March 20, 2025
(Revised April 9, 2025)

Holcim-Utelite
P.O. Box 387
Coalville, Utah 84017

Attention: Mr. Kenneth Nunley

Subject: Physical Properties Testing
Holcim-Utelite Pump Blend Lightweight Aggregate (9.5 mm - No.0)
Project No. CT17,698.000-400-L3

Dear Mr. Nunley:

This report presents results of laboratory testing performed to determine chemical and physical properties of lightweight aggregate delivered to our laboratory on January 22, 2024. Testing was performed in general conformance with ASTM C330, *Standard Specification for Lightweight Aggregates for Structural Concrete*. The following tests were performed:

CHEMICAL COMPOSITION

Staining Test (ASTM C641)
Loss on Ignition (ASTM C114)

PHYSICAL PROPERTIES OF AGGREGATES

Gradation Analysis (ASTM C136)
Passing No. 200 Sieve (ASTM C117)
Clay Lumps and Friable Particles (ASTM C142)
Loose Bulk Density (ASTM C29)
Relative Density (ASTM C127)
Organic Impurities (ASTM C40)
Internal Curing (ASTM C1761)
Sodium Soundness (ASTM C88)
Magnesium Soundness (ASTM C88)

CONCRETE PROPERTIES

Compressive Strength (ASTM C39)
Splitting Tensile Strength (ASTM C496)
Measured Equilibrium Density (ASTM C567) – In Progress
Measured Oven-Dry Density (ASTM C567)
Calculated Equilibrium Density (ASTM C567)
Drying Shrinkage (ASTM C157)
Popouts (ASTM C151)

A summary of test results is presented in Table 1. Detailed results are presented in Appendix A for the lightweight aggregate properties and Appendix B for the concrete properties and results. Test results indicate the lightweight aggregate meets the ASTM C330 requirements for the properties reported.

If we may be of further assistance, please call or email.

Respectfully submitted,

CTL | THOMPSON, INC.

Daniel L. Barrett
Junior Associate
Dbarrett@ctlthompson.com

Reviewed by:

Zachoriah J. Ballard, MCE, P.E.
Materials Department Manager
Zballard@ctlthompson.com

Attachments:

Via email: Kenneth.nunley@holcim.com
Darren.medeiros@holcim.com

Aggregate Qualification Summary - ASTM Specifications (ASTM C330)

Holcim - Utelite - Pump Blend Aggregate

Project No. CT17,698.000 Report Date: April 09, 2025

Sieve Analysis (ASTM C136 & C117)		
Sieve Size	**Retaining (%)**	**Specification (%)**
1/2 inch (12.5 mm)	100	100
3/8 inch (9.5 mm)	97	90-100
No. 4 (4.75 mm)	77	65-90
No. 8 (2.36 mm)	57	35-65
No. 16 (1.18 mm)	38	-
No. 30 (600 µm)	22	-
No. 50 (300 µm)	12	10-25
No. 100 (150 µm)	7	5-15
No. 200 (75 µm)	3.8	0-10
Fineness Modulus	3.90	-

Test	Results	Specification
Specific Gravity (ASTM C128)	1.86	-
Absorption (ASTM C128)	18.7%	-
Clay Lumps and Friable Particles (ASTM C142)	0.4% Particles	2.0% Max
Sodium Sulfate Soundness (ASTM C88)	10% Weighted Loss	-
Magnesium Sulfate Soundness (ASTM C88)	6% Weighted Loss	-
Rodded Bulk Density (ASTM C29)	70 pcf	-
Organic Impurities (ASTM C40)	1	$\leq$ 3
Popouts (ASTM C151)	No Surface Popouts	No Surface Popouts
Internal Curing Desorption (ASTM C1761)	90.3%	≥85%
Loss of Ignition (ASTM C114)	1.89%	5% Wt. Max
Fe in Solution (ASTM C641)	0.1	1.5 mg Fe_2O_3/200G Max

Concrete Properties		
	Results	**Specifications**
Plastic Unit Weight (lb/ft^3)	119	-
Air Content	5.9%	6$\pm$1%
Slump (in)	3.0	2in. to 4in.
Concrete Temperature (°F)	60	-
Average 7-Day Compressive Strength (ASTM C39)	5450 psi	-
Average 28-Day Compressive Strength (ASTM C39)	6730 psi	3000 psi
Oven-Dry Density (ASTM C567)	105.0 pcf	-
Calculated Equilibrium Density (ASTM C567)	108.0 pcf	110.0 pcf Max
Splitting Tensile (ASTM C496)	380 psi	310 psi
Dry Shrinkage Average 28-Day (ASTM C157)	-0.032%	-0.070% Max
Popouts (ASTM C151)	No Popouts	No Popouts

CTL | THOMPSON, INC.

Zachoriah J. Ballard, MCE, P.E.

APPENDIX A

LIGHTWEIGHT AGGREGATE TEST RESULTS

PHYSICAL PROPERTIES OF AGGREGATES

Company Name: Holcim - Utelite
Material Source: Pump Blend Aggregate
Material Type: Coarse and Fine (9.5 mm - No.0)

Received Date: January 22, 2025
Project No. CT17,698.000
Report Date: April 9, 2025

Sieve Analysis of Fine Aggregate

(ASTM C136)

Sieve Size	Percent Retained Coarse and Fine (9.5 mm - No.0)	Grading Requirements (ASTM C330)
1/2 inch (12.5 mm)	100	100
3/8 inch (9.5 mm)	97	90-100
No. 4 (4.75 mm)	77	65-90
No. 8 (2.36 mm)	57	35-65
No. 16 (1.18 mm)	38	-
No. 30 (600 µm)	22	-
No. 50 (300 µm)	12	10-25
No. 100 (150 µm)	7	5-15
No. 200 (75 µm)	3.8	0-10

Material Finer Than No. 200 Sieve by Washing

ASTM C117) Procedure A

Initial Dry Weight (g)	Final Dry Weight (g)	Material Finer Than No. 200 Sieve (%)
350.0	337.0	3.7

Specific Gravity and Absorption of Fine Aggregate

(ASTM C128)

Pycnometer Weight With Water (g)	SSD In Air Weight (g)	Pycnometer Weight With Sample (g)	Bulk Volume	Oven Dry Weight (g)	Bulk (SSD) Specific Gravity	Absorption (%)
650.6	322.4	799.4	173.6	271.7	1.86	18.7

Clay Lumps and Friable Particles in Aggregate

(ASTM C142)

Sieve Size		Weight Before (g)	Weight After (g)	Percent Particles
Passing	Retained			
No. 4	No. 16	25.1	25.0	0.4

PHYSICAL PROPERTIES OF AGGREGATES

Company Name: Holcim - Utelite
Material Source: Pump Blend Aggregate
Material Type: Coarse and Fine (9.5 mm - No.0)

Received Date: January 22, 2025
Project No. CT17,698.000
Report Date: April 9, 2025

Soundness of Fine Aggregates by Use of Sodium Sulfate

(ASTM C 88)

Sieve Size		Percent Grading of Sample	Weight Before(g)	Weight After (g)	Percent Loss	Weighted % Loss
Passing	Retained					
1/2"	3/8"	3	-	-	-	-
3/8"	No. 4	20	301.4	261.4	13.3	2.7
No. 4	No. 8	20	100.1	80.5	19.6	3.9
No. 8	No. 16	19	100.1	90.4	9.7	1.8
No. 16	No. 30	16	100.1	95.3	4.8	0.8
No. 30	No. 50	10	100.0	95.5	4.5	0.5
Less than No. 50		12	-	-	-	-
Total Percent Grading:		100			Total Weighted Loss:	10

Soundness of Fine Aggregates by Use of Magnesium Sulfate

(ASTM C 88)

Sieve Size		Percent Grading of Sample	Weight Before(g)	Weight After (g)	Percent Loss	Weighted % Loss
Passing	Retained					
1/2"	3/8"	3	-	-	-	-
3/8"	No. 4	20	300.6	291.4	3.1	0.6
No. 4	No. 8	20	100.0	91.4	8.6	1.7
No. 8	No. 16	19	100.1	89.3	10.8	2.0
No. 16	No. 30	16	100.0	92.4	7.6	1.2
No. 30	No. 50	10	100.1	96	4.1	0.4
Less than No. 50		12	-	-	-	-
Total Percent Grading:		100			Total Weighted Loss:	6.0

Bulk Density (Unit Weight) and Voids in Aggregates (Loose Method)

(ASTM C29)

Sample Weight (lbs)	Bucket Volume (ft^3)	Unit Weight (pcf)
32.1338	0.4981	64.5
32.3326	0.4981	64.9
32.4260	0.4981	65.1
	Average Unit Weight:	65 pcf

Organic Impurities in Fine Aggregate

(ASTM C40)

Organic Plate Number
Plate Number 1

PHYSICAL PROPERTIES OF AGGREGATES

Company Name: Holcim - Utelite
Material Source: Pump Blend Aggregate
Material Type: Coarse and Fine (9.5 mm - No.0)

Received Date: January 22, 2025
Project No. CT17,698.000
Report Date: April 9, 2025

Internal Curing - Desorption
(ASTM C1761)

Results
90.3%

Iron Staining Materials
(ASTM C641)

Parameters	Results	Units
Fe in Solution	0.1	mg Fe_2O_3/200G
Visual Determination	0	Photographic Stain Index

Loss on Ignition
(ASTM C114)

Results	Units
0.09%	wt%

APPENDIX B

LIGHTWEIGHT CONCRETE TEST RESULTS

PHYSICAL PROPERTIES OF AGGREGATES

Company Name: Holcim - Utelite
Material Source: Pump Blend Aggregate
Material Type: Coarse and Fine (9.5 mm - No.0)

Received Date: January 22, 2025
Project No. CT17,698.000
Report Date: April 9, 2025

CONCRETE PROPERTIES

Compressive Strength

(ASTM C39)

7 Day (psi)	28 Day (psi)
3790	4530
3750	4710
3930	4650
Average (psi)	
3820	4630

Popouts

(ASTM C151)

Results
No Popouts

TABLE 1
Splitting Tensile Strength of Cylindrical Concrete Specimens
ASTM C496

Client: Holcim Utah
Project No.: CT17698.000

Date Cast: February 7, 2025
Break Date: March 7, 2025

Mix ID	Sample ID	Age of Sample	Sample Cured	Diameter inches 0.00	Length inches 0.00	Total Load (lbs)	Tensile Splitting Strength (psi)	Percent Coarse Aggregate Fractured	Type of Fracture
Mix 3 Structural Pump Blend	1	28	50% RH	6.00	12.04	42,911	380	98	Split/Wedge
	2	28	50% RH	6.00	12.03	42,384	370	98	Split/Wedge
	3	28	50% RH	6.01	12.05	39,610	350	98	Split/Wedge
	4	28	50% RH	6.00	12.04	39,014	340	98	Split/Wedge
	5	28	50% RH	6.00	12.02	51,811	460	98	Split
	6	28	50% RH	6.00	12.04	45,784	400	98	Split
	7	28	50% RH	6.00	12.02	40,953	360	98	Split/Wedge
	8	28	50% RH	6.01	12.02	40,674	360	98	Split/Wedge

Length Change of Hardened Hydraulic Cement Mortar and Concrete (ASTM C157)

Client Name: Holcim Utah
Project Name: Holcim Utelight Lightweight C330
Project No. CT17698.000

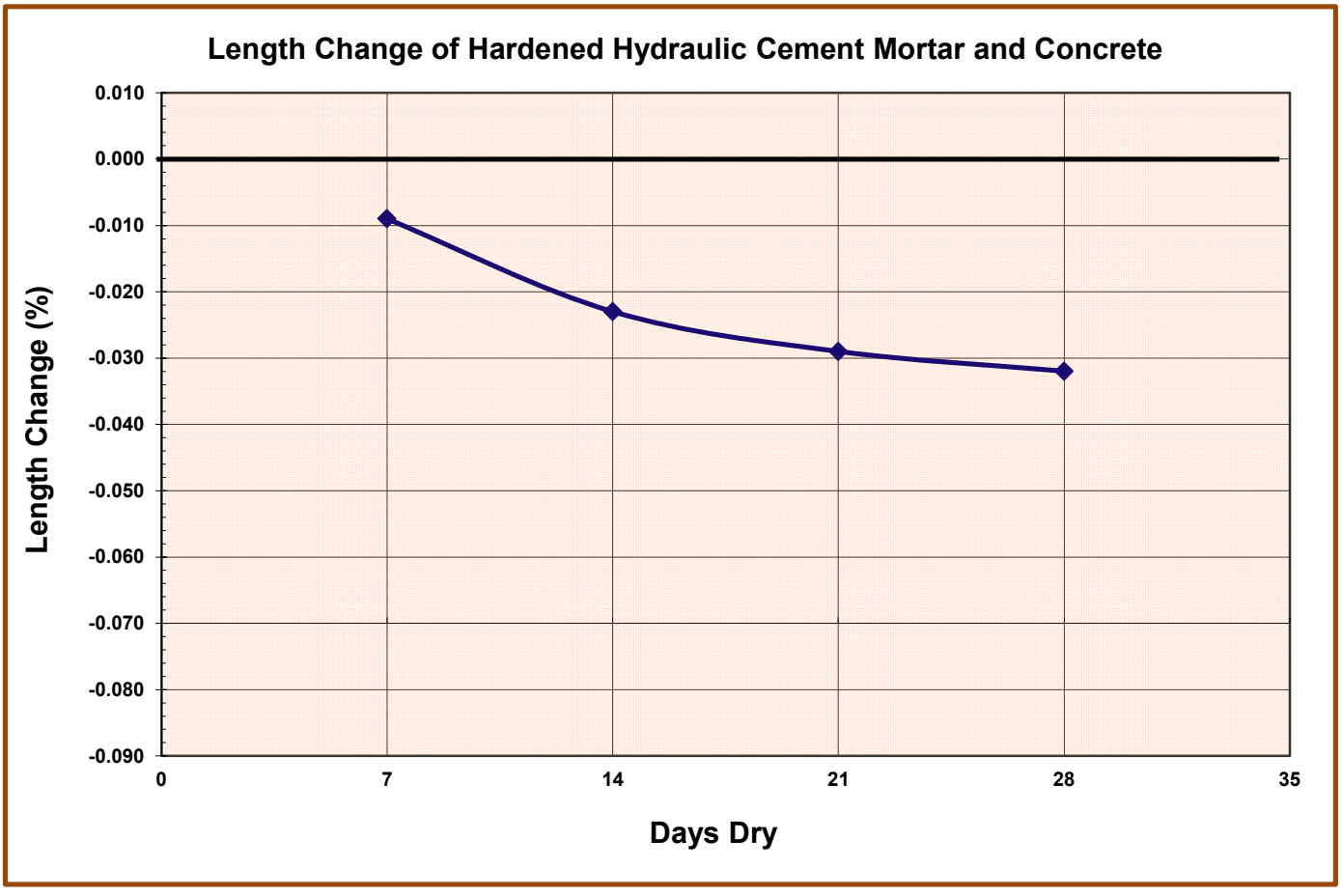
Report Date: April 9, 2025
Mix ID: Pump Blend Aggregate
Cast Date: February 7, 2025

Type of Specimen: Concrete
Fine Aggregate: Fountain Pit, WCS
Coarse Aggregate: Utelite Pump Blend Aggregate
Admixtures: None

Cement Source/Type: Holcim Type IL
Fly Ash Source/Class: None

Consolidation Method: Rodding
Initial Curing Environment: Lab
Storage Schedule: 7 day Moist Room, 28 day 100°F / 32% RH

Sample I.D.	7 Day Soak	7 Day Dry	Length Change (%)	14 Day Dry	Length Change (%)	21 Day Dry	Length Change (%)	28 Day Dry	Length Change (%)
Actual Age	7	14		21		28		35	
Date	02/14/25	02/21/25		02/28/25		03/07/25		03/14/25	
1	0.0132	0.0123	-0.009	0.0111	-0.021	0.0102	-0.030	0.0097	-0.035
2	0.0472	0.0465	-0.007	0.0447	-0.025	0.0442	-0.030	0.0440	-0.032
3	0.0199	0.0189	-0.010	0.0176	-0.023	0.0172	-0.027	0.0169	-0.030
		Average	**-0.009**		**-0.023**		**-0.029**		**-0.032**



WORKSHEET OF DRY UNIT WEIGHTS FOR STRUCTURAL LIGHTWEIGHT CONCRETE

ASTM C 567, Standard Test Method for Density of Structural Lightweight Concrete, Oven-Dry Method

Project: Holcim Utah Utelite Plant **Cast Date:** February 7, 2025

Job No.: CT17698.000 **Sample I.D.:** Pump Blend Aggregate

DATE OF WEIGHTS:		2/8/25	28/25	2/11/25	2/11/25	2/12/25	2/12/25
Ticket Number	**Date Cast**	**24-32 hrs from cast Weight Suspended-Immersed (lbs)**	**Weight in Air (lbs)**	**72 hours Oven Dry (lbs)**	**72 hours Oven-Dry Density**	**96 hours Oven Dry (lbs)**	**96 hours Oven-Dry Density**
Mix 3 #1	2/7/25	11.6800	24.0100	21.1892	107.1	21.0176	106.2
Mix 3 #2	2/7/25	11.6850	24.0450	21.2984	107.4	21.0920	106.3
Mix 3 #3	2/7/25	11.7300	24.0750	21.3486	107.7	21.1354	106.7
Average:	-	11.6983	24.0433	21.2787	107.5	21.0817	106.5

		2/13/25	2/14/25	2/14/25	2/14/25
Ticket Number	**Date Cast**	**120 hours Oven Dry (lbs)**	**120 hours Oven-Dry Density**	**144 hours Oven Dry (lbs)**	**144 hours Oven-Dry Density**
Mix 3 #1	2/7/25	20.8830	105.5	20.7888	105.0
Mix 3 #2	2/7/25	20.9388	105.5	20.8400	105.0
Mix 3 #3	2/7/25	20.9796	105.6	20.8806	105.4
Average:	-	20.9338	105.5	20.8365	105.0