



# LETTER OF TRANSMITTAL

## PIPELINE CONTRACTORS

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Commerce City, CO 80022  
Office 303-289-4355  
Fax 303-289-4353

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Project JBS Job No 0210

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				Squeegee

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### COMMENTS

CC:

*Amie Parent*

Amie Parent  
JBS Pipeline Contractors

March 27, 2019

Mr. Joe Frei  
Albert Frei and Sons  
PO Box 700  
Henderson, Colorado 80640

Subject: Physical Properties Testing  
No. 9 Stone  
Project No. 19-1001

Dear Joe:

This letter presents results of physical properties testing performed on material picked up at your facility in December 2018. Representative samples delivered were identified as No. 9 Stone from the Hatchery Pit in Henderson, Colorado. Testing was performed to determine the materials compliance with ASTM, AASHTO, and City of Aurora specifications. The following testing was performed in general conformance with the applicable standards.

- 1) Sieve Analysis (Gradation) – ASTM C 136 (AASHTO T 27)
- 2) Material Finer Than No. 200 Sieve by Washing – ASTM C 117 (AASHTO T 11)
- 3) Specific Gravity & Absorption of Coarse Aggregate – ASTM C 127 (AASHTO T 85)
- 4) Clay Lumps & Friable Particles in Aggregate – ASTM C 142 (AASHTO T 112)
- 5) Sodium Sulfate Soundness – ASTM C 88 (AASHTO T 104)
- 6) Magnesium Sulfate Soundness – ASTM C 88 (AASHTO T 104)
- 7) Lightweight Particles in Aggregate – ASTM C 123 (AASHTO T 113)
- 8) Rodded Unit Weight & Voids – ASTM C 29 (AASHTO T 19)
- 9) Loose Unit Weight & Voids – ASTM C 29 (AASHTO T 19)
- 10) Los Angeles Abrasion – ASTM C 131 (AASHTO T 96)
- 11) Moisture Content – ASTM D 2216 (AASHTO T 265)
- 12) Fractured Faces – ASTM D 5821 (AASHTO T 335)
- 13) Potential Alkali Silica 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 required specifications for No. 9 Stone.

Respectfully submitted,

**BEST ENGINEERING**

  
Matthew A. Best, P.E.  
Project Engineer



# BEST ENGINEERING SOLUTIONS AND TECHNOLOGIES

# AGGREGATE SUMMARY SHEET

## PROJECT INFORMATION

PROJECT NAME:	2019 Aggregate Qualification	CLIENT NAME:	Albert Frei and Sons
MATERIAL TYPE:	No. 9 Stone	PROJECT NUMBER:	19-1001
SAMPLE LOCATION:	Hatchery Pit		

MECHANICAL SIEVE ANALYSIS (ASTM C 136, ASTM C 117, ASTM D 422)					
SIEVE SIZE		PERCENT PASSING	ASTM C 33 SPEC	AASHTO (CDOT) SPEC	City of Aurora Spec
US STD	METRIC				
3/8"	9.5	100	100	100	100
NO. 4	4.75	85	85-100	85-100	85-100
NO. 8	2.36	25	10-40	10-40	10-40
NO.16	1.18	4	0-10	0-10	0-10
NO. 50	0.3	0.8	0-5	0-5	0-5
NO. 200	0.075	0.3	1.0% Max	1.0% Max	1.0% Max

\*INDICATES OUT OF TOLERANCE

SPECIFIC GRAVITY AND ABSORPTION (ASTM C 127)			
	RESULTS	SPECIFICATION	PASS/FAIL
Specific Gravity	2.60	N/A	N/A
Absorption (%)	1.1%	N/A	N/A

CLAY LUMPS AND FRIABLE PARTICLES (ASTM C 142)			
	RESULTS	SPECIFICATION	PASS/FAIL
Weighted Particles	0.5%	2.0% Max	Pass

SODIUM SULFATE SOUNDNESS (ASTM C 88)			
	RESULTS	SPECIFICATION	PASS/FAIL
Weighted Loss (Coarse)	1.1%	12% Max	Pass

MAGNESIUM SULFATE SOUNDNESS (ASTM C 88)			
	RESULTS	SPECIFICATION	PASS/FAIL
Weighted Loss (Coarse)	4.2%	18% Max	Pass

LIGHTWEIGHT PARTICLES (ASTM C 123)			
	RESULTS	SPECIFICATION	PASS/FAIL
Specific Gravity 2.0	0.0	0.5% Max	Pass
Specific Gravity 2.4	0	3.0% Max	Pass

UNIT WEIGHT AND VOIDS IN AGGREGATE (ASTM C 29)			
Rodded	RESULTS	SPECIFICATION	PASS/FAIL
Unit Weight (pcf)	99	N/A	N/A
Percent Voids	83%	N/A	N/A
Tons per cubic yard	1.34	N/A	N/A
Loose	RESULTS	SPECIFICATION	PASS/FAIL
Unit Weight (pcf)	93	N/A	N/A
Percent Voids	42%	N/A	N/A
Tons per cubic yard	1.26	N/A	N/A

LOS ANGELES ABRASION (ASTM C 131)			
Grading C	RESULTS	SPECIFICATION	PASS/FAIL
Percent Loss	34.6%	50% Max	Pass

DETERMINATION OF MOISTURE CONTENT OF SOIL AND ROCK (ASTM D 2216)			
	RESULTS	SPECIFICATION	PASS/FAIL
No. 9 Stone	0.6%	N/A	N/A

PERCENTAGE OF FRACTURED PARTICLES (ASTM D 5821)			
2 Or More Faces	RESULTS	SPECIFICATION	PASS/FAIL
Percent Fractured	95.6%	N/A	N/A

POTENTIAL ALKALI REACTIVITY (ASTM C 1260)			
14-Day Soak	RESULTS	SPECIFICATION	PASS/FAIL
Average Expansion	0.09%	< 0.10%	Pass
Classification	Innocuous		
Potential for Deleterious ASR	Low Potential		

ATTACHMENT A  
LABORATORY TEST RESULTS

**PROJECT INFORMATION**

PROJECT NAME:	2019 Aggregate Qualification	CLIENT NAME:	Albert Frei and Sons
MATERIAL TYPE:	No. 9 Stone	PROJECT NUMBER:	19-1001
SAMPLE LOCATION:	Hatchery Pit		

SPECIFIC GRAVITY AND ABSORPTION (COARSE) (ASTM C 127)				
Oven Dry Weight (g)	SSD Weight (g)	Submerged Weight (g)	Bulk (SSD) Specific Gravity	Absorption (%)
2500.3	2529.0	1555.0	2.60	1.1%

Material Finer Than No. 200 Sieve (ASTM C 117)		
Initial Dry Weight (g)	Final Dry Weight (g)	Passing No. 200 Sieve (%)
1991.0	1985.3	0.3%

UNIT WEIGHT AND VOIDS IN AGGREGATE (ASTM C 29)			
Rodded	Sample Weight (lbs)	Bucket Volume (ft <sup>3</sup> )	Unit Weight (pcf)
Sample 1	24.68	0.25	98.7
Sample 2	24.87	0.25	99.5
Sample 3	24.77	0.25	99.1
Average Unit Weight			99
Loose	Sample Weight (lbs)	Bucket Volume (ft <sup>3</sup> )	Unit Weight (pcf)
Sample 1	23.12	0.25	92.5
Sample 2	23.37	0.25	93.5
Sample 3	23.26	0.25	93.0
Average Unit Weight			93

LOS ANGELES ABRASION (ASTM C 131)			
Grading	Initial Weight (g)	Final Weight (g)	Percent Loss (%)
C	5001.2	3271.8	34.6

CLAY LUMPS AND FRIABLE PARTICLES (ASTM C 142)					
Retained Sieve Size	Percent Grading	Initial Weight (g)	Final Weight (g)	Percent Loss	Weighted Loss (%)
No. 4	15	2005.0	1998.1	0.3%	0.0%
No. 16	81	50.1	49.8	0.6%	0.5%
- No. 16	4	-	-	-	-
Total Grading	100	Total Weighted Loss		0.5%	

SODIUM SULFATE SOUNDNESS (ASTM C 88)					
Retained Sieve Size	Percent Grading	Initial Weight (g)	Final Weight (g)	Percent Loss	Weighted Loss (%)
No. 4	15	300.0	296.3	1.2%	0.2%
No. 8	60	100.0	99.5	0.5%	0.3%
No. 16	21	100.0	98.8	1.2%	0.3%
No. 30	3	-	-	1.2%	0.0%
- No. 30	1	-	-	-	-
Total Combine Grading	100	Total Weighted Loss		1.1%	

MAGNESIUM SULFATE SOUNDNESS (ASTM C 88)					
Retained Sieve Size	Percent Grading	Initial Weight (g)	Final Weight (g)	Percent Loss	Weighted Loss (%)
No. 4	15	300.2	289.7	3.5%	0.5%
No. 8	60	100.0	96.2	3.8%	2.3%
No. 16	21	100.0	94.3	5.7%	1.2%
No. 30	3	-	-	5.7%	0.2%
- No. 30	1	-	-	-	-
Total Combine Grading	100	Total Weighted Loss		4.2%	

PERCENTAGE OF FRACTURED PARTICLES (ASTM D 5821)		
Initial Weight (g)	Final Weight (g)	Fractured Particles Minimum 2 Faces (%)
151.3	144.6	95.6%

Figure A-1

**PROJECT INFORMATION**

PROJECT NAME:	2019 Aggregate Qualification	CLIENT NAME:	Albert Frei and Sons
MATERIAL TYPE:	No. 9 Stone	PROJECT NUMBER:	19-1001
SAMPLE LOCATION:	Hatchery Pit		

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

**Cast Date:** January 9, 2019

**Cement:** Holcim Type I/II - Portland

**Cementitious Content:** 440 g

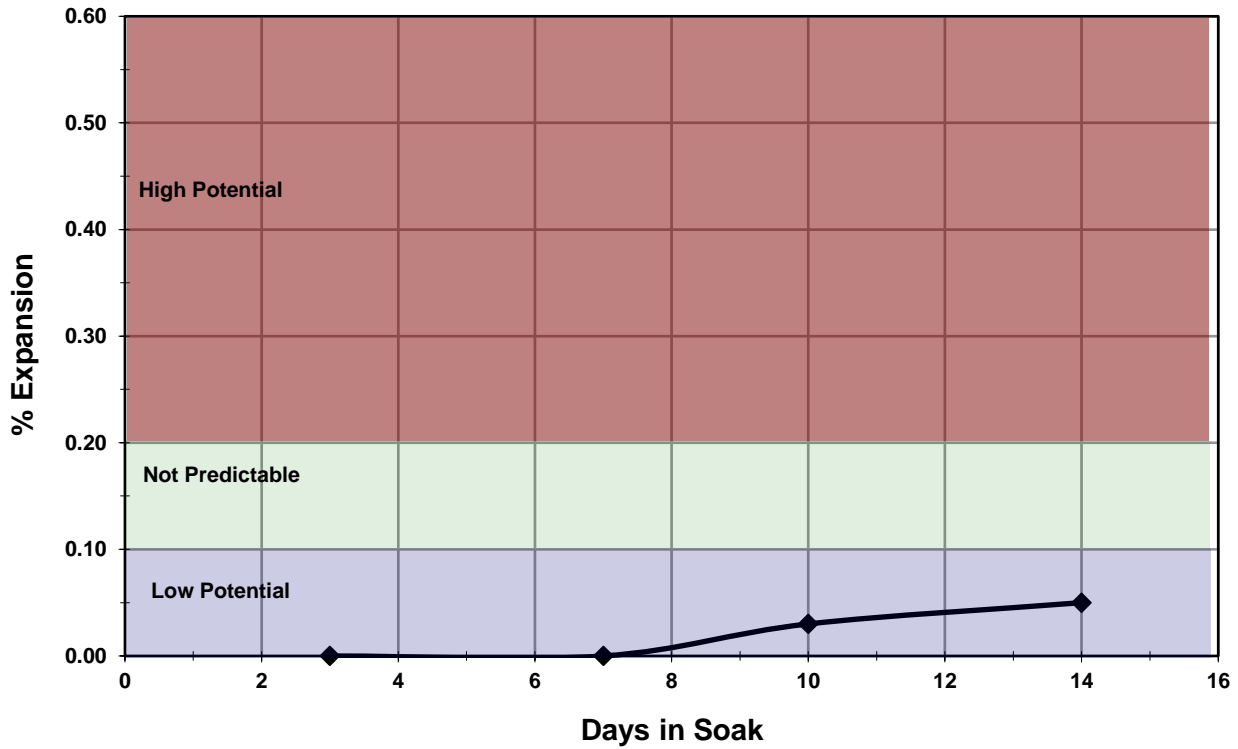
**Cement Alkalies** (Total Alkalies as Na<sub>2</sub>O): 0.75%

**Aggregate/Cement Ratio:** 990g/440g

**Cement Expansion** (Autoclave): 0.02%

**Water/Cement Ratio:** 0.47

**Mortar Bar Expansion**



Date	Age (Days)	Expansion (%)			
		Sample ID			Average
		1	2	3	
1/14/19	3	0.000	0.006	0.007	<b>0.00</b>
1/18/19	7	0.012	0.000	0.000	<b>0.00</b>
1/21/19	10	0.032	0.026	0.027	<b>0.03</b>
1/25/19	14	0.059	0.051	0.053	<b>0.05</b>