Approved
By:Jeff Rice
Date:11/14/2020
El Paso County Planning & Community Development

1910 Rand Ave.
Colorado Springs, Colorado 80905
Office: (719) 473-3100
Dispatch: (719) 638-8000

CONCRETE MIXTURE DESIGN REPORT

MM Mixture ID#: ZA4115SP
Class / Use: 4500 PSI General Exterior Concrete

Material	Amount / Cubic Yard	Source / Type	ASTM Std.
Cement	560 lbs.	Type I-II	C 150
Fly Ash	100 lbs.	Class F Fly Ash	C 618
Coarse Aggregate*	1630 lbs.	Martin Marietta #57/67	C 33
Fine Aggregate*	1275 lbs.	Martin Marietta WCS	C 33
Water (35.65 gal.)	297 lbs.	Municipal	C 94
Air Entraining Agent**	** oz.	AEA	C 260
Water Reducer**	** oz.	WR-Type A	C 494
Water Reducer**	** oz.	High Range WR-Type F	C 494

*Aggregate masses determined in SSD condition.
*Mix proportions may be adjusted in accordance with ACI 301-16 section 4.2.3.6.
** AEA adjustments at plant and on site may be required to achieve proper air entrainment.
** AEA adjustments may be made with either liquid or Fritz air entrainment and Perfin.
**Admixture dosages may be adjusted based on varying environmental and/or jobsite conditions.

Specified Physical Properties

Compressive Strength:	**4500**	psi (Min.)
Air Content:	**4.5-7.5**	% (Range)
Slump:	**5.00-8.00**	in. (Range)
W/CM Ratio:	**0.45**	(Max)

Todd W Andersen

Prepared by Martin Marietta
Quality Control Manager

STRENGTH PERFORMANCE REPORT

Mix Design: ZA4115-ZA4115SP
Batch Date Range: 07 Mar 2019 to 19 Dec 2019

Specified Strength (psi): **4500**
Required Strength (psi): **4930**

	Air	Slump/Flow	7 Day	28 Day
Count:	30	30	30	30
Lot Average:	5.6	6.00	4580	5670
Minimum Value:	4.5	3.00	3860	5070
Maximum Value:	7.1	8.00	5340	6290
Standard Deviation:	0.8	1.69	331	321

Sample		Air	Slump/Flow	7 Day	28 Day
Ticket #	Date Sampled	%	(in)	(psi)	(psi)
67042106	07 Mar 2019	4.5	4.25	4100	5330
68058603	09 May 2019	6.8	7.00	4320	5500
67045929	29 May 2019	6.4	6.25	4990	6120
68059949	31 May 2019	5.3	4.25	4510	5480
67046115	03 Jun 2019	5.9	7.50	4540	5430
67046428	07 Jun 2019	5.7	6.50	4160	5070
67046630	11 Jun 2019	5.8	7.00	4860	6250
67047310	21 Jun 2019	6.8	3.00	4320	5340
67047315	21 Jun 2019	6.1	5.00	4400	5470
67047646	26 Jun 2019	5.7	5.75	4370	5640
67048157	08 Jul 2019	5.7	6.50	4850	5660
68062666	09 Jul 2019	6.0	6.50	4840	5780
68064523	02 Aug 2019	6.1	5.25	4340	5450
68065466	15 Aug 2019	7.1	5.50	4480	5490
68065574	16 Aug 2019	5.0	3.00	4470	5510
67050847	20 Aug 2019	5.5	5.75	4800	5770
67051353	28 Aug 2019	4.5	5.00	4560	5600
68066466	29 Aug 2019	4.5	3.50	4330	5440
67051512	30 Aug 2019	5.4	3.75	4360	5420
67051873	09 Sep 2019	5.4	6.75	4240	5510
68067440	13 Sep 2019	5.7	5.00	4470	5450
67053040	27 Sep 2019	5.3	3.00	4580	5380
68069304	09 Oct 2019	4.5	4.00	4800	5560
67054956	05 Nov 2019	6.0	8.00	5340	6010
67055580	14 Nov 2019	7.0	7.75	4520	5790
67056045	19 Nov 2019	5.0	8.00	3860	5890
67056442	03 Dec 2019	4.6	3.00	4800	6290
68072367	05 Dec 2019	4.7	8.00	5110	6270
68072873	11 Dec 2019	6.0	7.50	4980	6010
68073277	19 Dec 2019	5.3	3.75	4970	6170

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: 9-Jan-20
Production Period: 1-Dec-19
To: 31-Dec-19

STANDARD REQUIREMENTS ASTM C150/AASHTO M85/ASTM C1157

CHEMICAL

Item	ASTM Test Method	ASTM C150 Spec. Limit	Test Result
SiO_2 (%)	C114	-	20.0
Al_2O_3 (%)	C114	6.0 max	4.4
Fe_2O_3 (%)	C114	6.0 max	3.1
CaO (%)	C114	-	63.7
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_2O (%)	C114	-	0.15
K_2O (%)	C114	-	0.61
Insoluble Residue (%)	C114	1.5 max	1.0
CO_2 (%)[B]	C114	-	1.6
Limestone (%)	C150	5.0 max	4.4
$CaCO_3$ in Limestone (%)	C150	70 min	85
Inorganic Processing Addition	C150	5.0 max	-
Potential Phase Composition			
C_3S (%)	C150	-	58
C_2S (%)	C150	-	13
C_3A (%)	C150	8 max	6
C_4AF (%)	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	-	421	
Residue 45 µm (No.325) Sieve (%)	C430	-	-	2.1	
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	31.2	(4520)
7 days, MPa (psi)	C109	19.0 (2760) min	20.0 (2900) min	37.1	(5370)
28 days, MPa (psi)[D]	C109	-	28.0 (4060) min	44.3	(6430)
Time of Setting, Initial Vicat (min)	C191	45 min / 375 max	45 min / 420 max	107	
Mortar Bar Expansion (%)	C1038	0.020 max	0.020 max	0.011	

ADDITIONAL DATA

Type	Limestone	Test Method	Base Phase Composition	ASTM Test Method	Test Result
SiO_2 (%)	7.6	Internal	C_3S (%)	C150	61
Al_2O_3 (%)	2.8	Internal	C_2S (%)	C150	13
Fe_2O_3 (%)	1.2	Internal	C_3A (%)	C150	6
CaO (%)	47.7	Internal	C_4AF (%)	C150	10
SO_3 (%)	1.6	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	0.55

PHYSICAL

Item	ASTM Test Method	ASTM C150 Spec. Limit	ASTM C1157 Spec. Limit	Test Result
False Set (%)	C451	50 min	50 min	64

[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

Salt River Materials Group
100% AMERICAN™

Martin Marietta
10170 Church Ranch Wat Ste 201
Westminster, CO 80021

Product: ASTM C618 Class F, Four Corners Fly Ash
AASHTO M295

12-12-19

POZZOLAN TEST REPORT

Ctl#: 174461

Lot: 2320035	**Results**	**Specifications**
Chemical Analysis (C311 / C114 / T105 / D4326)		
Silicon Dioxide, SiO_2	61.72 %	---
Aluminum Oxide, Al_2O_3	23.21 %	---
Ferric Oxide, Fe_2O_3	4.75 %	---
$SiO_2+Al_2O_3+Fe_2O_3$	89.68 %	50.00 Min
Calcium Oxide, CaO	2.89 %	18.00 Max
Magnesium Oxide, MgO	1.03 %	---
Sulfur Trioxide, SO_3	0.23 %	5.00 Max
Moisture Content	0.03 %	3.00 Max
Loss on Ignition	0.56 %	6.00 Max
Sodium Oxide, Na_2O	1.29 %	---
Potassium Oxide, K_2O	1.41 %	---
Total Alkalis	2.22 %	---
Available Alkalis	0.56 %	---
Physical Analysis		
Fineness, amount retained on #325 sieve, % (C430)	26.00	34.00 Max
variation, points from average	0.89	5.00 Max
Density, g/cm^3 (C188)	2.01	---
Variation from average, %	0.01	5.00 Max
Strength Activity Index with Portland Cement (C311 / C109)		
at 7 days, % of cement control	75.48	---
at 28 days, % of cement control	78.23	75.00 Min
Water Requirement (C311)		
% of cement control	97.11	105.00 Max
Soundness, autoclave expansion or contraction, % (C311 / C151)	-0.03	0.80 Max

All tests have been made in strict accordance with the current standards of the American Society for Testing and Materials covering the type of material specified.

Lee Gorby, Quality Assurance Manager
05 MAR 2020

AAP® AASHTO R18

PHOENIXCEMENT

Clarkdale Cement Plant
601 N. Cement Plant Rd
Clarkdale, AZ 86324

19th Ave. Terminal
1802 W. Lower Buckeye Rd
Phoenix, AZ 85007

Lower Buckeye Terminal
1941 W. Lower Buckeye Rd
Phoenix, AZ 85007

21st Ave. Terminal
1325 N. 21st Ave.
Phoenix, AZ 85009

54th Ave. Terminal
5402 W Buchanan St.
Phoenix, AZ 85043

Dobson Storage
9595 E. McKellips Rd.
Scottsdale, AZ 85250

Cholla Fly Ash Plant
4801 Frontage Rd.
Joseph City, AZ 86032

Four Corners Fly Ash Plant
End of County Road 6675
Fruitland, NM 87416

San Juan Fly Ash Plant
End of County Road 6800
Waterflow, NM 87421

Escalante Fly Ash Plant
County Road 19
Prewitt, NM 87405

Gallup Terminal
900 N 9th St.
Gallup, NM 87301

San Diego Terminal
920 Bay Marina Dr.
National City, CA 91950

Fontana Terminal
13600 Napa St.
Fontana, Ca 92335

Bakersfield Terminal
32535 7th Standard Rd.
Bakersfield, CA 93314

Stockton Terminal
1300 N. Gertrude Ave.
Stockton, CA 95215

Sacramento Terminal
4520 50th St.
McClellan Park, CA 95652

Panaca Pozzolan Plant
333 Hansen St.
Panaca, NV 89042

Denver Terminal
220 East 54th Avenue
Denver, CO 80216

Bonanza Fly Ash Plant
12500 East, 25500 South
Vernal, UT 84078

Approved
By:Jeff Rice
Date:11/14/2020
El Paso County Planning & Community Development

Rocky Mountain Division
Southern Area Aggregate District
1910 Rand Avenue
Colorado Springs, CO 80905

Attention: Mr. David Chelgren

Re: Aggregate Physical Property Test Results
#57/67 Rock
Parkdale Quarry
Cañon City, CO

October 11, 2019

Mr. Chelgren:

Enclosed are the results of the physical properties tests performed on the #57/67 Rock sampled from the Parkdale Quarry in September 2019. Testing was performed in accordance with the procedures and specifications contained herein. Below is a summary of the results. Detailed test information is contained in the attachments.

Procedure	Description	#57/67 Rock
ASTM C 136	Sieve Analysis of Fine and Coarse Aggregate	Att. #1-1
ASTM C 117	Materials Finer than 75µm (No. 200) Sieve by Washing	Att. #1-1
ASTM C 29	Bulk Density (Unit Weight) and Voids by Rodding	102 / 40
ASTM C 127	Specific Gravity (SSD) and Absorption of Coarse Aggregate	2.73 / 0.5
ASTM C 131	Degradation of Coarse Aggregate in the LA Abrasion Machine	22
CDOT CP-L 4211	Degradation of Coarse Aggregate in the Micro Deval Apparatus	8.0
ASTM C 88	Soundness by Use of Magnesium Sulfate	1
ASTM C 142	Clay Lumps and Friable Particles	0.1
ASTM C 123	Lightweight Particles	0.0

The materials selected for testing do not constitute the constituents of any specific mix design or blend. The materials named above represent products sold from the aforementioned site. Please contact us if you have any questions regarding these results.

Respectfully submitted,
Martin Marietta Materials, Inc.
Central Laboratory

COLORADO LICENSED
TODD MICHAEL GENOVESE
39923
10/11/19
PROFESSIONAL ENGINEER

Erik Biggers
Testing Lab Manager

Todd Genovese, P.E.
Division QA/QC Manager

AASHTO ACCREDITED

Martin Marietta Materials, Inc.

Parkdale Quarry

Approved
By:Jeff Rice
Date:11/14/2020
El Paso County Planning & Community Development

Attachment #1-1

#57/67 Rock

Sieve Analysis of Fine and Coarse Aggregate

ASTM C 136 & C 117

Sieve Size		Percent Passing (%)	Specification ASTM (No. 57/67)
1"	25.0 mm	100	100
3/4"	19.0 mm	92	90 to 100
1/2"	12.5 mm	45	25 to 60
3/8"	9.5 mm	24	20 to 55
No. 4	4.75 mm	4	0 to 10
No. 8	2.36 mm	2	0 to 5
No. 16	1.18 mm	2	
No. 30	600 µm	1	
No. 50	300 µm	1	
No. 100	150 µm	1	
No. 200	75 µm	1.0	1.5 max.*

* Denotes limit for material that is essentially free of clay or shale.

Bulk Density (Unit Weight) and Voids by Rodding

ASTM C 29

Sample Weight (lbs)	Measure Volume (ft^3)	Unit Weight (lbs/ft^3)	Unit Weight (tons/cy)	Voids by Rodding (%)
33.83	0.3340	101.3	1.37	40.2
34.25	0.3340	102.5	1.38	39.5
34.52	0.3340	103.4	1.40	39.0
	Average	102	1.38	40

Bulk Specific Gravity (DRY) = 2.717

Specific Gravity and Absorption of Coarse Aggregate

ASTM C 127

Oven Dried Mass in Air (grams)	SSD Mass in Air (grams)	Mass in Water (grams)	$G_{sb\ (SSD)}$	Absorption (%)
3491.3	3509.6	2224.4	2.73	0.5

Degradation of Coarse Aggregate in the LA Abrasion Machine

ASTM C 131

Grading	Sample Mass Before Test (grams)	Sample Mass After Test (grams)	Percent Loss (%)	Specification ASTM C 33
B	5001.2	3917.2	22	50% max.

Degradation of Coarse Aggregate in the Micro Deval Apparatus

CDOT CP-L 4211

Grading	Sample Mass Before Test (grams)	Sample Mass After Test (grams)	Percent Loss (%)	Specification CDOT
B (7.3)	1501.1	1381.5	8.0	18% max.

Soundness by Use of Magnesium Sulfate

ASTM C 88

Sieve Size	Original Sample Individual % Retained		Mass of Individual Test Fraction (grams)	Mass of Combined Test Fraction (grams)		Percent Passing Designated Sieve After Test	Weighted Percent Loss (%)
				Before	After		
1-1/2" to 1"	0	8	-	503.1	502.4	0.1	0.0
1" to 3/4"	8		503.1				
3/4" to 1/2"	47	68	670.0	1000.5	992.2	0.8	0.6
1/2" to 3/8"	21		330.5				
3/8" to No. 4	20	20	300.2	300.2	293.9	2.1	0.4
Minus No. 4	4	4	-	-	-	2.1	0.1
Total	100	100% coarse aggregate fraction					1
Specification - ASTM C 33							18% max.

Sieve Size	Splitting		Crumbling		Cracking		Flaking		Total No. of Pieces Before Test
	No.	%	No.	%	No.	%	No.	%	
1-1/2" to 3/4"	0	0	0	0	0	0	0	0	35

Clay Lumps and Friable Particles

ASTM C 142

Sieve Size	Original Sample Individual % Retained		Mass of Combined Test Fraction (grams)		Percent Passing Designated Sieve After Test	Weighted Percent Loss (%)
			Before	After		
1-1/2" to 1"	0	8	3003.7	3002.0	0.1	0.0
1" to 3/4"	8					
3/4" to 1/2"	47	68	2003.3	2001.5	0.1	0.1
1/2" to 3/8"	21					
3/8" to No. 4	20	20	1004.4	1004.0	0.0	0.0
Total	96%					0.1
Specification - ASTM C 33 (Class 5S)						2.0% max.

Lightweight Particles

ASTM C 123

Sieve Size	Specific Gravity of Heavy Liquid	Mass of Test Sample (grams)	Mass of Floating Particles (grams)	Percent of Lightweight Pieces (%)	Specification ASTM C 33
Plus No. 4	2.0	3001.2	0.0	0.0	0.5% max.

Rocky Mountain Division
Southern Area Aggregate District
1910 Rand Avenue
Colorado Springs, CO 80905

Attention: Mr. David Chelgren

Re: Aggregate Physical Property Test Results
Washed Concrete Sand
Penrose Pit
Florence, CO

November 13, 2019

Mr. Chelgren:

Enclosed are the results of the physical properties tests performed on the materials sampled from the Penrose Pit in September 2019. Testing was performed in accordance with the procedures and specifications contained herein. Below is a summary of the results. Detailed test information is contained in the attachments.

Approved
By:Jeff Rice
Date:11/02/2020
El Paso County Planning & Community Development

Procedure	Description	Washed Concrete Sand
ASTM C 136	Sieve Analysis of Fine and Coarse Aggregate	Att. #1-1
ASTM C 117	Materials Finer than 75µm (No. 200) Sieve by Washing	Att. #1-1
ASTM C 29	Bulk Density (Unit Weight) and Voids by Rodding	107 / 34
ASTM C 128	Specific Gravity (SSD) and Absorption of Fine Aggregate	2.63 / 1.0
ASTM D 7428	Degradation of Fine Aggregate in the Micro Deval Apparatus	9.3
ASTM C 88	Soundness by Use of Magnesium Sulfate	7
ASTM C 142	Clay Lumps and Friable Particles	0.3
ASTM C 123	Lightweight Particles	0.0
ASTM D 2419	Sand Equivalent Value of Soils and Fine Aggregate	82
ASTM C 40	Organic Impurities in Fine Aggregate	Plate 1

The materials selected for testing do not constitute the constituents of any specific mix design or blend. The materials named above represent products sold from the aforementioned site. Please contact us if you have any questions regarding these results.

Respectfully submitted,
Martin Marietta Materials, Inc.
Central Laboratory

COLORADO LICENSED
TODD MICHAEL GENOVESE
39323
11/13/19
PROFESSIONAL ENGINEER

Erik Biggers
Testing Lab Manager

Todd Genovese, P.E.
Division QA/QC Manager

AASHTO ACCREDITED

Martin Marietta Materials, Inc. **Attachment #1-2**

Penrose Pit **Washed Concrete Sand**

703.00

Sieve Analysis of Fine and Coarse Aggregate — ASTM C 136 & C 117

Sieve Size		Percent Passing (%)	Specification ASTM C 33	Fine Aggregate 4.75 mm to 150 µm (#4 to #100)
3/8"	9.5 mm	100	100	
No. 4	4.75 mm	99	95 to 100	
No. 8	2.36 mm	85	80 to 100	
No. 16	1.18 mm	66	50 to 85	
No. 30	600 µm	45	25 to 60	
No. 50	300 µm	20	5 to 30	100
No. 100	150 µm	5	0 to 10	95 – 100
No. 200	75 µm	1.9	0 to 3.0	80 – 100
Fineness Modulus		2.80	2.3 to 3.1	50 – 85
				25 – 60
				10 – 30
				2 – 10

Approved
By:Jeff Rice
Date:11/02/2020
El Paso County Planning & Community Development

Bulk Density (Unit Weight) and Voids by Rodding — ASTM C 29

Sample Weight (lbs)	Measure Volume (ft^3)	Unit Weight (lbs/ft^3)	Unit Weight (tons/cy)	Voids by Rodding (%)
10.70	0.1000	107.0	1.44	34.1
10.67	0.1000	106.7	1.44	34.3
10.69	0.1000	106.9	1.44	34.2
	Average	107	1.44	34

Bulk Specific Gravity (DRY) = 2.603

Specific Gravity and Absorption of Fine Aggregate — ASTM C 128

Oven Dried Mass in Air (grams)	Mass of Pycnometer Filled with Water (grams)	SSD Mass in Air (grams)	Mass of Pycnometer w/ Sample and Water (grams)	$G_{sb\ (SSD)}$	Absorption (%)
495.1	1264.7	500.0	1574.5	2.63	1.0

Degradation of Fine Aggregate in the Micro Deval Apparatus — ASTM D 7428

Grading	Sample Mass Before Test (grams)	Sample Mass After Test (grams)	Percent Loss (%)	Specification CDOT
Fine Agg	500.0	453.6	9.3	18% max.

703.03

703.01 Fine Aggregate for Concrete. Fine aggregate for concrete shall conform to the requirements of AASHTO M 6, Class A. The minimum sand equivalent, as tested in accordance with Colorado Procedure 37 shall be 80 unless otherwise specified. The fineness modulus, as determined by AASHTO T 27, shall not be less than 2.50 or greater than 3.50 unless otherwise approved.

Soundness by Use of Magnesium Sulfate — ASTM C 88

Sieve Size	Original Sample Individual % Retained		Mass of Individual Test Fraction (grams)	Mass of Combined Test Fraction (grams)		Percent Passing Designated Sieve After Test	Weighted Percent Loss (%)
				Before	After		
3/8" to No. 4	1	1	-	-	-	0.0	0.0
No. 4 to No. 8	14	14	100.0	100.0	86.7	13.3	1.9
No. 8 to No. 16	19	19	100.0	100.0	90.6	9.4	1.8
No. 16 to No. 30	21	21	100.0	100.0	88.8	11.2	2.4
No. 30 to No. 50	25	25	100.0	100.0	94.2	5.8	1.5
Minus No. 50	20	20	-	-	-	0.0	0.0
Total	100	100%	of fine aggregate fraction				7
Specification - ASTM C 33							15% max.

Clay Lumps and Friable Particles — ASTM C 142

Sieve Size	Original Sample Individual % Retained		Mass of Combined Test Fraction (grams)		Percent Passing Designated Sieve After Test	Weighted Percent Loss (%)
			Before	After		
No. 4 to No. 16	33	33	50.0	49.9	0.2	0.1
Total	33%					0.3
Specification - ASTM C 33 (Class 5S)						2.0% max.

Lightweight Particles — ASTM C 123

Sieve Size	Specific Gravity of Heavy Liquid	Mass of Test Sample (grams)	Mass of Floating Particles (grams)	Percent of Lightweight Pieces (%)	Specification ASTM C 33
Plus No. 4	2.0	200.1	0.0	0.0	0.5% max.

Concrete admixture

CHRYSO® Air 260

New generation air entrainer

Features

CHRYSO®Air 260 is an aqueous solution specially formulated for use as an air entraining admixture for concrete. It introduces millions of uniformly sized and spaced air voids throughout the concrete mixture. Concrete containing this types of uniformly distributed air voids has been proven far more resistant to freezing and thawing than plain concrete.

CHRYSO®Air 260 improves concrete's rheology, finishability and resistance to freeze-thaw and surface deterioration caused by deicing chemicals.

CHRYSO®Air 260 is manufactured under rigid quality control measures to provide uniform, reliable results.

Benefits

- Improves concrete quality by decreasing water-cement ratio for a given degree of workability
- Increases concrete durability through reducing sensitivity to freeze-thaw & surface deterioration caused by deicing salts
- Improves the plasticity and workability of concrete
- Reduces concrete permeability
- Reduces segregation
- Improves surface paste qualities for superior and smoother finish
- Improves pumpability of concrete
- Enhance the resistance of concrete to segregation and reduces honeycombing
- Limits bleeding

Areas of Application

CHRYSO®Air 260 is recommended for all concrete mixes where improved resistance to freeze-thaw, superior workability, improved pumpability and enhanced finish characteristics are desirable.

CHRYSO®Air 260 is especially beneficial when concrete is to be exposed to freezing and thawing conditions.

CHRYSO

www.chrysoinc.com

Concrete admixture

Technical Data Sheet

CHRYSO® Air 260

Description:

Characteristics:

- Physical state: liquid
- Color: Reddish Orange
- Density: 1.01 ± 0.020 g/cc
- pH: 11 ± 1.0
- Cl^- ion content: Nil

CHRYSO®Air 260 does not contain any purposely added calcium chloride or other chloride based components. It will not promote or contribute to corrosion of reinforcing steel in concrete.

Packaging:

- 55 gallon (210 L) drums
- 264 gallon (1000 L) totes
- bulk deliveries

Standard specifications:

Conforms to ASTM C 260
AASHTO M 154
CRD C 13

Directions for use:

Dosage:

There is no standard dosage rate for **CHRYSO®Air 260**.

CHRYSO®Air 260 is typically used at a dosage rate of 0.2 to 3 fluid ounces per 100 pounds (13 to 196 ml per 100 kg) of cement.

Because local job conditions vary, please contact your local **CHRYSO®** sales representative for further assistance if using outside recommended dosage ranges.

Compatibility:

CHRYSO®Air 260 is compatible with all types of Portland cement, class C and F fly ash, slag, microsilica, calcium chloride, fibers and approved **CHRYSO®** admixtures.

CHRYSO®Air 260 can be used in all white, colored, and architectural concrete. For best results, each admixture must be dispensed separately into the concrete mix.

Precaution:

CHRYSO®Air 260 may freeze at temperatures below 35°F (2°C). Although freezing does not harm **CHRYSO®Air 260**, precautions should be taken to protect it from freezing. If **CHRYSO®Air 260** should happen to freeze, thaw and reconstitute with mechanical agitation.

Shelf life: 9 months.

Safety:

CHRYSO®Air 260 is an alkaline solution and therefore can cause moderate to severe irritation. Please refer to the material safety data sheet for additional information.

About CHRYSO:

CHRYSO is a subsidiary of the multi-billion dollar specialty construction chemicals Group, Materis.
Worldwide leader for Concrete and Cement additives, **CHRYSO** has been servicing the construction Industry for over half a century with outstanding innovation and service.
As a result, **CHRYSO**'s name and products have been associated with the most prestigious and demanding construction projects worldwide.
Respectful of the environment, **CHRYSO** continually develops and produces innovative and effective solutions for the cement and concrete industries.

CHRYSO Inc. Tel: 800-936-7553 - 972-772-6010

Southern Division:	P.O. Box 190	Rockwall, TX	75087
Midwest Division:	P.O. Box 129	Charlestown, IN	47111
Western Division:	5090 Nome St	Denver, CO	80239
Eastern Division:	200 C Leonard Rd	Lexington, NC	27295

CHRYSO

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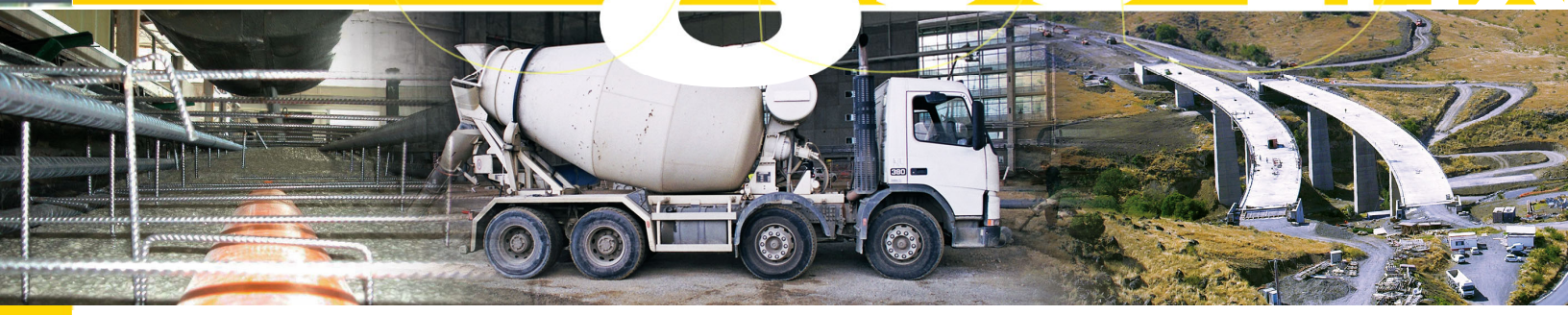
Concrete admixture

CHRYSO® Quad 855 EMx



Uniformity Enhancer - Rheology Modifier – Water Reducer

■ Overview

CHRYSO® Quad 855 EMx is a breakthrough in chemical admixtures, utilizing the latest molecular synthesis technology from the CHRYSO® Synthesis Lab, combining patented **CHRYSO®** technologies into one, user focused solution.

CHRYSO® Quad 855 EMx is engineered to address the challenges of today's more variable concrete materials, enabling consistent desired concrete properties while providing maximum performance across a broad range of dosage rates and workability demands.

CHRYSO® Quad 855 EMx greatly enhances paste quality and lubricity thanks to the **CHRYSO® Quad** component of the formulation,

Set times and early strength of concrete made with **CHRYSO® Quad 855 EMx** are uniform and "normal" across a broad range of dosage rates and slump improvements.

Engineered for water reduction, slump retention and ultimate strength, **CHRYSO® Quad 855 Emx** utilizes patented **CHRYSO®** synthesized molecules to provide a true full range water reducer for maximum versatility, performance and economy.

■ Features & Benefits

- Excellent slump retention reducing risk of jobsite water addition
- World class air control, reducing QC time, expense, lost loads
- Wide range of water reduction at same set time, offering maximum versatility with one product, one tank, fewer variables
- Enables the use of high proportions of manufactured sand
- Proprietary finishing aid provides superior workability and finishability, improved lubricity (pumpability, consolidation, finishability)
- Faster placements, improved jobsite and equipment efficiency
- More robust when using sand containing a high amount of fines
- Early strength = project acceleration
- Reduced potential for shrinkage cracks
- Higher early and ultimate strengths

CHRYSO® Quad 855 EMx is recommended for use in Ready Mixed Concrete where improved efficiency (more psi/pound) of cement and SCM is desired for quality, economy and environmental responsibility.

CHRYSO® Quad 855 EMx is recommended for all Ready Mixed Concrete to improve rheology and paste quality & lubricity, especially where more harsh aggregates are used.

CHRYSO® Quad 855 EMx is recommended for all Ready Mixed Concrete where superior robustness is desired, offering less sensitivity to variations of aggregate gradations, clay content, aggregate moisture, cement variability, etc.

CHRYSO® Quad 855 EMx is recommended for use in Ready Mixed Concrete mixes to improve uniformity and control of air content, set time and slump retention.

EMx®

CLEAR® TECHNOLOGY By CHRYSO

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Concrete admixture

Technical Datasheet

CHRYSO® Quad 855 EMx

Description:

Characteristics:
Physical state: Liquid
Color: Brown
Density: Approx. 1.077
pH: Approx. 3.9
Cl^- ion content: Nil

CHRYSO® Quad 855 EMx does not contain any purposely added calcium chloride or other chloride based components. It will not promote or contribute to corrosion of reinforcing steel in concrete.

Packaging:
- 55 gallon (210 L) drums
- 264 gallon (1000 L) totes
- bulk deliveries

Standard specifications:
Conforms to ASTM C 494 Type A & F
AASHTO M 194 Type A & F

Directions for use:

Dosage
CHRYSO® Quad 855 Emx is recommended for use at a dosage rate of 2 to 10 fluid ounces per 100 pounds (130 to 652 ml per 100 kg) of cement for a Type A and 6 to 20 fluid ounces per 100 pounds (391 to 1304 ml per 100 kg) of cement for a Type F.

CHRYSO® Quad 855 EMx can be added at the concrete plant with either the initial or tail water and allowed to mix 3 - 5 minutes. If **CHRYSO® Quad 855 EMx** is added at the job site the concrete should be mixed a minimum of 3 minutes before discharge.

Because local job conditions vary, please contact your local Chryso sales representative for further assistance if using outside recommended dosage ranges.

Compatibility
CHRYSO® Quad 855 EMx is compatible with all types of Portland cement, class C and F fly ash, slag, microsilica, calcium chloride, fibers and approved air entraining admixtures.

CHRYSO® Quad 855 EMx is compatible with most admixtures and can be used with other CHRYSO® admixtures, unless stated otherwise. For best results, each admixture must be dispensed separately into the concrete mix.

CHRYSO® Quad 855 EMx can be used in all white, colored, and architectural concrete. For best results, each admixture must be dispensed separately into the concrete mix.

Precaution:
CHRYSO® Quad 855 EMx may freeze at temperatures below 32°F (0°C) Freezing will damage **CHRYSO® Quad 855 EMx** and precautions should be taken to protect it from freezing.

If **CHRYSO® Quad 855 EMx** should happen to freeze the product cannot be reconstituted with mechanical agitation. Do not store the product at temperatures above 100°F (38°C) or under 33°F (1°C) for long periods.
Do Not Use Pressurized Air For Agitation

Shelf life: 9 months.

Safety:
CHRYSO® Quad 855 EMx is not considered dangerous to handle. Please refer to the material safety data sheet for additional information.

About CHRYSO:
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CHRYSO

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Concrete admixture

CHRYSO® Fluid Optima 258 EMx

HRWR - extended slump retention and high early strengths capabilities

Features

CHRYSO®Fluid Optima 258 is a new generation high range water reducing admixture based on patented **CHRYSO®** technology.

CHRYSO®Fluid Optima 258 is formulated specifically to retain workability in extreme conditions while allowing for very high early strengths.

CHRYSO®Fluid Optima 258 is formulated specifically to enhance rheology and strengths characteristics of High and Ultra-High Performance Concrete (HPC & UHPC).

CHRYSO®Fluid Optima 258 exclusive formulation allows for extreme easiness of use and robustness.

CHRYSO®Fluid Optima 258 is manufactured under rigid quality control standards to provide uniform, reliable results.

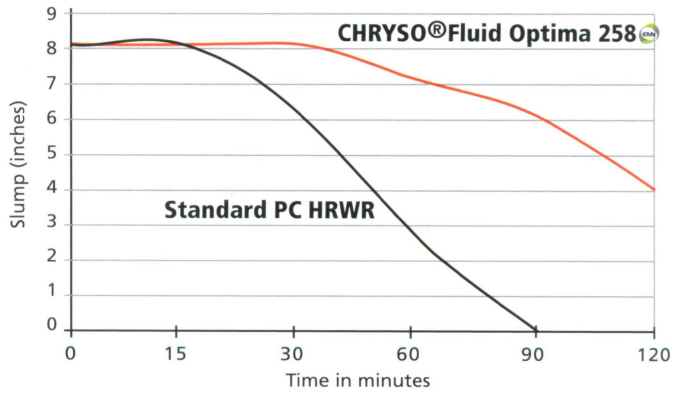
Benefits

- Provides enhanced workability retention
- Allows for high early strengths performances
- Provides increased slump and flowability without increased water content
- Improves finish, placement and pumpability of concrete
- Improves concrete quality by reducing the water-cement ratio for a given degree of workability
- Proprietary molecule reduces concrete viscosity (stickiness) allowing for easier placement, better finish and enhanced pumpability
- Reduces cracking and shrinkage
- Improves concrete chemical resistance and durability
- Improves cementitious material performance (more psi/lb)

Areas of Application

CHRYSO®Fluid Optima 258 is recommended for all concrete mixes where significant water reduction, improved cementitious material performance (more psi/lb), improved finishing and enhanced slump retention characteristics are desirable.

CHRYSO®Fluid Optima 258 is especially recommended for use in ready mixed concrete applications where very good slump or flow (SCC) retention characteristics along with very high early strengths are required.



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Concrete admixture

Technical Data Sheet

CHRYSO® Fluid Optima 258 EMx®

Description:

Characteristics:

- Physical state: liquid
- Color: green
- Density: 1.090 ± 0.020g/cc
- pH: 5.5 ± 2.0
- Cl^- ion content Nil

CHRYSO®Fluid Optima 258 does not contain any purposely added calcium chloride or other chloride based components. It will not promote or contribute to corrosion of reinforcing steel in concrete.

Packaging:

- 55 gallon (210 L) drums
- 264 gallon (1000 L) totes
- bulk deliveries

Standard specifications:

CHRYSO®Fluid Optima 258 meets the requirements of ASTM C494, Types A & F for a high range water reducing admixture.

Directions for use:

Dosage:

CHRYSO®Fluid Optima 258 is recommended for use at a dosage rate of 2 to 7 fluid ounces per 100 pounds (130 to 456 ml per 100 kg) of cement for a Type A and 7 to 16 fluid ounces per 100 pounds (456 to 1045 ml per 100 kg) of cement for a Type F.

CHRYSO®Fluid Optima 258 can be added at the concrete plant with the initial or tail water or on the job site. In case of addition in a mixing truck, it is recommended that the concrete be mixed at high speed for 70 to 100 revolutions (approximately 5-6 minutes).

Because local job conditions vary, please contact your local **CHRYSO®** sales representative for further assistance if using outside recommended dosage ranges.

Compatibility:

CHRYSO®Fluid Optima 258 is compatible with all types of Portland cement, class C and F fly ash, slag, microsilica, calcium chloride, fibers and approved air entraining admixtures.

CHRYSO®Fluid Optima 258 can be used in all white, colored, and architectural concrete. For best results, each admixture must be dispensed separately into the concrete mix.

Precaution:

CHRYSO®Fluid Optima 258 may freeze at temperatures below 35°F (2°C). Although freezing does not harm **CHRYSO® Fluid Optima 258**, precautions should be taken to protect it from freezing.

If **CHRYSO®Fluid Optima 258** should happen to freeze, thaw and reconstitute with mechanical agitation.

Do not store the product at temperatures above 100°F (38°C) or under 40°F (5°C) for long periods.

Shelf life: 9 months.

Safety:

CHRYSO®Fluid Optima 258 is not considered dangerous to handle. Please refer to the material safety data sheet for additional information.

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