



LETTER OF TRANSMITTAL

JBS PIPELINE CONTRACTORS

8600 Verbena St.
Commerce City, CO 80022
Office 303-289-4355
Fax 303-289-4353

ISSUED TO:

Owner ATTN: Con Cockrum and Mike Snyder

DATE:

REGARDING:

TRANSMITTAL NO.:

Project Trails at Crowfoot Filing 9
JBS Job No 0245

We are issuing you under separate cover the following (via):

- Blue Prints
- Submittals
- Change Order
- Request for Information
- Copy of a letter
- Shop Drawings

#	Copies	Item Dated	Item #	Description
	1-Electronic		A-016	Concrete for Storm Inlets

- For your bid
- For Approval
- As Requested
- Returned for Correction
- For Review and Comment
- For Pricing

Prints are loaned to you and are to be returned to us by: _____ Date: _____

Bids are due on or before: _____ Date: _____

COMMENTS

CC:

Amie Parent

Amie Parent
JBS Pipeline Contractors



Technical Services Dept.
 5775 Franklin Street
 Denver, CO 80216
 Telephone (303) 383-6442
 Facsimile (303) 295-0470



Orozco Landscaping
 RE: Jackson St Storm
 Dear Sir/Madam:

Date Issued: 1/13/2021

We propose to furnish the following concrete mix for the above referenced project:

Mix Code Number	Description	Use
145813G	CLASS B/D CRUSHED	CDOT Class B/D - Curb - Gutter - Sidewalk

Please Note: You must use Mix Code for ordering purposes.

The above mixes have been proportioned in accordance with the applicable portions of ACI 211, and your verbal request.

The proposed mix designs will meet the stated strengths, when test specimens are manufactured and tested in accordance with current ASTM standards, and evaluated per ACI recommended standards and practices.

It is suggested that a pre-pour conference be held at the jobsite prior to jobsite delivery. The purpose of the meeting would be to answer any questions regarding responsibilities in scheduling and jobsite operation.

As referenced in ASTM C-94*, **Ready Mixed Concrete Co. is required to be on the distribution for all reporting of test results. We ask your cooperation on notifying your customer to include RMCC on the mailing list.** This enables us to monitor the status of your project and provides valuable data for future projects. Test results shall be mailed or faxed to:

5775 Franklin Street
 Denver, CO 80216
 Fax: 303-295-0470

**ASTM C-94 Standard Specification for Ready-Mixed Concrete 4.6: The purchaser shall ensure that the manufacturer is provided copies of all reports of tests performed on the concrete samples taken to determine compliance with specification requirements. Reports shall be provided on a timely basis.*

Please forward this information and data to the proper authorities for approval.

Bryon Blatter
 Technical Services Department



Ready Mixed Concrete Company
 5775 Franklin Street
 Denver, Colorado 80216
 www.concretecolorado.com



Concrete Mix Design Report

Date Mix ran: 6-22-2020

Mix Number: 145813G

Date Mix Reported : 7-27-2020

Class / Use: Class D

Material	1 Cu. Yd.	Source / Type
Cement	492 lbs	GCC Pueblo Type I-II LA, ASTM C-150
Fly Ash	148 lbs	Boral Class F Craig Terminal, ASTM C-618
Coarse Aggregate	1710 lbs	Albert Frei And Sons # 67 Stone Pit 6, ASTM C-33
Fine Aggregate	1290 lbs	Brannan Aggregates Morton Lakes Pit 25 Sand, AASHTO M6 ASTM C-33
Water	256 lbs	City
Air Entraining Agent	1.5 oz	Chryso Air 260, ASTM C -260
Water Reducer	58 oz	Chryso Quad 520, ASTM C-494

*Note: Batch weights are based upon aggregates in Saturated Surface Dry condition.

Physical Properties

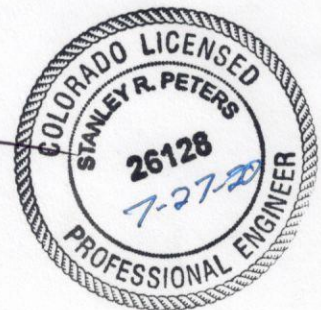
Slump:	3 in
Sam #	0.45
Leak Test	No Leak
Air Content:	6.6 %
Temperature:	75 F
Unit Weight:	143.8 lbs/cu. Ft
W/C Ratio:	0.40
Yield:	1.00

Compressive Strength Data

Age	PSI	Ave:	3510	Surface resistivity AASHTO T 358 28 Day
3 Day	3600			Test Resu 21.9 12 KΩ-CM or Above
3 Day	3410	Ave:	3510	
7 Day	4120			
7 Day	4170	Ave:	4150	Drying Shrinkage ASTM C 157 And CP-L4103 At 28 day
28 Day	5680			
28 Day	5790			Test Result 0.044%
28 Day	5620	Ave:	5700	

Bryon Blatter
 Technical Services Manager

Reviewed by:
 Castle Rock Consulting, LLC



March 20, 2020

Mr. Adrian Gamueda
Brannan Companies
2500 East Brannan Way
Denver, CO 80229

Subject: Brannan Aggregates-Morton Lakes/Pit 25
Washed Concrete Sand Fine Aggregate
Aggregate Qualification Testing
Laboratory ID 205039
Project No. 20.027

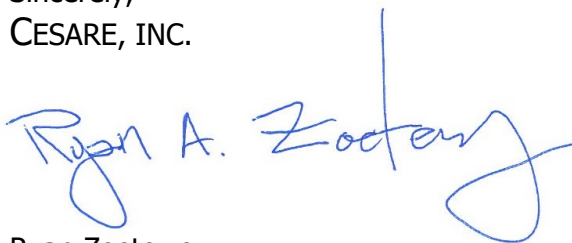
Dear Mr. Gamueda:

Cesare, Inc. (Cesare) performed laboratory tests on representative samples of the subject aggregate obtained from Morton Lakes Pit 25 in Brighton, Colorado. Samples were obtained and transported to Cesare's facilities by Brannan Companies in February 2020. The following tests were performed in accordance with ASTM standard test methods and the results are presented in association with the relevant ASTM C33, AASHTO M6, and Colorado Department of Transportation (CDOT) Standard Specifications criteria, where applicable:

- Gradation with Minus #200 Wash
- Specific Gravity and Absorption
- Lightweight Particles
- Clay Lumps and Friable Particles
- Magnesium Sulfate Soundness
- Unit Weight (Density) and Voids
- Organic Impurities
- Sand Equivalency
- Potential Alkali Reactivity, Mortar Bar Method

The results of testing indicate the material complies with the criteria presented and the material is suitable for use as a concrete constituent. A summary of laboratory test results follows. Please contact us with any questions.

Sincerely,
CESARE, INC.



Ryan Zoetewey
Director of Laboratories

DJW/ksm

Attachments



Erin Arndt, P.E.
Senior Project Manager

SUMMARY OF LABORATORY TEST RESULTS

Brannan Aggregates-Morton Lakes/Pit 25
 Washed Concrete Sand Fine Aggregate
 Laboratory ID 205039

Gradation (ASTM C136)

Sieve Size	Passing (%)	ASTM C33 Table 1 (%)	AASHTO M6 Table 1 (%)	CDOT Table 703-1 (%)
3/8" (9.5 mm)	100	100	100	100
#4 (4.75 mm)	100	95 to 100	95 to 100	95 to 100
#8 (2.36 mm)	92	80 to 100	80 to 100	80 to 100
#16 (1.18 mm)	67	50 to 85	50 to 85	50 to 85
#30 (600 µm)	41	25 to 60	25 to 60	25 to 60
#50 (300 µm)	16	5 to 30	10 to 30	10 to 30
#100 (150 µm)	4	0 to 10	2 to 10	2 to 10
#200 (75 µm)	1	0 to 3	--	--
		ASTM C33 Sec. 6.2	AASHTO M6 Sec. 5.3	CDOT Sec. 703.01
Fineness Modulus	2.8	2.3-3.1	2.3-3.1	2.5-3.5

Minus #200 Wash (ASTM C117)

Sieve Size	Passing (%)	ASTM C33 Table 1 (%)	AASHTO M6 Table 2, Class A (%)	CDOT Section 703.01 (%)
#200 (75 µm)	0.8	≤ 3.0	≤ 2.0	≤ 3.0

Specific Gravity and Absorption (ASTM C128)

Bulk Specific Gravity (Oven Dry)	2.58
Bulk Specific Gravity (SSD)	2.61
Apparent Specific Gravity	2.65
Absorption (%)	1.0

Lightweight Particles (ASTM C123)

Lightweight Pieces at 2.0 Specific Gravity (%)	ASTM C33, Table 2, Coal and Lignite, Concrete Surface Appearance Important (%)	AASHTO M6 Table 2, Class A (%)	ASTM C33 Table 2, All Other Concrete (%)	AASHTO M6 Table 2, Class B, (%)
0.0	≤ 0.5	≤ 0.25	≤ 1.0	≤ 1.0

Clay Lumps and Friable Particles (ASTM C142)

Sieve Size	Grading of Original Sample (%)	Mass of Test Fraction Before Test (g)	Mass of Test Fraction After Test (g)	Passing After Test (%)	Clay Lumps and Friable Particles (%)
#4 (4.75 mm) to #16 (1.18 mm)	33	29.9	29.7	0.7	0.7
					ASTM C33 Table 2
					≤ 3.0
					AASHTO M6 Table 2, Class A
					≤ 3.0

SUMMARY OF LABORATORY TEST RESULTS

Brannan Aggregates-Morton Lakes/Pit 25
 Washed Concrete Sand Fine Aggregate
 Laboratory ID 205039

Magnesium Sulfate Soundness (ASTM C88)

Sieve Size	Grading of Original Sample (%)	Mass of Test Fraction Before Test (g)	Mass of Test Fraction After Test (g)	Passing After Test (%)	Weighted Loss (%)
#4 (4.75 mm) to #8 (2.36 mm)	8	100.1	91.4	8.7	0.7
#8 (2.36 mm) to #16 (1.18 mm)	24	99.9	91.9	8.0	1.9
#16 (1.18 mm) to #30 (600 µm)	26	100.0	90.9	9.1	2.4
#30 (600 µm) to #50 (300 µm)	25	100.0	94.1	5.9	1.5
Minus #50 (300 µm)	17	--	--	--	--
Total Weighted Loss (%)					7
ASTM C33 Section 8.1					≤ 15
AASHTO M6 Section 8.1					≤ 15

Unit Weight (Density) and Voids (ASTM C29) by Rodding

Unit Weight (pcf)	106
Unit Weight (pcy)	2,853
Voids (%)	34

Organic Impurities (ASTM C40)

Color Plate	ASTM C33 Section 7.2.1	AASHTO M6 Section 7.2.1
1	≤ Plate 3 (Standard)	≤ Plate 3 (Standard)

Sand Equivalency (ASTM D2419)

Sand Equivalent Result	88
CDOT Section 703.01	≥ 80

Potential Alkali Reactivity, Mortar Bar Method (ASTM C1260)

Average Expansion at 16 Days (%)	ASTM C1260 Test Result Interpretation
0.02	Expansion < 0.10%: Innocuous Expansion > 0.20%: Reactive ¹ Expansions 0.10% to 0.20%: Inconclusive ²

¹ Potentially deleterious expansion

² Includes both innocuous and deleterious aggregates

GRADATION - SOIL AND AGGREGATE

Project number	<u>20.027, Brannan Companies</u>	Date	<u>February 4, 2020</u>
Project name	<u>Brannan Companies</u>	Technician	<u>E. Van Bommel</u>
Lab ID number	<u>205039</u>	Reviewer	<u>J. Weinerth</u>
Sample location	<u>Morton Lakes/Pit 25 - Brighton, CO</u>		
Visual description	<u>Washed Concrete Sand</u>		

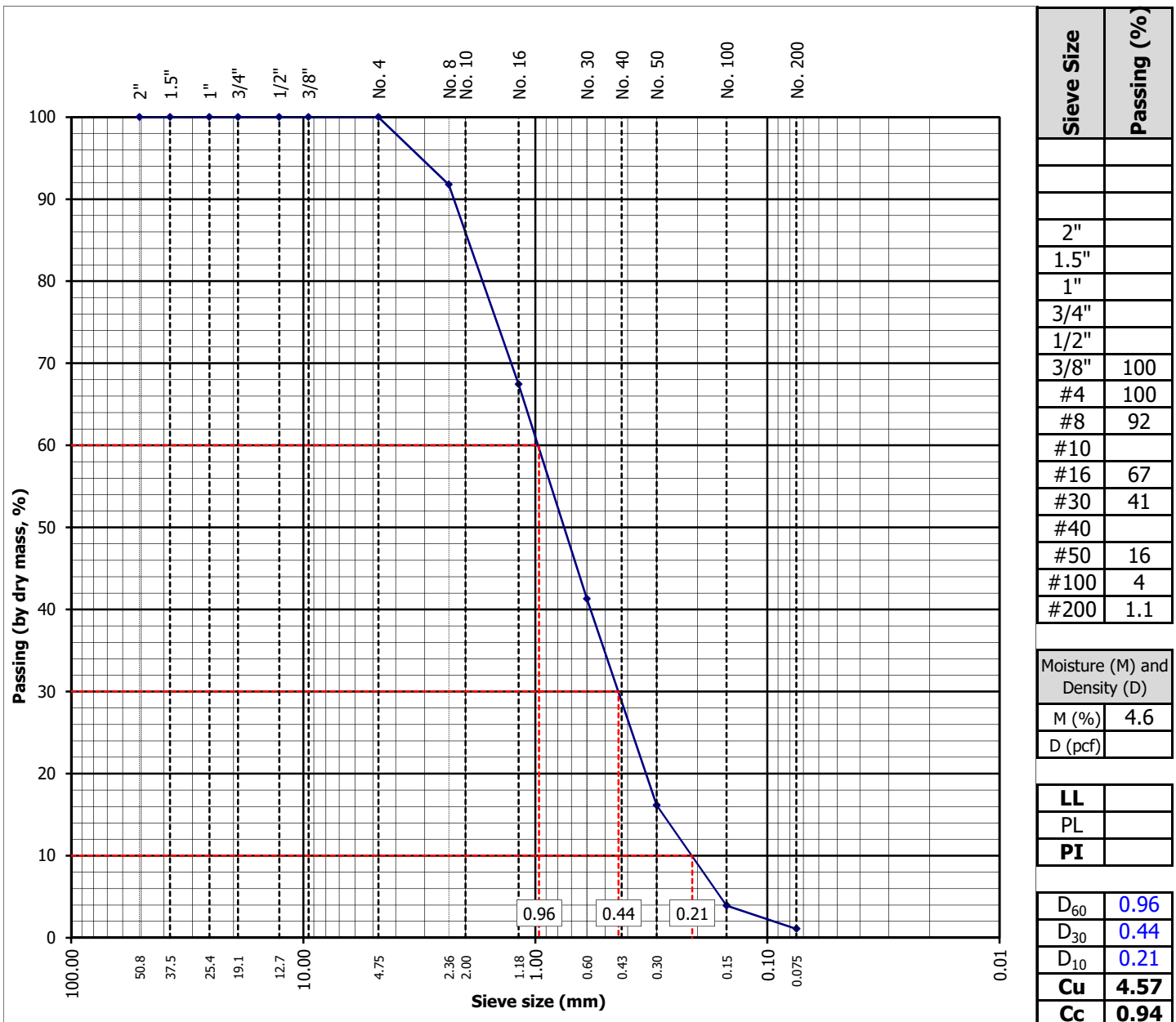
AASHTO M145 Classification _____ **Group Index** _____
Unified Soil Classification System (ASTM D2487) (0)

Sieve Analysis (ASTM C136 and AASHTO T27)					-#200 Wash (D1140, C117, and T11)	
Sieve Size	Accum. Mass (g)	Retained (%)	Passing (%)	Criteria	Dish ID	H
2"				ASTM C33	Dish mass (g)	172.9
1.5"				WCS	Wet soil bef. wash + dish (g)	516.7
1"					Dry soil bef. wash + dish (g)	501.5
3/4"					Dry soil aft. wash + dish (g)	498.9
1/2"					-#200 (%)	0.8
3/8"	0.0	0.0	100	100	Moisture Content	
#4	0.0	0.0	100	95 to 100	Dish ID	F
#8	27.0	8.2	92	80 to 100	Mass of dish (g)	173.6
#10					Wet soil + dish (g)	514.5
#16	107.0	32.6	67	50 to 85	Dry soil + dish (g)	499.4
#30	192.8	58.7	41	25 to 60	Moisture Content (%)	4.6
#40					Atterberg Limits (D4318 and T89/T90)	
#50	275.5	83.8	16	5 to 30	Liquid Limit (LL)	
#100	315.7	96.1	4	0 to 10	Plastic Limit (PL)	
#200	325.0	98.9	1.1	0 to 3.0	Plasticity Index (PI)	
Total	328.6	grams			Criteria:	LL
Pan	325.6		Fineness Modulus	2.79		PI
Split Gradation Sample Mass				Remarks:		
	Wet	Dry	%			
Total Mass (g)						
+ #4 Mass (g)						
- #4 Mass (g)						
In Situ Density (Unit Weight)						
Diameter (in)		Height (in)		Sample mass (g)		
Diameter (in)		Height (in)		Sample moisture content (%)		4.6
Diameter (in)		Height (in)		Dry sample mass (g)		
Diameter (in)		Height (in)		Wet density (unit weight, pcf)		
Avg. diameter		Avg. height		In situ dry density (unit weight, pcf)		

GRADATION PLOT - SOIL AND AGGREGATE

Project number	20.027, Brannan Companies		Date	February 4, 2020
Project name	Brannan Companies		Technician	E. Van Bommel
Lab ID number	205039		Reviewer	J. Weinerth
Sample location	Morton Lakes/Pit 25 - Brighton, CO			
Visual description	Washed Concrete Sand			

AASHTO M145 Classification _____ **Group Index** _____
Unified Soil Classification System (ASTM D2487) _____ **()**



**Potential Alkali Reactivity (Mortar Bar Method) ASTM C1260
250 mm Mold**

Project number	<u>20.027, Brannan Companies</u>	Date	<u>02/18/20</u>
Project name	<u>General Lab Testing</u>	Technician	<u>C. Zoetewey</u>
Lab ID number	<u>205039</u>	Reviewer	<u>J. Weinerth</u>
Type and source of aggregate	<u>Washed Concrete Sand - Morton Lakes/Pit 25 - Brighton, CO</u>		
Type and source of cement	<u>Type I/II - GCC, Pueblo</u>		

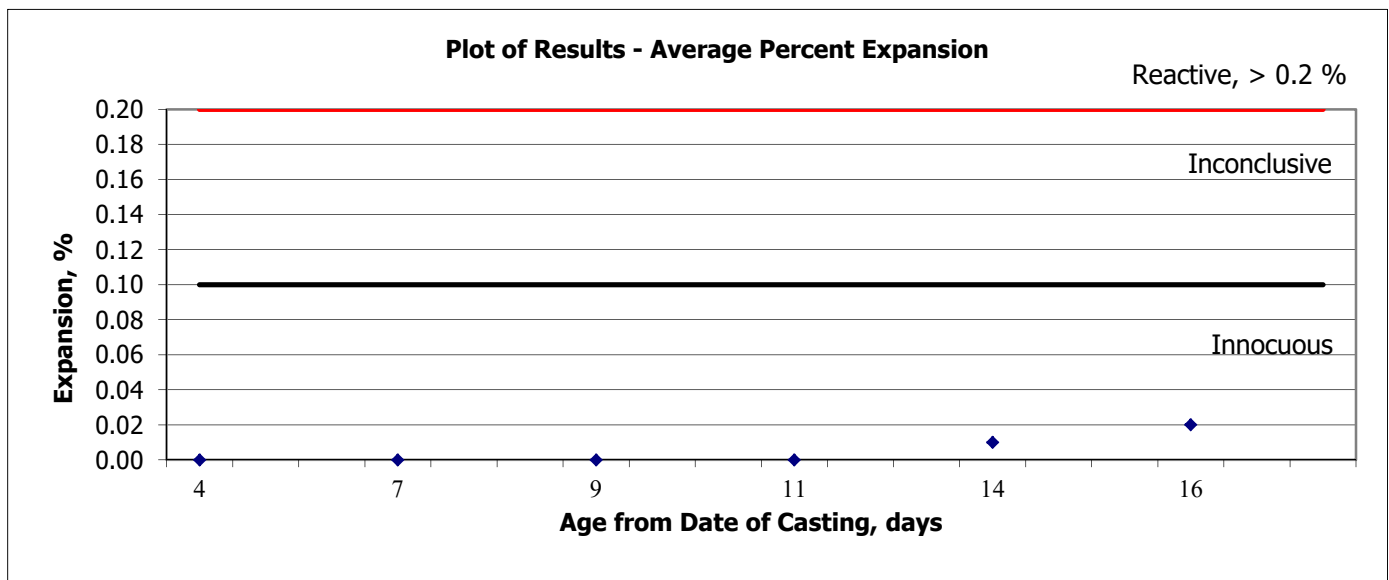
Grading: Retaining Sieve	Mass (g)	Water/Cement Ratio	
#8	99.0	Mass of cement (g)	440.0
#16	247.5	Mass of water (g)	206.8
#30	247.5	w/cm ratio	0.47
#50	247.5	Remarks:	
#100	148.5		
Total	990.0		

Comparator Readings					
(24 hrs) initial readings		(48 hrs) Zero Readings:			
Date	Reading	Date	Reading		
2/19/2020	A	-0.162	2/20/2020	A	0.022
	B	0.594		B	0.778
	C	0.274		C	0.456

Date	Age (days)	Reading (mm)	Difference	Change (%)	CA Average Expansion (%)	
2/22/2020	4	A	0.010	-0.012	-0.005	0.00
		B	0.764	-0.014	-0.006	
		C	0.446	-0.010	-0.004	
2/25/2020	7	A	0.016	-0.006	-0.002	0.00
		B	0.772	-0.006	-0.002	
		C	0.454	-0.002	-0.001	
2/27/2020	9	A	0.024	0.002	0.001	0.00
		B	0.778	0.000	0.000	
		C	0.456	0.000	0.000	
2/29/2020	11	A	0.010	-0.012	-0.005	0.00
		B	0.766	-0.012	-0.005	
		C	0.448	-0.008	-0.003	
3/3/2020	14	A	0.058	0.036	0.014	0.01
		B	0.810	0.032	0.013	
		C	0.492	0.036	0.014	
3/5/2020	16	A	0.070	0.048	0.019	0.02
		B	0.824	0.046	0.018	
		C	0.508	0.052	0.021	

**Potential Alkali Reactivity (Mortar Bar Method) ASTM C1260
250 mm Mold**

Project number	<u>20.027, Brannan Companies</u>	Date	<u>02/18/20</u>
Project name	<u>General Lab Testing</u>	Technician	<u>C. Zoetewey</u>
Lab ID number	<u>205039</u>	Reviewer	<u>J. Weinerth</u>
Type and source of aggregate	<u>Morton Lakes/Pit 25 - Washed Concrete Sand - Brighton, CO</u>		
Type and source of cement	<u>Type I/II, GCC</u>		



January 9, 2020



Albert Frei and Sons
P.O. Box 700
Henderson, Colorado 80640

Attention: Mr. Joe Frei

Subject: Physical Properties Testing (ASTM)
No. 67 stone, Pit 6
Project No. CT16695.000-400

Dear Mr. Frei:

This report presents results of physical properties testing performed on material delivered to our laboratory on October 2, 2019. The material was sampled on October 1, 2019. Representative samples delivered were identified as No. 67 stone from Pit 6. Testing was performed to determine the materials compliance with ASTM specifications. The following testing was performed in general conformance with the applicable standards.

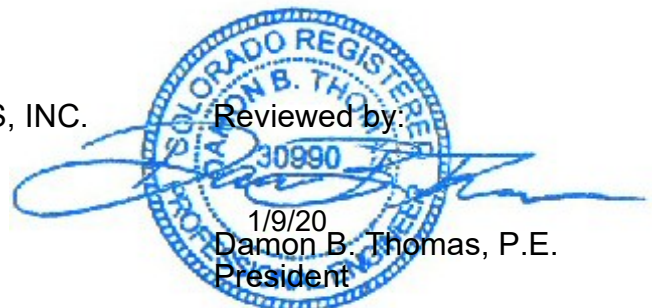
- 1) Sieve Analysis (Gradation)
- 2) Material Finer Than No. 200 Sieve by Washing
- 3) Specific Gravity & Absorption
- 4) Clay Lumps & Friable Particles
- 5) Lightweight Particles 2.0
- 6) Lightweight Particles 2.4
- 7) Sodium Sulfate Soundness
- 8) Magnesium Sulfate Soundness
- 9) Rodded Unit Weight & Voids
- 10) Loose Unit Weight & Voids
- 11) Los Angeles Abrasion
- 12) Fractured Faces
- 13) Scratch Hardness
- 14) Flat and Elongated Particles
- 15) Micro Deval
- 16) Total Evaporable Moisture Content
- 17) Potential Alkali Reactivity – ASTM C 1260

A summary of the aggregate test results is attached, followed by the complete test results. Based on the test results, the material tested meets the ASTM specifications for coarse aggregate. If you have any questions regarding this report, please call.

Respectfully submitted,

CTL | THOMPSON MATERIALS ENGINEERS, INC.


Daniel L. Barrett
Materials Lab Manager



DLB:DBT/clm
Enclosures
1 copy sent
1 copy emailed: jfrei@albertfreiandsons.com

Aggregate Qualification Summary - ASTM Specifications (ASTM C 33)

Albert Frei and Sons, Inc. - Pit 6, No. 67



Project No. CT16695.000-400

Report Date: January 08, 2020

Sieve Analysis (ASTM C 136 & C 117)		
Sieve Size	Passing (%)	Specification (%)
1-1/2 inch (37.5 mm)	100	-
1 inch (25 mm)	100	100
3/4 inch (19 mm)	94	90-100
1/2 inch (12.5 mm)	42	-
3/8 inch (9.5 mm)	21	20-55
No. 4 (4.75 mm)	2	0-10
No. 8 (2.36 mm)	1	0-5
No. 200 (75 µm)	0.2	1.0 Max

Test		Results	Specification
Specific Gravity (ASTM C 127)		2.81	-
Absorption (ASTM C 127)		0.5%	-
Clay Lumps and Friable Particles (ASTM C 142)		0.1% Weighted Particles	2.0% Max
Lightweight Particles, 2.0 sp.g. (ASTM C 123)		< 0.01%	0.5% Max
Lightweight Particles, 2.4 sp.g. (ASTM C 123)		< 0.01%	3.0% Max
Sodium Sulfate Soundness (ASTM C 88)		2% Weighted Loss	12% Max
Magnesium Sulfate Soundness (ASTM C 88)		3% Weighted Loss	18% Max
Rodded Unit	Unit Weight	102 pcf	-
Weight & Voids (ASTM C 29)	Percent Voids	42%	-
	Tons per cubic yard	1.38 tons/cu. yd.	-
Loose Unit	Unit Weight	95 pcf	-
Weight & Voids (ASTM C 29)	Percent Voids	46%	-
	Tons per cubic yard	1.28 tons/cu. yd.	-
Los Angeles Abrasion (ASTM C 131)		33%	50% Max
Percentage of Fractured Particles (ASTM D 5821)		100%	-
Total Evaporable Moisture Content (ASTM C 566)		0.9%	-
Micro-Deval (ASTM D 6928)		17.8%	-
Scratch Hardness (CRD 130-01)		0.0%	-
Weighted Average Flat Particles		1.7%	-
Weighted Average Elongated Particles		0.0%	-
Total Weighted Average Flat and/or Elongated Particles		1.7%	5% max AREMA

Potential Alkali Reactivity (ASTM C 1260)			
Days in Soak	Average Expansion (%)	Classification	Potential for Deleterious ASR
14-Days	0.02	Innocuous	Low Potential
28-Days	0.06		

CTL | THOMPSON MATERIALS ENGINEERS, INC.





ATTACHMENT A
LABORATORY TEST RESULTS

PHYSICAL PROPERTIES OF AGGREGATES



Company Name: Albert Frei and Sons, Inc.
Material Source: Pit 6
Material Type: No. 67

Project No. CT16695.000-400
Report Date: January 8, 2020

Sieve Analysis of Coarse Aggregate

(ASTM C 136)

Sieve Size	Percent Passing No. 67	Percent Passing (ASTM C 33)
1-1/2 inch (37.5 mm)	100	-
1 inch (25 mm)	100	100
3/4 inch (19 mm)	94	90-100
1/2 inch (12.5 mm)	42	-
3/8 inch (9.5 mm)	21	20-55
No. 4 (4.75 mm)	2	0-10
No. 8 (2.36 mm)	1	0-5
No. 200 (75 µm)	0.2	1.0 Max

Material Finer Than No. 200 Sieve by Washing

(ASTM C 117)

Initial Dry Weight (lbs)	Final Dry Weight (lbs)	Material Finer Than No. 200 Sieve (%)
24.3868	24.3324	0.2

Specific Gravity and Absorption of Coarse Aggregate

(ASTM C 127)

Oven Dry Weight (lbs)	SSD in Air Weight (lbs)	Submerged Weight (lbs)	Bulk Volume	Bulk (SSD) Specific Gravity	Absorption (%)
12.9396	13.0074	8.3850	4.6224	2.81	0.5

Clay Lumps and Friable Particles in Aggregate

(ASTM C 142)

Sieve Size		Percent Grading of Sample	Weight Before (g)	Weight After (g)	Percent Loss	Weighted Percent Loss
Passing	Retained					
1-1/2 inch	3/4 inch	6	3014.3	3012.4	0.1	0.0
3/4 inch	3/8 inch	73	2001	1998.9	0.1	0.1
3/8 inch	No. 4	19	1001.1	999.3	0.2	0.0
Less Than No. 4		2	-	-	-	-

Total Percent Grading

100

Total Weighted Loss

0.1%

PHYSICAL PROPERTIES OF AGGREGATES



Company Name: Albert Frei and Sons, Inc.
Material Source: Pit 6
Material Type: No. 67

Project No. CT16695.000-400
Report Date: January 8, 2020

Lightweight Particles in Aggregate

(ASTM C 123)

Sample Weight (g)	Specific Gravity of Liquid	Percentage by Mass of Lightweight Particles
3753	2.0	< 0.01
3753	2.4	< 0.01

Soundness of Coarse 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 inch	3/4 inch	6	503.4	500.4	0.6	0.0
3/4 inch	1/2 inch	52	670.9	663.7	1.1	0.6
1/2 inch	3/8 inch	21	330.5	309.7	6.3	1.3
3/8 inch	No. 4	19	300.4	293.9	2.2	0.4
Less Than No. 4		2	-	-	-	-

Total Percent Grading: 100

Total Weighted Loss: 2

Soundness of Coarse 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 inch	3/4 inch	6	508.1	502.7	1.1	0.1
3/4 inch	1/2 inch	52	670.8	656.5	2.1	1.1
1/2 inch	3/8 inch	21	330.2	310.6	5.9	1.2
3/8 inch	No. 4	19	300.4	286.1	4.8	0.9
Less Than No. 4		2	-	-	-	-

Total Percent Grading: 100

Total Weighted Loss: 3

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

(ASTM C 29)

Sample Weight (lbs)	Bucket Volume (ft ³)	Unit Weight (pcf)
34.2774	0.3332	102.9
34.1254	0.3332	102.4
33.7680	0.3332	101.3

Average Unit Weight: 102 pcf

Bulk Specific Gravity (OD) = 2.80
 Voids in Aggregate Compacted by Rodding = 42%

PHYSICAL PROPERTIES OF AGGREGATES



Company Name: Albert Frei and Sons, Inc.
Material Source: Pit 6
Material Type: No. 67

Project No. CT16695.000-400
Report Date: January 8, 2020

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

(ASTM C 29)

Sample Weight (lbs)	Bucket Volume (ft ³)	Unit Weight (pcf)
31.6368	0.3332	94.9
31.6884	0.3332	95.1
31.2518	0.3332	93.8

Average Unit Weight: 95 pcf

Bulk Specific Gravity (OD) = 2.80

Voids in Aggregate Compacted by Rodding = 46%

Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

(ASTM C 131)

Grading	Initial Weight	Final Weight	Percent Loss
B	5001.1	3332.8	33

Determining the Percentage of Fractured Particles in Coarse Aggregate

(ASTM D 5821)

Initial Weight (g)	Weight of Fractured Particles (g)	Percent of Fractured Particles (minimum 2 faces)
3025.7	3025.7	100

Micro-Deval

(ASTM D6928)

Initial Weight (g)	Final Weight (g)	Loss (%)
1500.7	1233.0	17.8

Total Evaporable Moisture Content of Aggregates by Drying

(ASTM C 566)

Initial Weight (lbs)	Final Weight (lbs)	Moisture Content %
13.2818	13.1670	0.9



PHYSICAL PROPERTIES OF AGGREGATES

Client: Albert Frei and Sons, Inc.
Project: Flat and Elongated Particles
Project No. CT16695.000

Sample ID: No. 67 stone
Pit Name: Pit 6

Percentage of Flat Particles in Coarse Aggregate (ASTM D 4791) Criteria: 3:1 Ratio

Sieve Retained Size	Percent of Grading	Number of Particles	Weight of Particles (g)	Flat Particles (by count)	Flat Particles (by weight) (g)	Percentage of Flat Particles (by count)	Percentage of Flat Particles (by weight)	Weighted Percentage of Flat Particles (by count)	Weighted Percentage of Flat Particles (by weight)
¾ inch	6	-	-	-	-	-	-	-	-
½ inch	52	100	682.4	2	7.5	2.0	1.1	1.0	0.6
⅜ inch	21	100	254.6	6	13.7	6.0	5.4	1.3	1.1
< ⅜ inch	21	-	-	-	-	-	-	-	-
Total:	100						Total Weighted Average Flat Particles:	2.3	1.7

Percentage of Elongated Particles in Coarse Aggregate (ASTM D 4791) Criteria: 3:1 Ratio

Particle Size	Percent of Grading	Number of Particles	Weight of Particles (g)	Elongated Particles (by count)	Elongated Particles (by weight) (g)	Percentage of Elongated Particles (by count)	Percentage of Elongated Particles (by weight)	Weighted Percentage of Elongated Particles (by count)	Weighted Percentage of Elongated Particles (by weight)
¾ inch	6	-	-	-	-	-	-	-	-
½ inch	52	100	682.4	0	0.0	0.0	0.0	0.0	0.0
⅜ inch	21	100	254.6	0	0.0	0.0	0.0	0.0	0.0
< ⅜ inch	21	-	-	-	-	-	-	-	-
Total:	100						Total Weighted Average Elongated Particles:	0.0	0.0



CRD-C 130-01 Standard Recommended Practice for Estimating Scratch Hardness of Coarse Aggregate Particles

Client: Albert Frei and Sons, Inc.
 Job No.: CT16695.000
 Material: No. 67 rock

Date Submitted: 10/2/2019
 By Technician: DB

Nominal Sieve Size: 1"

Minimum Criteria:

Particle Size Passing/Retain	Total Individual Weight	Total Individual Number	Classified "Soft" by Weight	Classified "Soft" by Number	% of Soft by Weight (5.1.3)	% of "Soft" by Number (5.1.3)	% Grading of representative sample (> %10)	Weighted Avg.
1/2" to 3/8" min. (200g)	275.6	101	0	0	0.0	0.0	21	0.0
3/4" to 1/2" min. (600g)	691.5	100	0	0	0.0	0.0	52	0.0
1" to 3/4" min. (1500g)	-	-	-	-	-	-	6	-
1 1/2" to 1" min. (4500g)	-	-	-	-	-	-	0	-
2" to 1 1/2" min. (12000g)	-	-	-	-	-	-	0	-

Total Weights:	Total Individual Weight	Total Individual Number	Total Classified "Soft" by Weight	Total Classified "Soft" by Number	Total % of Soft by Weight (5.1.3)	Total % of Soft by Number (5.1.3)	Total Grading	Total Weighted Avg.
	967.1	201	0	0	0	0	79	0.0



ATTACHMENT B
POTENTIAL ALKALI REACTIVITY RESULTS

Potential Alkali Reactivity of Aggregates, Mortar-Bar Method (ASTM C 1260)



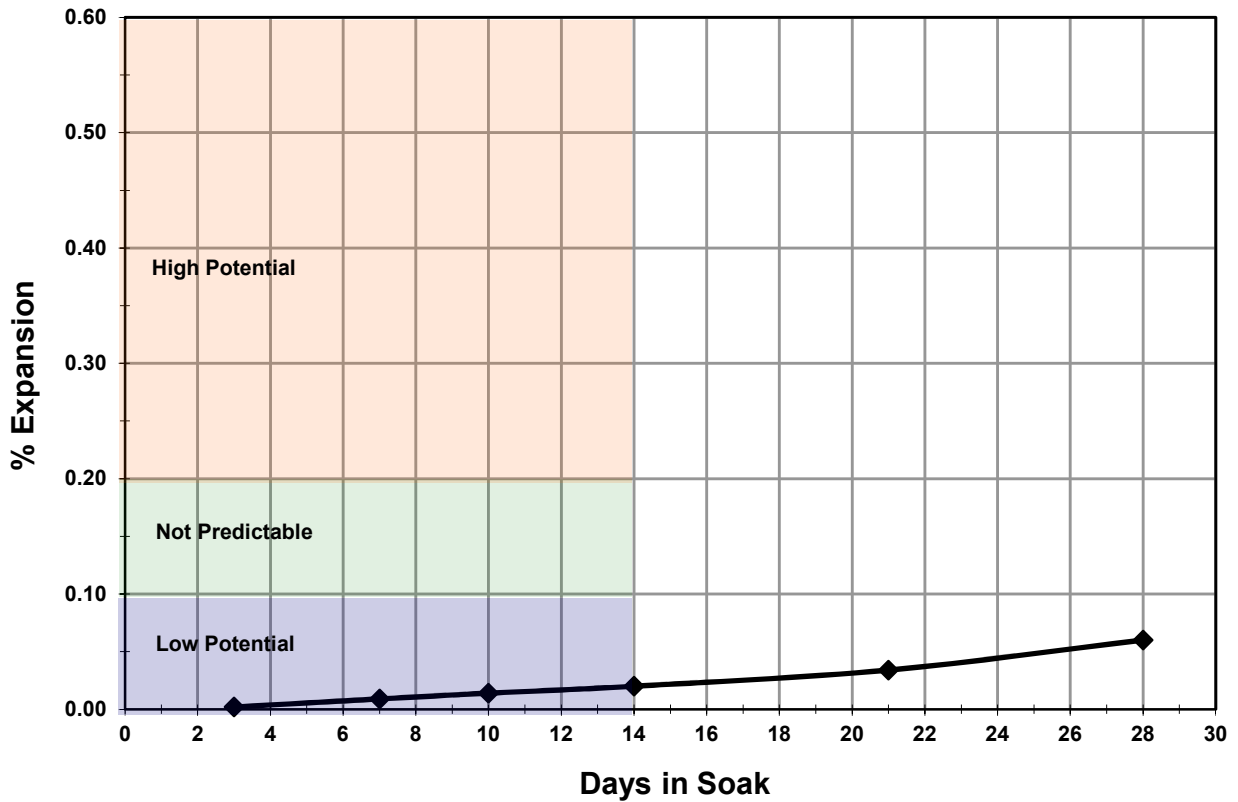
Client: Albert Frei and Sons, Inc.
Project: 2020 Qualification Testing
Aggregate: 100% No. 67, Pit 6

Project No. CT16695.000-400
Cast Date: October 21, 2019

Cement: 100% GCC I/II	Cementitious Content: 440 g
Cement Alkalies (Total Alkalies as Na ₂ O): 0.68%	Aggregate/Cement Ratio: 990g/440g
Cement Expansion (Autoclave): 0.02%	Water/Cement Ratio: 0.47

Date	Age (Days)	Expansion (%)			
		Sample I.D.			Average
		1	2	3	
10/26/19	3	0.004	0.000	0.001	0.00
10/30/19	7	0.008	0.012	0.006	0.01
11/2/19	10	0.010	0.016	0.016	0.01
11/6/19	14	0.020	0.021	0.021	0.02
11/13/19	21	0.033	0.033	0.036	0.03
11/20/19	28	0.057	0.055	0.059	0.06

Mortar Bar Expansion





February 5, 2020

MANUFACTURER'S CERTIFICATION

This is to certify that Chryso® Air 260, manufactured by CHRYSO, Inc. is compatible for use in Portland cement concrete and concrete containing fly ash, Portland-pozzolan cements and GGBF.

This is to certify that Chryso® Air 260 is manufactured under strict quality control conditions and conforms to the mandatory requirements of the following specifications:

American Society For Testing and Materials.....ASTM C-260

United States Corps of Engineers.....CRD C-13

American Association of State Highway and
Transportation Officials.....AASHTO M-154

We further certify that Chryso® Air 260 remains the same in uniformity and equivalence as originally submitted for testing. The Chloride content of Chryso® Air 260 is <0.1% and no chlorides are added during the manufacturing process.

Admixtures from the Chryso product lines may not be compatible with other manufacturer's product lines.

A handwritten signature in black ink, appearing to read "Brian D. Breitzman".

Brian D. Breitzman
R & D and Quality Manager - North America



February 5, 2020

MANUFACTURER’S CERTIFICATION

This is to certify that Chryso® Quad 520 EMx, manufactured by CHRYSO, Inc. is compatible for use in Portland cement concrete and concrete containing fly ash, Portland-pozzolan cements and GGBF.

This is to certify that Chryso® Quad 520 EMx is manufactured under strict quality control conditions and conforms to the mandatory requirements of the following specifications:

American Society For Testing and Materials.....ASTM C-494, Type A

United States Corps of Engineers.....CRD C-87

American Association of State Highway and
Transportation Officials.....AASHTO M-194, Type A

We further certify that Chryso® Quad 520 EMx remains the same in uniformity and equivalence as originally submitted for testing and no chlorides are added during the manufacture of Chryso® Quad 520 EMx.

Admixtures from the Chryso product lines may not be compatible with other manufacturer’s product lines.

A handwritten signature in black ink, appearing to read "Brian D. Breitzman".

Brian D. Breitzman
R & D and Quality Manager - North America

ASTM C618 / AASHTO M295 Testing of Craig Fly Ash

Sample Date: 5/1 - 5/31/20
Sample Type: Monthly
Sample ID:

Report Date: 7/15/2020
MTRF ID: 1154CG

Chemical Analysis	Results	ASTM Limit Class F / C	AASHTO Limit Class F / C
Silicon Dioxide (SiO ₂)	<u>53.01</u> %		
Aluminum Oxide (Al ₂ O ₃)	<u>23.24</u> %		
Iron Oxide (Fe ₂ O ₃)	<u>5.76</u> %		
Sum (SiO ₂ +Al ₂ O ₃ +Fe ₂ O ₃)	<u>82.01</u> %	50.0 min	50.0 min
Sulfur Trioxide (SO ₃)	<u>0.49</u> %	5.0 max	5.0 max
Calcium Oxide (CaO)	<u>9.55</u> %	18.0 max / >18.0	18.0 max / >18.0
Magnesium Oxide (MgO)	<u>2.54</u> %		
Sodium Oxide (Na ₂ O)	<u>0.96</u> %		
Potassium Oxide (K ₂ O)	<u>1.02</u> %		
Moisture	<u>0.06</u> %	3.0 max	3.0 max
Loss on Ignition	<u>0.24</u> %	6.0 max	5.0 max
Available Alkalies, as Na ₂ O _e	<u>0.67</u> %	Not Required	1.5 max* <small>*when required by purchaser</small>
Physical Analysis			
Fineness, % retained on 45-µm sieve	<u>12.25</u> %	34 max	34 max
Strength Activity Index - 7 or 28 day requirement			
7 day, % of control	<u>86</u> %	75 min	75 min
28 day, % of control	<u>96</u> %	75 min	75 min
Water Requirement, % control	<u>94</u> %	105 max	105 max
Autoclave Soundness	<u>-0.05</u> %	0.8 max	0.8 max
Density	<u>2.37</u> g/cm ³		

The test data listed herein was generated by applicable ASTM methods. The reported results pertain only to the sample(s) or lot(s) tested. This report cannot be reproduced without permission from Boral Resources.

Christy Sieg

Christy Sieg
Lab Manager





GCC of America

600 S. Cherry Street, Suite 1000, Glendale, CO 80246
Sales (303) 739-5900, Customer Service (800) 225-5422

MATERIAL CERTIFICATION REPORT

Plant: Pueblo
Address: 3372 Lime Road
Pueblo, CO 81004
Contact: Urs Fuchs
Phone: (719) 647-6821

Cement Type: I/II, Low Alkali, GU
Date Issued: 10-Mar-20
Production Period: 1-Feb-20
To: 29-Feb-20

STANDARD REQUIREMENTS ASTM C150/AASHTO M85/ASTM C1157

CHEMICAL			
Item	ASTM Test Method	ASTM C150 Spec. Limit	Test Result
SiO ₂ (%)	C114	-	20.1
Al ₂ O ₃ (%)	C114	6.0 max	4.5
Fe ₂ O ₃ (%)	C114	6.0 max	3.1
CaO (%)	C114	-	63.9
MgO (%)	C114	6.0 max	0.9
SO ₃ (%)	C114	3.0 max ^A	3.4
Loss On Ignition (%) ^B	C114	3.5 max ^C	3.2
Na ₂ O (%)	C114	-	0.17
K ₂ O (%)	C114	-	0.61
Insoluble Residue (%)	C114	1.5 max	1.1
CO ₂ (%) ^B	C114	-	1.7
Limestone (%)	C150	5.0 max	4.3
CaCO ₃ in Limestone (%)	C150	70 min	88
Inorganic Processing Addition	C150	5.0 max	-
Potential Phase Composition			
C ₃ S (%)	C150	-	56
C ₂ S (%)	C150	-	14
C ₃ A (%)	C150	8 max	7
C ₄ AF (%)	C150	-	9

PHYSICAL				
Item	ASTM Test Method	ASTM C150 Spec. Limit	ASTM C1157 Spec. Limit	Test Result
Air Content (% vol)	C185	12 max	12 max	8
Blaine Fineness (m ² /kg)	C204	260 min	-	414
Residue 45 μm (No.325) Sieve (%)	C430	-	-	2.5
Autoclave Expansion (%)	C151	0.80 max	0.80 max	0.02
Compressive Strength				
3 days, MPa (psi)	C109	12.0 (1740) min	13.0 (1890) min	30.9 (4490)
7 days, MPa (psi)	C109	19.0 (2760) min	20.0 (2900) min	36.9 (5360)
28 days, MPa (psi) ^D	C109	-	28.0 (4060) min	43.0 (6230)
Time of Setting, Initial Vicat (min)	C191	45 min / 375 max	45 min / 420 max	103
Mortar Bar Expansion (%)	C1038	0.020 max	0.020 max	0.004

ADDITIONAL DATA					
Type	Limestone	Test Method	Base Phase Composition	ASTM Test Method	Test Result
SiO ₂ (%)	5.3	Internal	C ₃ S (%)	C150	59
Al ₂ O ₃ (%)	2.5	Internal	C ₂ S (%)	C150	15
Fe ₂ O ₃ (%)	1.1	Internal	C ₃ A (%)	C150	7
CaO (%)	50.0	Internal	C ₄ AF (%)	C150	10
SO ₃ (%)	0.3	Internal			

OPTIONAL REQUIREMENTS ASTM C150/AASHTO M85/ASTM C1157

CHEMICAL			
Item	ASTM Test Method	ASTM C150 Spec. Limit	Test Result
Equivalent Alkalies (%)	C114	0.60 max	0.57

PHYSICAL				
Item	ASTM Test Method	ASTM C150 Spec. Limit	ASTM C1157 Spec. Limit	Test Result
False Set (%)	C451	50 min	50 min	68

^A It is permissible to exceed the specification limit provided that ASTM C1038 Mortar Bar Expansion does not exceed 0.020 % at 14 days.

^B This alternative analysis has been qualified in accordance with ASTM C114 and meets requirements of Table 1.

^C Loss on ignition, max: 3.0 % when limestone is not an ingredient; Loss on ignition, max: 3.5 % when limestone is an ingredient

^D Test result of prior month

GCC of America Cement is warranted to conform at the time of shipment with current ASTM C150/AASHTO M85/ASTM C1157. No other warranty is made or implied. Having no control over the use of its cements, GCC of America does not guarantee finished work.



Wiss, Janney, Elstner Associates, Inc.
330 Pfingsten Road
Northbrook, Illinois 60062
847.272.7400 tel
www.wje.com

March 23, 2020

Anne Miller
Chemist
GCC
3372 Lime Rd
Pueblo, CO 81004

ASTM C452 Testing

WJE No. 2020.1174

Dear Ms. Miller

As requested, a cement sample, received in the Northbrook laboratory of Wiss, Janney, Elstner associates via FedEx on February 25, 2020, was analyzed for potential sulfate expansion. The sample was identified as FMC 12-03-19 and labeled as a Type I/II cement with a sulfate content of 3.37%.

Testing was performed in accordance with ASTM C452, *Test Method for Potential Expansion of Portland-Cement Mortars Exposed to Sulfate*. The gypsum used for testing was provided by GCC for a previous project. The sulfate content of this gypsum source was measured by evolution and infrared detection methods just prior to use on this project. Expansion measurements were taken at twenty-four (24) hours and fourteen (14) days. Pertinent testing data and the percent expansion are listed in Table 1.

The expansion of Sample FMC 12-03-19 is determined to be 0.036% at 14 days. This meets the specification for Type V cement in ASTM C150, *Specification for Portland Cement*, Table 4, Optional Physical Requirements.

If you have any questions or require additional information, please do not hesitate to contact us. Thank you for the opportunity to work with you on this project.

Sincerely,

WISS, JANNEY, ELSTNER ASSOCIATES, INC.

Tonya Werner
Associate III

Table 1. Batch Data and Test Results

Sample	FMC 12-03-19 Type I/II
Cement (g)	365
Gypsum (g)	35
Sand (g)	1100
Water (mL)	194
SO ₃ Content, Cement, %	3.37
SO ₃ Content, Gypsum, %	44.6
% Expansion	
Bar #1	0.036
Bar #2	0.034
Bar #3	0.036
Bar #4	0.036
Bar #5	0.037
Bar #6	Broken
Average	0.036



****ATTENTION** PLEASE READ****



Per ACI 1.6.3.1(c) the Owner's testing agency will report test and inspection results of Work to Owner, Architect/Engineer, Contractor, and concrete supplier within 7 days after tests and inspections are performed. Strength test reports will include location in Work where concrete represented by each test was deposited, date and time sample was obtained, and batch ticket number. Strength test reports will include information on storage and curing of specimens before testing.

Per ACI 1.6.4.1 General – If necessary, Owner's testing agency will perform tests on hardened concrete. Testing shall be at Contractors expense if this Specification requires tests to verify strength of concrete in structure and subsequent testing confirms concrete does not meet acceptance criteria. Contractor shall not be responsible for costs if tests are not required by this Specification or subsequent testing confirms concrete meets acceptance criteria.

Ready Mixed Concrete Company is required to be on the distribution for all test results. We ask your cooperation on notifying your customer to include RMCC on the mailing and/or email list. This enables us to monitor the status of your project and provides valuable data for future projects. It is the Owner, Owner's Rep, Contractor, and Testing Labs responsibility to ensure all test results are distributed in a timely fashion. Test results shall be mailed or emailed to:

Mailing Address:

Ready Mixed Concrete Company
Attn: QC Lab
5775 Franklin Street
Denver, CO 8026

Email: BBlatter@Brannan1.com

Thank you for your attention to this matter.



5775 Franklin Street
Denver, CO 80216
Main: 303-292-1771
Fax: 303-295-0470

March 26, 2019

To Our Valued Customers, Vendors, Suppliers and Subcontractors:

Ready Mixed Concrete Company are committed to ensuring safe and healthy working conditions for all people involved in our businesses including our employees, customers, vendors, suppliers, and subcontractors. Recently one of our Mixer Operators was involved in an accident where a pipe elbow on the pump blew out causing a fracture to his foot. Due to this accident Ready Mixed Concrete Company *will no longer* be able to back up to a pump that does not have the proper transition safety cover. An example is displayed below and can be found thru Seattle Tarp Company at www.seattletarp.com.



We thank you for your attention to this important matter. Feel free to contact us if you have any questions.

Ready Mixed Concrete Company



Ready Mixed Concrete Company

**CUSTOMER
SAFETY GUIDELINES**

Revised: 09/01/05



PURPOSE:

Accidents involving people or equipment have far reaching affects to any job site - morale is lowered, production falls behind schedule, and unexpected costs arise due to health care or equipment repair/replacement.

Ready Mix Concrete Company (the “Company”) publishes these customer safety guidelines to help accomplish several important objectives:

- To prevent all personal injuries while operators are on the job site
- To protect the environment we live in
- To protect equipment associated with the delivery of product
- To ensure superior service to our customers

The information provided herein applies to you as a customer, all of your employees, and all of your subcontractors and their employees. It is important that you read and follow the requirements of this document as well as comply with all Federal, State, and local safety and environmental laws and regulations. The information in this document is established to help ensure the protection of personnel and property and is not intended to supersede any Federal, State, or local laws or regulations or to replace any existing safety policies or procedures you or your subcontractors may have. In case of differences between these guidelines and your guidelines, the most stringent safety policy or procedure shall apply.

It is imperative that you understand that your personal safety and that of your employees, subcontractors and their employees is your responsibility. This responsibility cannot be delegated to others, nor shall it be assumed that the Company or Boral Construction Materials in any way accepts this responsibility for you.

Thank you for your cooperation in this important matter.

SCOPE:

The requirements of this document apply to all customers, their employees and representatives, and all subcontractors and their employees working on the job site associated with the delivery of Company product.

Any temporary exemptions or modifications initiated by the customer to these safety guidelines must be in writing and have joint approval of the Ready Mixed Concrete Company’s Concrete Operation Manager, Transportation Manager, and Boral Construction Materials’ Regional Safety Manager.

REQUIREMENTS:

GENERAL

1. Operator Authority – Customer shall be aware that the truck operator has the ultimate authority for any site access/pour procedures and for determining if the same can not be performed safely. If an irregular or questionable condition exists and the truck operator and customer cannot agree upon corrective action, then a Company representative shall inspect the site and approve a corrective action.
2. Unauthorized Equipment Operation – Customers, their employees, subcontractors and their employees shall not operate any Company vehicle, including any controls in the cab or outside the vehicle.
3. Safety Meetings – Prior to the start of any project, especially those with special circumstances, a pre-work safety meeting and job site walk-through will be scheduled. The meeting will involve Company management representative(s), the customer (or his/her job site representative), and any subcontractors that will be directly involved with the pour. In the event a safety meeting is scheduled during an extended contract job by either the customer or the Company, each party will ensure the other is made aware of and invited to same.
4. Training – Customer shall ensure all personnel (direct employees and subcontractors and their employees) associated with the concrete pour have been properly trained to safely work around the equipment and handle the product.
5. PPE – Customer personal protective equipment (“PPE”) selection, distribution, and use is left solely up to the customer and any subcontractors. Company representatives will not provide PPE to anyone not directly employed by the company. Truck operators are trained with the proper use and requirements associated with PPE the Company requires them to use when performing their job.
6. Job Site Entrance/Exit – Customer shall ensure the presence of a safe and easily identifiable access from the regular traveled roadway to the job site. If any condition exists that interferes with normal traffic patterns and speeds when entering/exiting a job site, the customer should have trained flaggers at the entrance/exit site to assist the truck operator in and out of roadway traffic flow.
7. Traffic Control – Customer shall provide traffic control during situations where the pour site does not permit trucks to be completely off the highway. Such traffic control may include a trained flagger, orange cones, or other device(s) that shall safely alert oncoming traffic to the presence of the truck and altered travel conditions. Company and truck operators will not be responsible for traffic control involving the job site.

8. Job Site Roadways – Customer shall ensure all roadways developed for truck travel are safely constructed of ample width, with dry compacted material, and well marked. As a general guideline, all roadways traversing the edge of any pit or drop-off should be positioned approximately one foot from the edge for every foot of drop-off.
9. Access Ramps – Customer shall ensure all site access ramps developed for truck usage are designed by a qualified engineer and are safely constructed of ample width, with dry compacted material (taking into account the type of soil at the site), and well marked. As a general guideline, all ramps should be constructed to the same specifications as roadways next to a pit – one foot from the edge for every foot of drop-off.
*NOTE: It is critical to remember that the gross weight of a loaded ready mix truck is approximately **68,000 pounds** and ramps must be designed to carry this weight and withstand multiple uses and inclement weather. Each ramp must be inspected at least daily or when conditions may alter a ramp's integrity.*
10. Backing – Customer shall provide backing assistance for the truck operator when approaching the pour site or pump hopper. Said assistance should be performed by personnel trained in safe zones (locations to stand or move that will not place the individual too close to the truck while maintaining a clear line of sight with the truck operator) and proper communication and hand signal techniques.
11. Housekeeping – Customer shall endeavor to maintain a clear work area to allow for safe truck travel and operator foot traffic. Excess rebar, form material, and other waste should be removed prior to the first truck arrival and kept clear until the completion of the pour.

TRUCKS

1. Passengers – Customers, their employees, subcontractors and their employees are not permitted to ride within the cab or along the outside area (running boards, ladders, platforms, bumpers, etc.) of any truck.
2. Ladders – Customers, their employees, subcontractors and their employees are not permitted to climb ladders or otherwise access the truck or mixer area.
3. Controls and Chutes – Unless otherwise granted permission by the particular truck operator, no customer, their employees, subcontractors and their employees are permitted to operate any controls or place/move concrete chutes during the pour procedure.
4. Water Tanks and Hoses – Customers are not permitted to operate any clean-up hoses, fill water tanks, or add water to the concrete mix. Water used on the trucks

is not potable and shall not be consumed, used to cool off or used to wash face/hands.

5. Washout Area – Customers shall provide *and maintain throughout placement* a safe and clearly marked area to be used for truck washouts. This area shall be designed to follow all Federal, State, and local environmental and other applicable laws and regulations related to drainage, runoffs, storm water plans, etc. In the event the washout area is not in proximity to the pour site and the truck would have to traverse public roadway, the customer should have a shovel available to allow quick chute debris scrape-outs. (This will greatly assist unsafe drop-offs of waste product on roadways.)
6. Product Return (Crane & Bucket) – The necessity for product return requests via crane and bucket must be eliminated. The safety risk this places on our truck operators is simply too high to accommodate this act. Customers shall endeavor to better estimate bucket product volume requirements to eliminate excess return requests. (Pump Cleanout) – Pump cleanout will be permitted since it does not require a truck operator’s direct involvement, however this act should be done in a safe manner taking into consideration both the ready mix truck and personnel in the immediate area.

Remainder of Page Intentionally Left Blank

ACKNOWLEDGEMENT (TO BE SIGNED AND RETURNED TO READY MIXED CONCRETE COMPANY)

As an authorized representative of _____, I
acknowledge the receipt of the Ready Mixed Concrete Company Customer Safety
Guidelines and fully understand the requirements thereof.

I further understand that it is my sole responsibility to disseminate this information to my
employees and any lower-tier subcontractors that will be directly involved in the pour
procedure.

PRINT CUSTOMER NAME

Ready Mixed Concrete Company

SIGNATURE

SIGNATURE

TITLE

TITLE

DATE

DATE



CONDITIONS UNDER WHICH READY MIXED CONCRETE COMPANY WILL BE RESPONSIBLE FOR CONCRETE STRENGTH

1. SPECIFICATIONS

Ready Mixed Concrete Company's responsibility is to manufacture a product meeting requirements of ASTM C-94 'Standard Specification for Ready Mixed Concrete', ACI 301 'Standard Specification for Structural Concrete' and ACI 318 'Building Code Requirements for Structural Concrete', including latest revisions.

2. HIGH PERFORMANCE/HIGH EARLY CONCRETE

All concrete strengths are based on 28 day performance. Ready Mixed Concrete Company will not be responsible for early strength requirements unless a high performance or high early concrete mix was specified and requested.

3. LABORATORY AND TECHNICIANS

Testing must be done by an agency qualified to do concrete testing by meeting the requirement of ASTM E-329. The Cement and Concrete Reference Laboratory of the National Bureau of Standards, (CRL) must review the tour and testing agency on a regular basis, and it must be shown that any deficiency mentioned in the report of that inspection has been corrected. All concrete testing must be done by personnel certified as ACI Concrete Field Testing Technician, Grade 1 or equivalent. Equivalent certification programs shall include requirements for written and performance examinations as stipulated in ACI publication CP-1. (ACI Section 1.6.2 'Testing/Agencies).

4. PRE CONSTRUCTION MEETING

A preconstruction meeting including the owners representative (architect), structural engineer, general contractor, concrete sub-contractor, Ready Mixed Concrete Company, concrete pump company (if applicable), and testing laboratory, shall be held prior to delivery of any concrete to the job.

5. TEST SPECIMENS

Sampling, fabricating and curing of test specimens must be done in strict accordance with ASTM C-31, Standard Method for Making and Curing Test Specimens in the Field and ASTM C-172, Standard Practice for Sampling Freshly Mixed Concrete, including latest revisions. Testing of test specimens must be done in accordance with ASTM C-39 and ASTM C-78, including latest revisions. Reports of all test results must be given to Ready Mixed Concrete Company at the same time and in the same manner as those made to architect, engineer, contractor and/or owner as per ACI 301-96 Section 1.6.4.2.E.

6. TEST ACCEPTANCE

Ready Mixed Concrete Company will not accept any test as valid if concrete was not brought up to ordered, or placement slump, prior to sampling and testing as per ASTM C-94 Section 11.7, ASTM C-172 Section 5-2.3, and CDOT 601.08.

7. CYLINDER MOLDS

Molds for casting test cylinders must adhere to the requirements set forth in ASTM C-470.

8. CURING TEST SPECIMENS

Ready Mixed Concrete Company cannot be held responsible for compressive strength of test specimens which are not cured in full accordance with ASTM C-31. In order to more closely gauge the actual strength potential of the concrete it is recommended that test specimens are water cured for 24 hours between 60° and 80° Fahrenheit. It is the responsibility of the contractor to provide and maintain adequate storage facilities on the job site per ACI 301-96 Section 1.6.3.2.D.

9. TRANSPORTATION OF SPECIMENS TO LABORATORY

According to ASTM C-31 Section 10 "During transportation, the specimens must be protected with suitable cushioning materials to prevent damage from jarring, freezing temperatures or moisture loss. Transportation shall not exceed 4 hours".



CRMCA Concrete Quality Pre-Construction Checklist

www.crmca.org

Project Information

Project Name: _____ **Location:** _____
Project Representatives:
 Owner: _____ Architect: _____
 Structural Engineer: _____ Construction Manager: _____
 General Contractor: _____ Concrete Supplier: _____
 Testing Agency: _____ Other: _____

Concrete Mixture Design Submittals

Mixture Usage	Mixture Code	Special Attributes	Mixture Design Specifications				Approved Y/N
			Strength @ __ d	Max. w/cm	Slump (in.)	Air (%)	

Special Attribute Codes:

AE	Air Entrained	CLR	Color Addition	NCA	Non-Chloride Acceleration
NAE	Non-Air Entrained	CI	Corrosion Inhibiting	SF	Silica Fume
LTWT	Lightweight Agg.	SRA	Shrinkage Reduction	UFFA	Ultra Fine Fly Ash
SCC	Self-Consolidating	FP	Fiber Product	HWWT	Heavy Weight Aggregate
HRWR	High Range WRA	HE	High Early Strength	RET	Retardation/ Hyd. Stabilization
Other					

Concrete Quality Control/ Assurance

Independent Testing Laboratory CCRL/AMRL* accredited including C1077?

(Circle Yes or No)
yes no

*CCRL Lab Listing AMRL Listing

Name & Certification #

ACI Concrete Strength Testing Technician _____

ACI Field Testing Technician(s) _____

ACI Certification can be obtained by contacting the CRMCA at

www.crmca.org

[ACI Certification Verification Link](#)

Contractor's Responsibilities in accordance with ACI 301-10 Section 1.6.2

- Allow access to the project site or to the source of materials and assist Owner's testing agency in obtaining and handling samples at the project site or at the source of materials.
- Advise Owner's testing agency at least 24 hours in advance of operations to allow for scheduling of quality assurance tests, review of project requirements, and for the assignment of personnel.
- Provide space and source of electrical power on the project site for facilities to be used for initial curing of concrete test specimens as required by ASTM C31 for the sole use of Owner's quality assurance testing agency.



CRMCA Concrete Quality Pre-Construction Checklist

Concrete Sampling and Testing Requirements

Sampling Frequency: _____

Sampling Location: _____

(Circle Yes or No)

Pt. of truck discharge (in accordance with ASTM C94)	yes	no		
Pt. of placement (must be specified and comply with OSHA regulations)	yes	no		

Note 1: The concrete supplier will be responsible for compliance when samples are obtained at truck discharge after 10% or before 90% of the batch has been discharged and tests are conducted in accordance with applicable ASTM standards.

Tests to be performed on each sample: (Circle Yes or No)

Slump:	yes	no	Compressive Strength:	yes	no
Air Content:	yes	no	# cylinders per test	_____	_____
Density (unit wt.):	yes	no	Flexural Strength:	yes	no
Temperature:	yes	no	Other: _____	yes	no

Note 2: ASTM C172, section 4.1.1 states, "Transport the individual samples to the place where fresh concrete tests are to be performed or where test specimens are to be molded." Section 4.1.2 states, "Start tests for slump, temperature and air content within 5 min. after obtaining the final portion of the composite sample."

Acceptance/Rejection of Fresh Concrete:

Who has the authority to accept or reject a concrete delivery? _____

What criteria will be used to accept or reject a concrete delivery? _____

(Circle Yes or No)

Slump:	yes	no	Temperature:	yes	no
Air Content:	yes	no	Density (unit wt.):	yes	no
W/CM Ratio:	yes	no	Time Limit:	yes	no

Note 3: ASTM C94, section 7.2 states, "the producer shall not be responsible for the limitation of minimum slump or slump flow after 30 min. have elapsed starting either on arrival of the vehicle at the prescribed destination or at the requested delivery time, whichever is later."

Who's responsible for adding water and/or air entrainment at the project site? _____

Note 4: ASTM C94 section 12.7, allows a 'one-time' water addition as long as the maximum water content for the batch as established by the mixture design proportions has not been exceeded. A 'one-time' water addition may be several distinct additions provided no concrete has been discharged except for slump or slump flow testing. When air content is below the specified level, Section 8.3 allows the concrete supplier to adjust the level with additional air-entraining admixture.

Test Specimen Storage and Transportation

Standard Curing Method: (Concrete Acceptance)

(Circle Yes or No)

Immersed in water-controlled temperature environment (Preferred)	yes	no
Storage box-controlled temperature environment	yes	no
Exposed to the environment	yes	no



CRMCA Concrete Quality Pre-Construction Checklist

Who's responsible for providing specimen storage water tank or box? _____

Who's responsible for maintaining the temperature of the storage environment? _____

Note 5: ASTM C31 states, "Immediately after molding and finishing, the specimens shall be stored for a period up to 48h in a temperature range from 60 and 80 F and in an environment preventing moisture loss from the specimens. For concrete mixtures with a specified strength of 6000 psi or greater, the initial curing temperature shall be between 68 and 78 F." ASTM C31 also states, "The storage temperature shall be controlled by use of heating and cooling devices, as necessary. Record the temperature using a maximum-minimum thermometer."

Note 6: ASTM C31 states, "Upon completion of initial curing and within 30 min after removing the molds, cure specimens with free water maintained on their surfaces at all times at a temperature of 73.5 +/- 3.5 F. ..."

Transportation of Specimens to the Laboratory

ASTM C31, Section 11.1 states, " Specimens shall not be transported until at least 8 h after final set. During transporting, protect the specimens with suitable cushioning material to prevent damage from jarring. During cold weather, protect the specimens from freezing with suitable insulation material. Prevent moisture loss during transportation by wrapping the specimens in plastic, wet burlap, by surrounding them with wet sand, or tight fitting plastic caps on plastic molds. Transportation time shall not exceed 4 h."

When will specimens, cast on days preceding non-work days, be transported to the laboratory?

Please explain: _____

Field Curing Method:	(Form or Shoring Removal but not Acceptance)	(Circle Yes or No)	
Storage under conditions consistent with concrete in the structure		yes	no
Maturity		yes	no

Acceptance Criteria for Hardened Concrete (ACI 301/318)

In accordance with ACI 301-10, the Owner's testing agency will report results to the Owner, Architect/ Engineer, Contractor, and concrete supplier within 7 days of testing. ACI 301 also requires that the testing agency issue a report immediately, to these parties when it appears that furnished material is not in compliance with the specifications. Test results from standard molded and cured strength specimens will be evaluated separately for each concrete mixture. Evaluation is valid only if tests have been conducted in accordance with specified procedures. Validation of of tests not conducted in accordance with specified procedures will be the responsibility of the Owner's testing agency.

Acceptance of Concrete Strength in accordance with ACI 301-10

The strength of standard molded and cured strength specimens is satisfactory if the following criteria are met:

- 1.6.6.1 a Every average of three consecutive strength tests equals or exceeds the specified compressive strength f_c .
- 1.6.6.1 b No strength test result falls below f_c by more than 500 psi when f_c is 5000 psi or less, or by more than 0.10 f_c when f_c is more than 5000 psi.



CRMCA Concrete Quality Pre-Construction Checklist

Coring

Section 1.6.6.2- The strength of concrete in the area represented by cores, tested in accordance with ASTM C42, is considered adequate when the average compressive strength of the cores is at least 85% of f_c and if no single core is less than 75% of f_c .

Statement of Acknowledgement

The American Concrete Institute (ACI) and the ASTM International have established many standards and practices related to the performance and safety of concrete construction. The quality of concrete construction is heavily dependent upon the commitment of the project team to the standard practices associated with the production, delivery, placement, and testing of ready mixed concrete. We believe the information in this document accurately reflects the discussion(s) between all attendees.

	(Circle Yes or No)			(Circle Yes or No)	
Owner:	Yes	No	Architect:	Yes	No
Structural Engineer:	Yes	No	Construction Manager:	Yes	No
General Contractor:	Yes	No	Concrete Supplier:	Yes	No
Owners Testing Agency:	Yes	No	Testing Agency:	Yes	No

Email Address of Attendees:

Owner:	
Architect:	
Structural Engineer:	
Construction Manager:	
General Contractor:	
Concrete Supplier:	
Owners Testing Agency:	
Testing Agency:	

Notes or Comments:
