.25-in. concrete prisms.
- After demolding, specimens were stored at 73°F ± 3°F and 100% RH for 7 days, then stored in a controlled environment kept nominally at 100°F ± 3°F and 32 ± 4% RH for the remainder of the test.
- Length change calculated based on specimen length at the start of drying (at the age of 7 days).
- This report might not be reproduced except in its entirety.

**ASTM C39 and AASHTO T 22  
 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTLGroup Mixture Identification	C330 - Fine		
Client Mixture Identification	N/A		
Casting Date	2/29/2024	2/29/2024	2/29/2024
Test Date / Time	3/28/2024	3/28/2024	3/28/2024
Loading Rate, psi/sec	35	35	35

**Concrete Description**

Concrete Age at Test, days	28	28	28
Moisture Condition at Test	SSD	SSD	SSD
Curing Conditions (Temp/RH)	73°F / 100% RH	73°F / 100% RH	73°F / 100% RH
Cylinder End Preparation	Ground	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	4.01	4.01	3.98
Diameter 2, in.	4.01	4.01	4.03
Length, in.	7.84	7.89	7.90
Average Diameter, in.	4.01	4.01	4.01
Length / Diameter (L/D)	1.96	1.97	1.97
Cross-Sectional Area, in <sup>2</sup>	12.63	12.63	12.63

**Compressive Strength and Fracture Pattern**

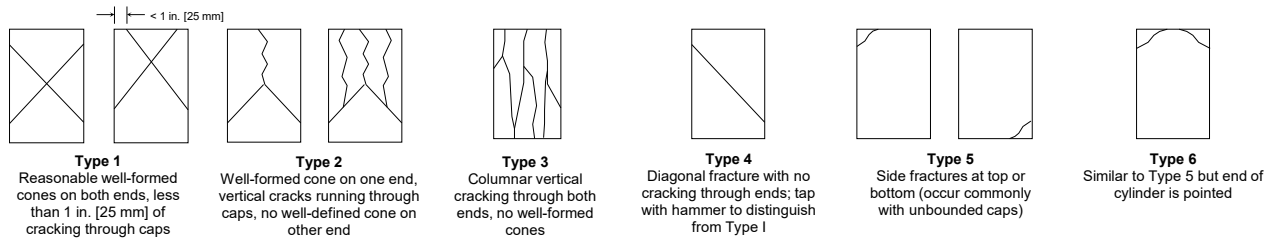
Maximum Load, lb	80,903	80,997	80,562
Compressive Strength, psi	6,410	6,410	6,380
Fracture Pattern	Type 1	Type 1	Type 4

<b>Average Compressive Strength, psi</b>	<b>6,400</b>
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**Notes:**

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2. The results specifically refer to the tested specimens.
3. Specimens were cast by CTLGroup. Mixture proportions are summarized in ASTM C192 summary sheet.
4. One day after cast, specimens were stored in moist room maintained at 73°F until testing.

**Schematic of Typical Fracture Patterns**



**ASTM C496 Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTLGroup Mixture Identification	C330 - Fine							
Client Mixture Identification	N/A							
Casting Date	November 8, 2022	November 8, 2022	November 8, 2022	November 8, 2022	November 8, 2022	November 8, 2022	November 8, 2022	November 8, 2022
Test Date	December 6, 2022	December 6, 2022	December 6, 2022	December 6, 2022	December 6, 2022	December 6, 2022	December 6, 2022	December 6, 2022
Type of Specimen	Concrete Cylinder	Concrete Cylinder	Concrete Cylinder	Concrete Cylinder	Concrete Cylinder	Concrete Cylinder	Concrete Cylinder	Concrete Cylinder
Defects in Specimen	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**Concrete Description**

Concrete Age at Test, days	28	28	28	28	28	28	28	28
Curing Conditions (Temp/RH)	73°F / 100% RH	73°F / 100% RH	73°F / 100% RH	73°F / 100% RH	73°F / 100% RH	73°F / 100% RH	73°F / 100% RH	73°F / 100% RH
Moisture Condition at Test	SSD	SSD	SSD	SSD	SSD	SSD	SSD	SSD

**Concrete Dimensions**

Diameter 1, in.	6.03	6.04	6.00	6.01	6.01	6.02	6.01	6.02
Diameter 2, in.	6.04	6.02	6.03	6.03	6.04	6.02	6.01	6.04
Diameter 3, in.	6.03	6.03	6.01	6.04	6.04	6.03	6.02	6.04
Length 1, in.	12.01	12.07	12.03	12.08	12.11	12.13	12.05	12.10
Length 2, in.	12.00	12.04	12.04	12.06	12.14	12.11	12.11	12.13
Average Diameter, in.	6.03	6.03	6.01	6.03	6.03	6.02	6.01	6.03
Average Length, in.	12.00	12.10	12.00	12.10	12.10	12.10	12.10	12.10

**Strength and Fracture Pattern**

Maximum Load, lbf	57,817	58,858	48,419	50,170	42,114	57,070	55,900	47,856
Splitting Tensile Strength, psi	510	515	425	440	365	500	490	420
Type of Fracture	Vertical Center	Vertical Center	Vertical Center	Vertical Center	Vertical Center	Vertical Center	Vertical Center	Vertical Center
Estimated Proportion of Coarse Aggregate Fractured during Test	100%	100%	100%	100%	100%	100%	100%	100%

<b>Average Splitting Tensile Strength</b>	<b>460 psi</b>
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**Notes:**

- Specimens were fabricated by CTLGroup.
- Mixture proportions are summarized in ASTM C192 summary sheet.
- One day after cast, specimens were stored in moist room maintained nominally at 73°F until test.
- This report may not be reproduced except in its entirety.
- The results refer specifically to the submitted specimens.