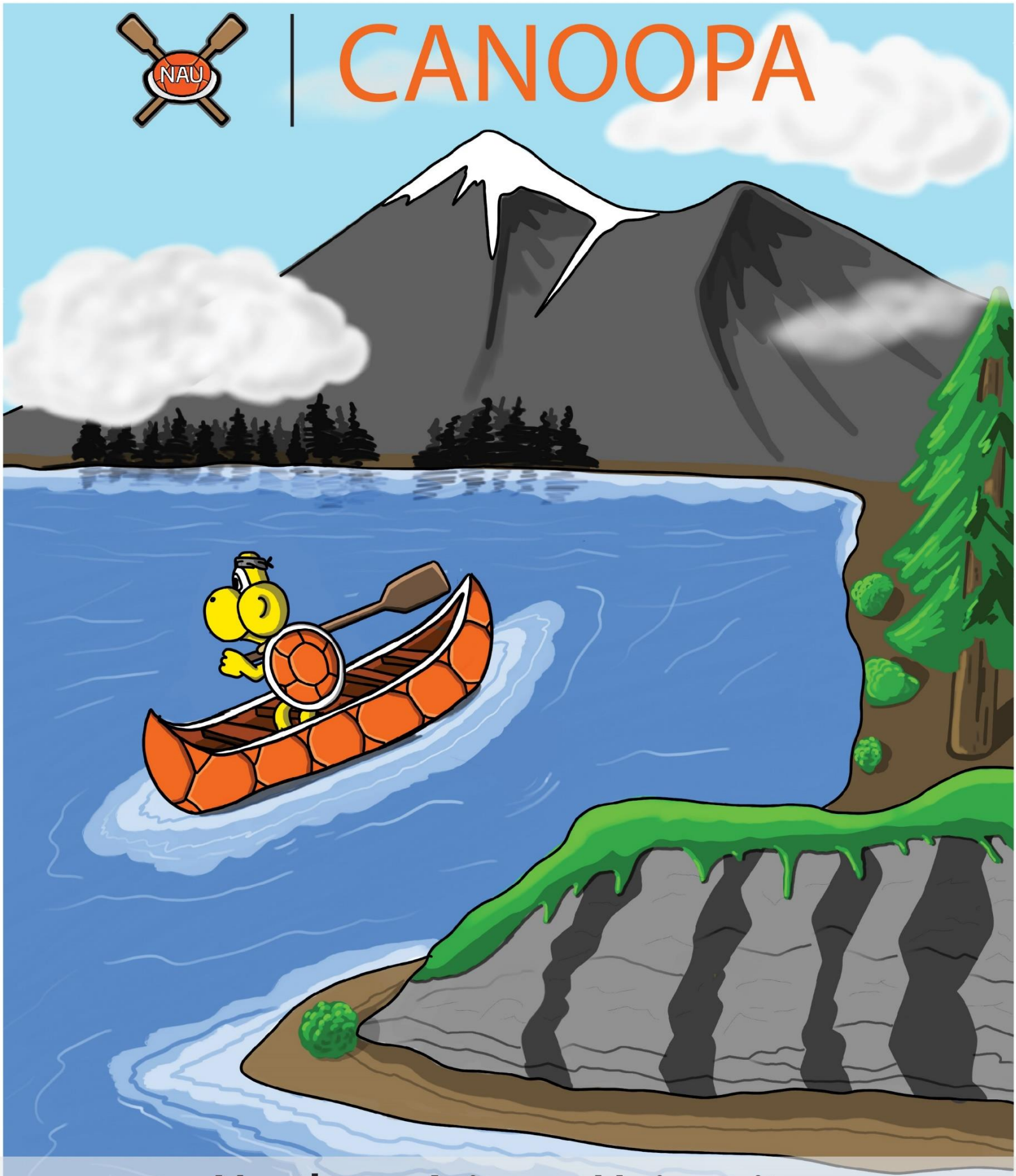
CANOOPA



Northern Arizona University

Project Overview & Technical Addendum

CANOOPA - NORTHERN ARIZONA UNIVERSITY
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TAB A: COMPLIANCE CERTIFICATE

We, the 2018 Northern Arizona University Concrete Canoe team, hereby certifies that:

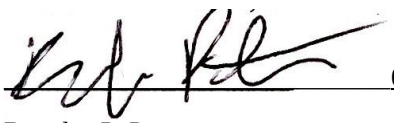
1. The construction and finishing of the 2018 Northern Arizona University Concrete Canoe, *Canoopa*, has been performed in complete compliance with the Rules and Regulations of the National Competition.
2. The ten (10) registered participants at the Conference Competition are qualified student members and National Student Members of ASCE, and meet all eligibility requirements.
3. *Canoopa* has been completely built within the current academic year.
4. The NAU Concrete Canoe team acknowledges all Safety Data Sheets and Material Technical Data Sheets have been read by the team, and
5. The NAU Concrete Canoe team acknowledges receipt of the Request for Information summary and that our entry complies with responses provided.

Registered Participants for NAU Concrete Canoe Team			
Male Participants		Female Participants	
Name	ASCE ID No.	Name	ASCE ID No.
Virgilio Bareng	10968838	Gina Boschetto	10156186
Logan Grijalva	11378386	Marie Cook	11377521
Joshua Leon	10156195	Kylie Dykstra	10934536
Branden Petersen	10927509	Paxson Lowther	10880828
Zachary Radovich	10947439	Ally Marnocha	10969417

Canoopa Dimensions and Parameter	
Maximum Length	258 in.
Maximum Depth	15 in.
Maximum Width	26 in.
Average Thickness	1.25 in.
Estimated Overall Weight	300 lb

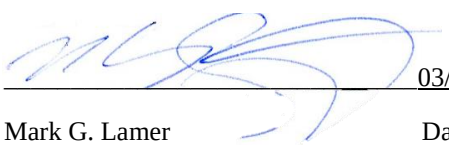
Concrete Parameters	Structural Mix #1	Structural Mix #2	Finishing Mix
Wet Unit Weight	68.4 lb/ft^3	65.0 lb/ft^3	65.9 lb/ft^3
Oven-Dried Unit Weight	61 lb/ft^3	56 lb/ft^3	59 lb/ft^3
28-Day Compressive Strength	1600 psi	1100 psi	1900 psi
28-Day Tensile Strength	370 psi	310 psi	350 psi
28-Day Composite Flexural Strength	830 psi	780 psi	910 psi
Concrete Slump	1 in.	1 in.	1 in.
Air Content	9.9%	12.4%	11.3%

By signing below, I certify the aforementioned information is valid.



03/15/18

Branden P. Petersen — Date
Team Captain
bpp35@nau.edu
(949) 547-8238



03/15/18

Mark G. Lamer — Date
Faculty Advisor
Mark.Lamer@nau.edu
(928)523-3435

Photo 1. Preparation for Mold Cutting: The construction of the male foam mold was done by using a computer numerical control (CNC) router from a third party. The CNC router cut 4 ft x 8 ft x 3 in. foam blocks into cross-section pieces of the canoe design.

Photo 2. CNC machine Cutting Mold Cross-Sections: Once the hull design was finalized in Prolines and Solidworks, a G-code was made so the CNC router would cut the cross-sections precisely.

Photo 3. Removing Cross-Section pieces from CNC Machine: After the CNC router completed cutting the first foam block, the next was placed in the machine.

Photo 4. Arranged Pieces of Mold Cross-Section: Once all the pieces were cut, they were transported to the field station (farm). A total of 83 cross-sections were cut from eight foam blocks.

Photo 5. Organizing Cross-Section pieces to be cut: The foam cross-sections are arranged in the order and prepared to be cut with a hot knife foam cutter.

Photo 6. Making Incisions to Mold Cross-Sections: Horizontal slits are made on the face of the cross-section, penetrating through the foam, to aid in the removal of the mold.

Photo 7. Preparing to Assemble Mold: Cross-Sections were put together with a 2 in. x 2 in. steel bar. This was done to keep the mold stable while applying concrete during casting.

Photo 8. Organized Mold Cross-Sections: The mold was organized and laid out on the construction table to prepare for saran wrapping.

Photo 9. Applying Saran Wrap: Saran wrap was added to the mold to ensure that concrete would not stick to the mold during casting. A heat gun was used to allow the wrap to shrink and tighten around the mold.

Photo 10. Completed Mold: Mold ready for casting day with the help of mentees.

Photo 1. Preparing to Cast *Canoopa*: Concrete being prepared to be placed for the first layer of the canoe.

Photo 2. Mixing Station at Pour Day: Designated mixing stations were located next to the canoe. While casting was occurring, concrete was being prepared in four tubs with material that had been pre-batched.

Photo 3. Mixing Concrete in Tubs: Finishing mix being prepared after the coloring admixtures had just been added.

Photo 4. Preparing for First Primary Reinforcement: To keep the concrete moist, a damp cloth was placed over the area where reinforcement was not prepared to be placed.

Photo 5. Placing Reinforcement Mesh: 11 sheets of mesh were used with 6 in. overlap to cover the full body of the canoe. Each layer reached from one side of the canoe to the other. Quality Assurance/Quality Control (QA/QC) was ensured by cutting the mesh to form to the canoe's shape.

Photo 6. Applying Finishing Layer: The finishing layer was comprised of yellow and red admixture to create an orange color. The same application method of troweling was used. QA/QC was done using toothpicks that measured 1 ¼ in. deep.

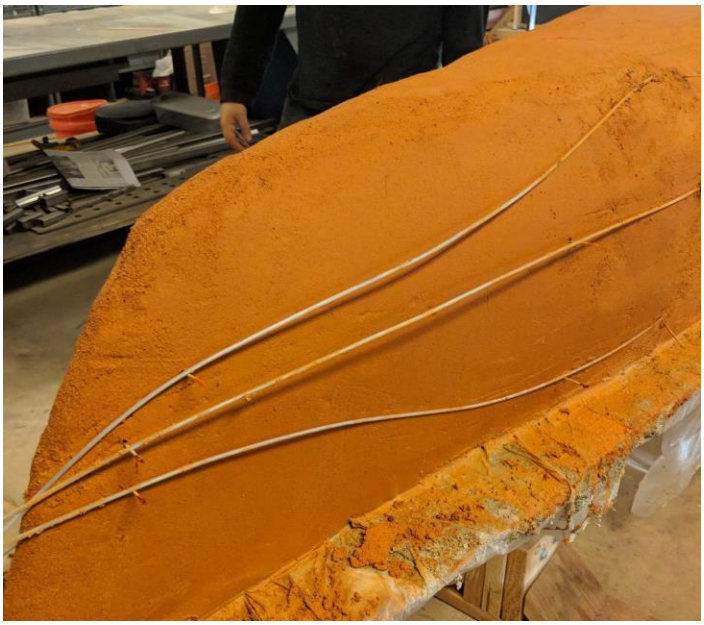


Photo 7. Cable Reinforcement Orientation: While placing the finishing layer, the steel cable reinforcement was laid underneath. To keep them in the same location during the concrete placement, toothpicks were pierced into the canoe and the cables on top of the toothpicks.

Photo 8. Stencil Imprint: A 3D stencil was printed to create a turtle shell design on the canoe. The ends were aligned when imprinting to develop that hexagonal shape

Photo 9. Stencil Pattern: This is the design on the walls of the canoe produced by using the 3D stencil.

Photo 10. End of Pour Day: All members in this photo are the students who helped build *Canoopa* on February 17, 2018.

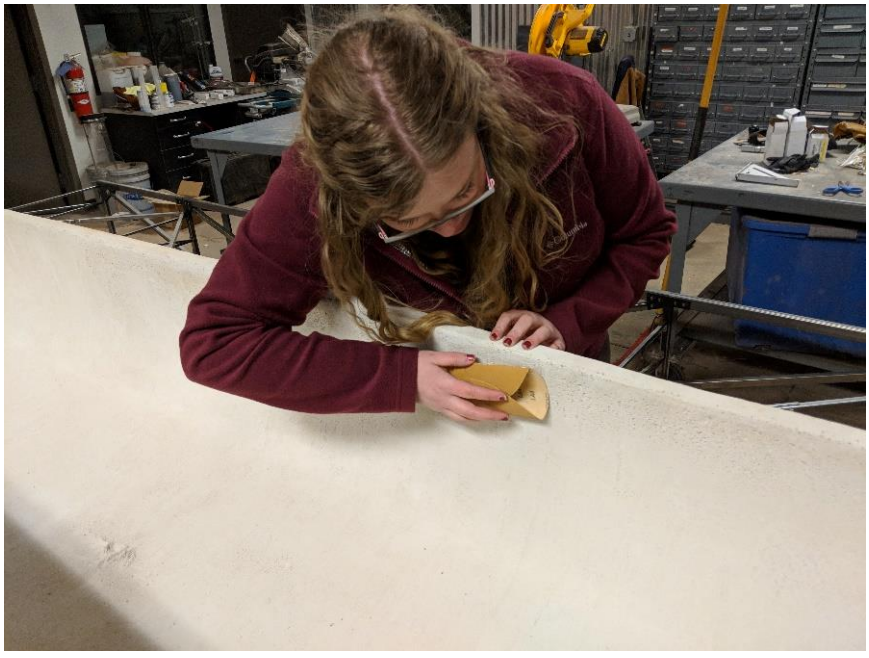
Photo 1. Curing Chamber Construction: Curing chamber was assembled with wood pieces that were inserted into holes on the sides of the construction table and a plastic tarp was used to encase the canoe. Allowing moisture to stay inside the chamber and properly cure.

Photo 2. Curing Chamber: The photo above displays the canoe resting on styrofoam slices in the curing chamber. Moisture in the curing chamber was caused by using two humidifiers. The canoe cured for 28 days for it to reach 95% strength.

Photo 3. Preparing for Mold Removal: The curing chamber was taken down and the canoe was flipped to prepare the removal of the styrofoam mold.

Photo 4. Removing Mold: A hot knife was used to cut through the styrofoam to properly removed pieces of the mold.

Photo 5. Incasing the Bow/Stern: The floatation in the bow and stern was encased in structural mix #1.



P**hoto 6. Sanding Inside:** Sanding the inside of the canoe.

Photo 7. Sanding Outside: Sanding the outside of the canoe.

Photo 8. Polishing the Canoe: Polishing the canoe using a wet polisher.

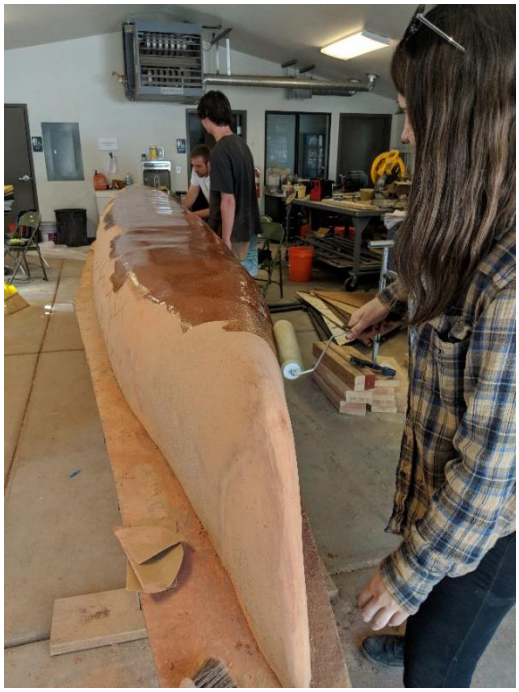


Photo 9. Sealing the Canoe: Sealing the canoe with Arizona Seal.

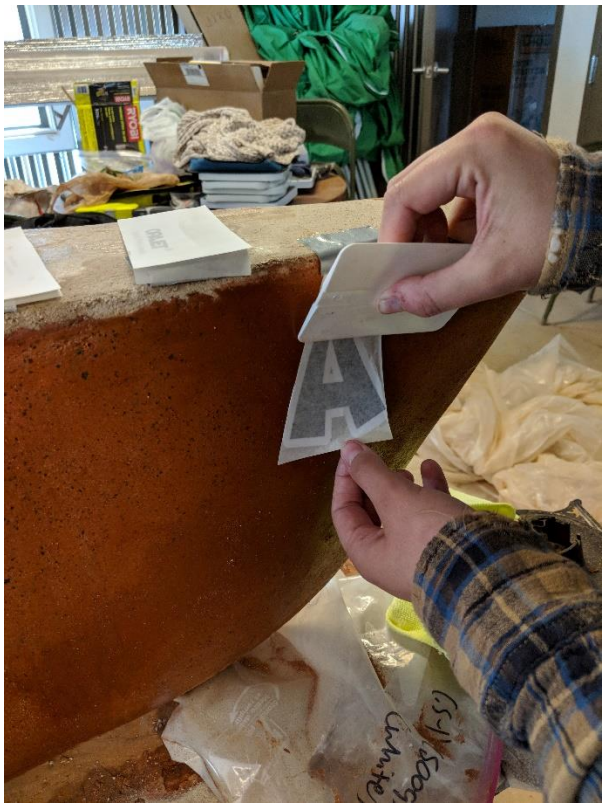


Photo 10. Apply Lettering: Applying lettering to the finished canoe.

Product Data Sheet

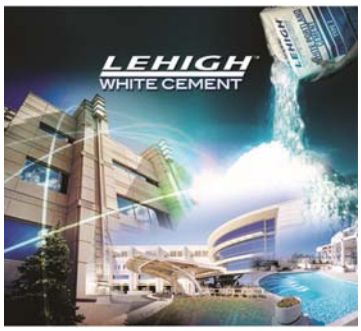
Division 3 — Concrete
Division 4 — Masonry

PRODUCT NAME

- Lehigh White Portland Cement Types I, II, III and V
- Lehigh White Portland Cement—Type I Water Repellent Added
- Lehigh White PLC—Portland Limestone Cement Type IL(10), GUL or GU
- Lehigh White Masonry Cement, Types N and S

MANUFACTURER

Lehigh White Cement Company
7660 Imperial Way
Allentown, PA 18195
Phone: 610.366.4600
info@lehighwhitecement.com
www.lehighwhitecement.com



PRODUCT DESCRIPTION

Lehigh White Cement Company is the leading supplier of white cements in North America. We have been producing quality portland cements since 1897. For more than 100 years Lehigh has built a reputation for serving the construction industry with high performance products that encourage creativity and ensure longevity. This Product Data Sheet gives a brief overview of the types, specifications and some common uses of our cement. Depending on application, Lehigh White Cement products may be specified in Division 3 - Concrete or Division 4 - Masonry. For more info on our products visit us online @ www.lehighwhitecement.com.

SPECIFICATIONS

Portland Cements

Portland Cements are manufactured to meet ASTM C150 / AASHTO M85 and CSA A3001 specifications

PLC - Portland Limestone Cement

Portland Limestone Cements are manufactured to meet either the ASTM C595 and CSA A3001 or ASTM C1157 specifications.

Masonry Cements

Masonry Cements are manufactured to meet ASTM C91 and CSA A3002 specifications

APPLICATIONS

Lehigh White Portland Type I - Lehigh White Cements are regularly used to produce architectural concrete. General applications include cast-in-place or precast wall panels, floors, slabs, terrazzo, thin-set and tile grouts, cast stone, masonry units and mortars, stucco, swimming pools & spas, glass fiber reinforced concrete, ornamental statuary, floor tiles, concrete roof tiles, perimeter security, pavers and traffic safety items such as concrete median barriers, bridge parapets, pedestrian crosswalks, curbs and other delineators. White cement is often used to produce bright finishes, vibrant colors or ultra high performance concretes that look great and provide structural performance that make them ideal for resilient building applications.

Portland Type II and Type V - In addition to general use, Type II and Type V cements have moderate heat of hydration. Combined in mixes with low water-to-cement ratios and low permeability, Type II and Type V cements are less susceptible to the negative effects of higher than normal sulfate concentrations.

APPLICATIONS - Continued

Portland Type III - Type III portland cement is intended for use where high early strength or a finer grind is required. Type III portland cement is frequently used in precast and cold weather applications.

Portland Limestone Cement CSA A3001 GUL / ASTM C595 Type IL(10) - We intergrind approximately 10% limestone by weight as an ingredient in this blended cement which has similar strength & setting characteristics to our Type I cement. It is used in applications where Type I cement would be typical. It offers advantages in workability and sustainability.

PLC - Portland Limestone Cements ASTM 1157 Type GU - This cement conforms to the Standard Performance Specification for Hydraulic Cement for general construction. It is used where longer set times and workability are preferred characteristics. This specialty cement is most often used in cement rich mixtures such as pool plasters.

Lehigh White Masonry Cements Types N and S - Lehigh White Masonry Cements are combined with sand to produce either Type N or Type S Masonry Mortars per the ASTM C270 specification. They can also be used to produce interior plasters & exterior stucco. These cements are specially formulated for enhanced workability and water retention.

QUALITY

Lehigh White Portland, PLC and Masonry Cements are produced using carefully selected raw materials and rigid manufacturing standards to assure uniform whiteness and high performance. Count on our quality to stretch architectural boundaries through design, color and texture.

SUSTAINABILITY

Minerals used to produce white cement rank among the most abundant elements on earth. Besides having very low embodied energy and CO_2 emissions, portland cement concrete is resilient, durable & long lasting. Specify white cement for dynamic architectural & structural applications.

STORAGE

Portland cement must be kept dry in order to retain its quality. Protect packaged cement from moisture; store bulk cement weather-tight silos.

AVAILABILITY

Not every cement type is available in all markets. Lehigh White Cements are distributed throughout the United States and Canada.

SAFETY

Prior to using or handling cement products first read and understand Safety Data Sheets available at www.lehighwhitecement.com.

WARRANTY

PORTLAND POZZOLAN

PHOENIX CEMENT® TYPE IP (25)

Salt River Materials Group
100% American™

Phoenix Cement® Portland Pozzolan Type IP (25) cement meets all chemical and physical requirements of the current ASTM Specification C 595 and ASTM C 1157, as well as the requirements for Types IP and IP (HS) blended hydraulic cements. Phoenix Cement® Portland Pozzolan Type IP (25) is a blend of Phoenix Cement® Type I/II/V (LA) and ASTM C 618 Class F fly ash which is interground at the mill. It is a general, all-purpose cement for use in most general construction applications where a typical Type I/II/V (LA) cement would be used.

Strength, Set Time and Pumping Ability

Type IP (25) is designed to provide strength development and setting characteristics similar to those of a typical Type I, Type II or Type V cement. Note that no further substitution of cement with fly ash or other pozzolan is necessary or recommended.

Due to the spherical particle shape of the fly ash, the ball bearing effect in concrete leads to superior pumpability and homogeneity.

Durability

As an intimate blend of Type I/II/V low alkali cement and Class F fly ash, Type IP (25) provides superior resistance to sulfate attack. ACI 232, Use of Fly Ash in Concrete, recommends Type V cement and Class F fly ash for the highest resistance to sulfate attack.

The low alkali cement portion combined with the Class F fly ash greatly minimizes the potential for damage due to alkalai-silica reactivity.

Uniformity

Testing after the blending process ensures consistency in strength, color, fineness, chemical composition and set time.

The Class F fly ash is subject to a rigorous quality assurance program meeting our own requirements that far exceed those of ASTM C 618.

Convenience

For producers with limited silo space or who simply want the many benefits of utilizing fly ash, Type IP (25) is the logical choice.

Availability

Produced year-round at our Clarkdale manufacturing facility 100 miles north of the Phoenix metro area, Type IP (25) is available in bulk and sack.

Salt River Materials Group has manufactured cement specifically designed for the Southwest since 1959. This experience enables Salt River Materials Group to continue to provide some of the highest quality cement products available. Salt River Materials Group is the commercial trade name for all marketing activities for Phoenix Cement Company and Salt River Sand and Rock.

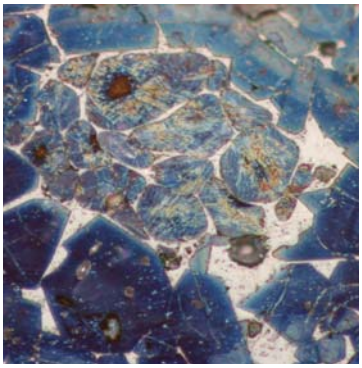
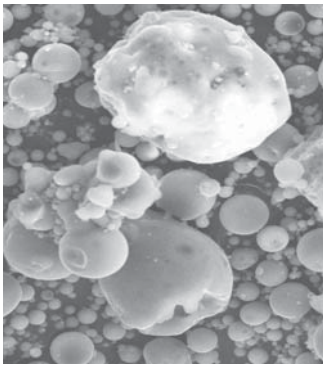


Photo micrographs of cement crystal structure

Limestone



Micrograph of Fly Ash particles

Clarkdale Shipping Facility

Cement Rotary Kiln, Clarkdale AZ

Sacking Operation, Clarkdale AZ

Chemical Analysis	Average Results	ASTM C 595 Specification
Calcium Oxide, CaO	49.02%	NA
Silicon Dioxide, SiO_2	30.67%	NA
Aluminum Oxide, Al_2O_3	8.62%	NA
Ferric Oxide, Fe_2O_3	3.86%	NA
Magnesium Oxide, MgO	1.76%	6.00% Max
Sulfur Trioxide, SO_3	2.73%	4.00% Max
Loss on Ignition	1.40%	5.00% Max
Physical Data		
Fineness, Blaine cm_2/gm	5260	NA
Specific Gravity	2.85	NA
Autoclave Expansion	-0.02%	0.80% Max
Air Content	5.0%	12% Max
Compressive Strength (psi)		
1 Day	1880	NA
3 Day	3310	1890 Min
7 Day	4070	2900 Min
28 Day	5710	3620 Min
Time of Setting, Vicat		
Initial Set	2:00	0:45 Min
Final Set	4:00	7:00 Max

Mission Statement

Creating Opportunities and Solutions with Quality Products and Exceptional People

Values

Profitability The Right Way... Integrity, Accountability, Excellence

SRMG
100% AMERICAN™

ENERGY STAR PARTNER

8800 E. Chaparral Rd., Ste 155 | Scottsdale, AZ 85250
(480) 850-5757 | Fax: (480) 850-5758 | www.srmaterials.com

PHOENIX FLY ASH

CLASS C POZZOLAN

Salt River Materials Group

100% American™

Salt River Materials Group (SRMG) Class C fly ash meets all chemical and physical requirements of the current ASTM Specification C 618 Coal Fly Ash for use in Concrete. Phoenix Class C Fly Ash is collected and processed at the Coronado Generating Station near St. Johns, Arizona.

Introduction

Fly ash, a by-product from the combustion of pulverized coal, is widely used as a pozzolanic and/or cementitious ingredient in hydraulic cement concrete. Due to the physical and chemical properties of fly ash, many desirable concrete properties are improved. Class C fly ash also possesses cementitious value due to reactive consistuents within the fly ash.

Proportioning

Under normal conditions, Class C fly ash is used to replace 15-35% of portland cement by weight. Replacement rates outside of this normal range have been used successfully for more specialized conditions. Phoenix Class C fly ash can also be added without cement reduction to achieve desired mix characteristics. Throughout the range of fly ash percentages, proper testing can provide proportions and material combinations yielding competitive strengths at various age requirements.

Strength, Set Time and Pumping Ability

Strengths of concrete properly proportioned with Class C fly ash can be designed to closely match those of equivalent cement-only mixes due to the cementitious characteristics of the fly ash. In fact, due the secondary pozzolanic reaction, fly ash mixes with similar 28-day compressive strengths generally achieve 10-20% higher strengths at ages beyond 28 days.

Concrete set times utilizing chemical admixtures and 15-35% Class C fly ash can be impacted. Proper testing can provide the materials combinations and proportions to yield adequate set times. Due to the spherical particle shape of fly ash, the ball bearing effect whereby the use of fly ash in concrete lubricates the mix, superior pumping ability is achieved, even in mixes utilizing very angular materials or high in coarse aggregate content.

Durability

Research has shown that Class C fly ashes can result in similar levels of resistance to sulfate attack and alkali-silica reactivity mitigation as Class F fly ash, utilizing higher ash content and specific proportioning. In applications where potential for durability problems exists, thorough testing of all mix ingredients should be conducted to ensure that sound, durable concrete can be produced using Class C fly ash.

Water Demand

The use of Class C fly ash in normal proportions typically provides mixes with a lower water demand for a given workability. This translates directly into increased strength and durability, reduced potential for shrinkage, reduced segregation, and most importantly, lower permeability.

Environmental Benefits

Fly ash is specifically listed in the Federal Register as a recycled material to be given preference under the Resource Conservation and Recovery Act (RCRA). The specification and use of fly ash in concrete, concrete and mortar products, and packaged goods highlights one of the greatest recycling efforts on record.

Salt River Materials Group (SRMG) Phoenix Fly Ash is considered by the U.S. Green Building Council (USGBC) as a 100% pre-consumer industrial by-product that can be recycled in new concrete, masonry, pre-cast and soil stabilization projects.

Coronado Generating Station Fly Ash Facility

Average Results								
	ASTM C 618 Class F						ASTM C 618 Class C	
Chemical Analysis	Specification	Cholla	Four Corners	San Juan	Gallup	Escalante	Coronado	Specification
Calcium Oxide, CaO_2	NA	3.60	2.54	4.03	3.11	3.70	23.30	NA
Silicon Dioxide, SiO_2	NA	58.91	61.53	57.83	59.05	59.49	38.14	NA
Aluminum Oxide, Al_2O_3	NA	23.33	23.97	25.04	24.71	23.29	17.88	NA
Ferric Oxide, Fe_2O_3	NA	6.49	4.24	4.20	3.96	5.68	6.16	NA
SiO_2+Al_2O_3+Fe_2O_3	70.0% Min	88.83	89.73	87.07	87.72	88.45	62.18	50 .0 - 70.0%
Magnesium Oxide, MgO	NA	1.19	1.18	1.26	1.03	1.28	4.18	NA
Sulfur Trioxide, SO_3	5.0% Max	0.35	0.20	0.37	0.36	0.27	2.17	5.0% Max
Moisture content	3.0% Max	0.08	0.06	0.06	0.05	0.06	0.09	3.0% Max
Loss on Ignition	6.0% Max	0.37	0.27	0.67	0.55	0.21	0.67	6.0% Max
Available alkalies as Na_2O		0.53	0.49	0.63	0.55	0.48	1.04	
Total alkalies as Na_2O		1.76	2.01	2.36	2.15	1.77	2.93	
Physical Analysis								
Fineness, +325 Sieve	34% Max	23	24	20	24	22	12	34.0% Max
Variation from average	5% Max	0.08	-0.09	-0.11	-0.16	0.17	1.42	5.0% Max
Density, g/cm³		2.21	1.96	2.03	2.00	2.14	2.64	NA
Variation from average	5% Max	0	0	0	0	0.02	0.65	5.0% Max
Strength Activity Index w/ Cement								
7 Day, % of control		80	80	80	80	81	100	NA
28 Day, % of control	75% Min	88	87	85	84	88	105	75% Min
Water Requirement, % of control	105% Max	96	96	96	97	96	95	105% Max
Soundness	0.8% Max	-0.02%	-0.02%	-0.02%	-0.02%	-0.02%	0.01%	0.8% Max

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ENERGY STAR PARTNER

poraver®
expanded glass

TECHNICAL DATA SHEET

Lightweight aggregate according to DIN EN 13055-1

Poraver® expanded glass	BASIC GRANULAR SIZES					SPECIAL GRANULAR SIZES	
Granular size in mm	**0.1-0.3**	**0.25-0.5**	**0.5-1**	**1-2**	**2-4**	**0.04-0.125**	**0.5-1.25**
Bulk density in kg/m³	400 ± 60	340 ± 30	270 ± 30	230 ± 30	190 ± 20	530 ± 70	260 ± 30
Particle density in kg/m³	950 [1] ± 150	700 [1] ± 80	500 [1] ± 80	400 [1] ± 60	320 [1] ± 40	1400 [2] ± 300	490 [1] ± 80
Crushing resistance in N/mm² according to DIN EN 13055-1 [3]	2.8	2.6	2.0	1.6	1.4	-	1.9
Oversize % by mass	≤ 10						
Undersize % by mass	≤ 15						
pH value	8 - 11						
Moisture content % by volume	< 0.2						
Moisture content % by mass	< 0.5						
Water absorption % by volume	33	15	9	7	4.5	-	10
Water absorption % by mass	35	21	18	19	14	-	20
Softening point	approx. 700°C						
Colour	creamy white						
Thermal conductivity W/(m·K)	-	-	-	-	0.07 [4]	-	-
CE according DIN EN 13055-1	•	•	•	•	•	-	•
Approval Z-3.42-1894	•	•	•	•	•	-	•
Approval Z-23.11-114	-	-	-	-	•	-	-

[1] Apparent (relative) density according to EN 1097-6
[2] Density of filler according to EN 1097-7
[3] Values according to DIN V 18004 on request
[4] Calculated values DIBt according to Approval Z-23.11-114 (Thermal insulating material, non combustible according to construction material class DIN 4102-A1)

The strength grades may vary within the tolerance range of bulk densities. The availability and delivery conditions for special grain sizes will be agreed on an individual basis.

CHEMICAL ANALYSIS

Constituent	Applied to the sample dried at 105°C	LOI free	Analysis method
Loss on ignition	0.3 %	-	DIN EN 1744-1
CaO	8.9 %	9.0 %	atomic emission spectrometric (AES)
SiO_2	71.7 %	71.9 %	
Al_2O_3	2.5 %	2.5 %	
TiO_2	0.1 %	0.1 %	
Fe_2O_3	0.4 %	0.4 %	
Mn_2O_3	0 %	0 %	
MgO	2.1 %	2.1 %	
K_2O	0.8 %	0.8 %	
Na_2O	13.2 %	13.2 %	
SO_3	0.1 %	0.1 %	coulometric
Cl	-	-	argentometric

Dennert Poraver GmbH
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🖷 +49 (0) 9552 929 77-26
✉ info@poraver.de
www.poraver.com

CHJ Consultants

A Terracon COMPANY

January 12, 2017

Revised July 11 and October 10, 2017

Trinity Industries, Inc.
11728 Highway 93
Boulder, Colorado 80303
Attention: Mr. Charles Kerzic

Job No. 16001-5

Subject: ASTM C330 Compliance Testing
Frazier Park Structural Lightweight Aggregate (Hydrolite)

Dear Mr. Kerzic:

At your request, CHJ Consultants performed tests on the Trinity Industries Structural Lightweight Aggregate (Hydrolite) to verify conformance with ASTM Designation C330-14 "Standard Specification for Lightweight Aggregates for Structural Concrete". The Trinity Industries Structural Lightweight Aggregate is an expanded clay aggregate produced at the Trinity Industries plant in Frazier Park. The results are as follows.

A. DELETERIOUS SUBSTANCES:

Test	Test Method	Test Result	C330 Requirement
Organic Impurities	C40	Lighter than Standard	Lighter Than Standard
Staining	C641	Stain Index of 20	Stain Index of Less Than 60
Loss on Ignition	C114	0.97 Percent	Less than 5 Percent

B. PHYSICAL TESTS:

Test	Test Method	Test Result	C330 Requirement
Clay Lumps and Friable Particles	C142	0.1 Percent	Less than 2 Percent
Bulk Density Dry Loose Condition	C29	49.1 pcf	55 pcf Maximum
Bulk Density Saturated Loose Condition	C29	57.1 pcf	No Requirement
Specific Gravity	C127	1.74	No Requirement
Absorption	C127	24.0	No Requirement

GRADING - SIEVE ANALYSIS (Test Method C136) Coarse Aggregate: 3/8-Inch to No. 8		
Sieve Size	**Percent Passing**	**C330 Requirement**
1/2" (12.5 mm)	100	100
3/8" (9.5 mm)	82	80-100
No. 4 (4.75 mm)	16	5-40
No. 8 (2.36 mm)	2	0-20
No. 16 (1.18 mm)	1	0-10

C. TESTS ON CONCRETE MADE WITH LIGHTWEIGHT AGGREGATE:
Concrete Mixture – 3/8" Lightweight Aggregate

Material	Weight (lbs.)	Specific Gravity	Absolute Volume
Cement - Type II	564	3.15	2.87
Water	300	1.00	4.81
Natural Sand	1,482	2.63	8.93
Trinity Frazier Park	942	1.74	8.57
Admixtures:			
Water Reducing (fl. oz.)	22.6		
Air Entraining (fl. oz.)	0.8		
Slump (inches)	4.50		
Air Content (%)	6.75		1.82
Plastic Unit Weight (pcf)	120.6		

Test	Test Method	28-Day Test Result (psi)	C330 Requirement
Compressive Strength	C39	4,280	
		4,110	
		4,410	
Average		4,270	3,000 psi Minimum
Splitting Tensile	C496	500	
		490	
		470	
		495	
		395	
		460	
		450	
		435	
Average		460	310 psi Minimum

TESTS ON CONCRETE MADE WITH LIGHTWEIGHT AGGREGATE (Cont'd):
Concrete Mixture – 3/8" Lightweight Aggregate

Test	Test Method	Test Result	C 330 Requirement
Oven Dry Density	C567-14 (Measured)	106.8 106.3 106.4 106.5	
Average			No Requirement
Calculated Approximate Equilibrium Density	C567-14 (Calculated per Section 9.2)	109.5 pcf	110.0 pcf Maximum
Equilibrium Density	C567-14 (Air dried per Section 8.2)	111.8 111.5 112.1	
Average		111.8	No Requirement
Drying Shrinkage	C330 (Section 8.4)	0.054%	0.070% (Max)
Popout Test	C151	No Popouts	No Popouts

D. CONFORMANCE:

The Trinity Structural Lightweight Aggregate (Hydrolite) manufactured by Trinity Industries, Inc. at Frazier Park, California, conforms to the requirements of ASTM Designation: C330-14 "Standard Specification for Lightweight Aggregates for Structural Concrete" for the tests indicated.

Thank you for the opportunity to provide materials testing services. If you should have any questions regarding this information, please do not hesitate to contact this firm at your convenience.

Respectfully submitted,

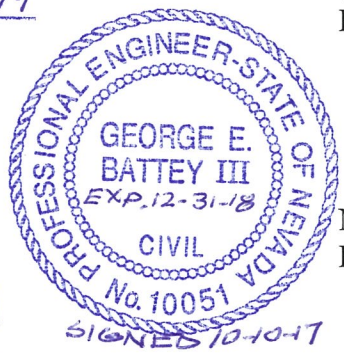
CHJ CONSULTANTS,
A TERRACON COMPANY

George Battey III

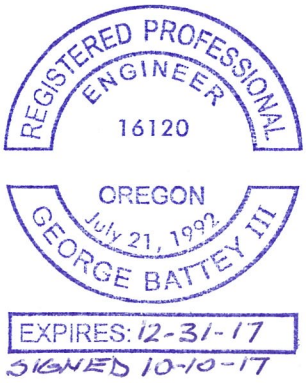
George Battey III
Senior Consulting Engineer

California Registered Civil Engineer No. 34323
Registration Expires 09-30-2019

Arizona Registered Professional
(Civil) Engineer No. 29666
Registration Expires 12-31-2019



Nevada Professional Engineer No. 10051
Registration Expires 12-31-2018



Oregon Professional Engineer No. 16120
Registration Expires 12-31-2017

Distribution: Trinity Industries (4)
Charles Kerzic - email (charles.kerzic@trin.net)
Nick Barrett - email (nick.barrett@trin.net)

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3

03 30 00	Cast-in-Place Concrete
03 40 00	Precast Concrete
03 70 00	Mass Concrete

MasterSet® DELVO

Hydration Controlling Admixture

Formerly DELVO Stabilizer*

Description

MasterSet DELVO ready-to-use, liquid admixture is used for making more uniform and predictable high-performance concrete. MasterSet DELVO admixture retards setting time by controlling the hydration of portland cement and other cementitious materials while facilitating placing and finishing operations. MasterSet DELVO admixture meets ASTM C 494/C 494M requirements for Type B, retarding, and Type D, water-reducing and retarding, admixtures.

Applications

Recommended for use in:

- Stabilization of concrete washwater
- Stabilization of returned plastic concrete
- Stabilization of freshly batched concrete for long hauls
- 4x4™ Concrete
- Pumped concrete, shotcrete (wet mix) and conventionally-placed concrete
- Plain, reinforced, precast, prestressed, lightweight and normal weight concrete
- Pervious concrete

Features

- Reduced water content required for a given workability
- Retarded setting time characteristics
- Improved workability

Benefits

- Provides flexibility in the scheduling of placing and finishing operations
- Offsets the effects of slump loss during extended delays between mixing and placing
- Reduces waste associated with concrete washwater and returned concrete
- Increased strength – compressive and flexural

Performance Characteristics

Rate of Hardening: The temperature of a concrete mixture and the ambient temperature (forms, earth, air, etc.) affect the hardening rate of concrete. At higher temperatures, concrete hardens more rapidly which may cause problems with placing and finishing.

One of the functions of MasterSet DELVO admixture is to retard the set of concrete. Within the normal dosage range, it will generally extend the working and setting times of concrete containing normal portland cement, fly ash, slag cement and silica fume approximately 1 hour to 5 hours compared to a plain concrete mixture. This depends on job materials and temperatures. Trial mixtures should be made under approximate job conditions to determine the dosage required.

Compressive Strength: Concrete produced with MasterSet DELVO admixture will develop higher early (within 24 hours) and higher ultimate strengths than plain concrete when used within the recommended dosage range and under normal, comparable curing conditions. When MasterSet DELVO admixture is used in heat-cured concrete, the length of the preheating period should be increased until the initial set of the concrete is achieved. The actual heat-curing period is then reduced accordingly to maintain existing production cycles without sacrificing early or ultimate strengths.

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Guidelines for Use

Dosage: MasterSet DELVO admixture is recommended for use at a dosage of 4 ± 1 fl oz/cwt (260 ± 65 mL/100 kg) of cementitious materials for most concrete mixtures using average concrete ingredients. Because of variations in job conditions and concrete materials, dosages other than the recommended amounts may be required. In such cases, contact your local sales representative. For concrete washwater and returned concrete stabilization, utilize MasterSet DELVO charts to determine the appropriate dosage rates.

Product Notes

Corrosivity – Non-Chloride, Non-Corrosive: MasterSet DELVO admixture will neither initiate nor promote corrosion of reinforcing steel in concrete. This admixture does not contain intentionally-added calcium chloride or other chloride-based ingredients.

Compatibility: MasterSet DELVO admixture may be used in combination with any BASF admixture. When used in conjunction with another admixture, each admixture must be dispensed separately into the mixture.

Storage and Handling

Storage Temperature: MasterSet DELVO admixture should be stored above freezing temperatures. If MasterSet DELVO admixture freezes, thaw at 35 °F (2 °C) or above and completely reconstitute by mild mechanical agitation. Do not use pressurized air for agitation.

Shelf Life: MasterSet DELVO admixture has a minimum shelf life of 12 months. Depending on storage conditions, the shelf life may be greater than stated. Please contact your local sales representative regarding suitability for use and dosage recommendations if the shelf life of MasterSet DELVO admixture has been exceeded.

Packaging

MasterSet DELVO admixture is supplied in specially designed 55 gal (208 L) drums, 275 gal (1040 L) totes and by bulk delivery.

Related Documents

Safety Data Sheets: MasterSet DELVO admixture

Additional Information

For more information on MasterSet DELVO admixture, contact your local sales representative.

The Admixture Systems business of BASF's Construction Chemicals division is the leading provider of solutions that improve placement, pumping, finishing, appearance and performance characteristics of specialty concrete used in the ready-mixed, precast, manufactured concrete products, underground construction and paving markets. For over 100 years we have offered reliable products and innovative technologies, and through the Master Builders Solutions brand, we are connected globally with experts from many fields to provide sustainable solutions for the construction industry.

Limited Warranty Notice

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Purchaser must determine the suitability of the products for the intended use and assumes all risks and liabilities in connection therewith. This information and all further technical advice are based on BASF's present knowledge and experience. However, BASF assumes no liability for providing such information and advice including the extent to which such information and advice may relate to existing third party intellectual property rights, especially patent rights, nor shall any legal relationship be created by or arise from the provision of such information and advice. BASF reserves the right to make any changes according to technological progress or further developments. The Purchaser of the Product(s) must test the product(s) for suitability for the intended application and purpose before proceeding with a full application of the product(s). Performance of the product described herein should be verified by testing and carried out by qualified experts.

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* Delvo Stabilizer became MasterSet DELVO under the Master Builders Solutions brand, effective January 1, 2014.

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Description

MasterLIFE SRA 20 shrinkage-reducing admixture was developed specifically to reduce drying shrinkage of concrete and mortar, and the potential for subsequent cracking.

MasterLIFE SRA 20 admixture functions by reducing capillary tension of pore water, a primary cause of drying shrinkage.

Applications

Recommended for use in:

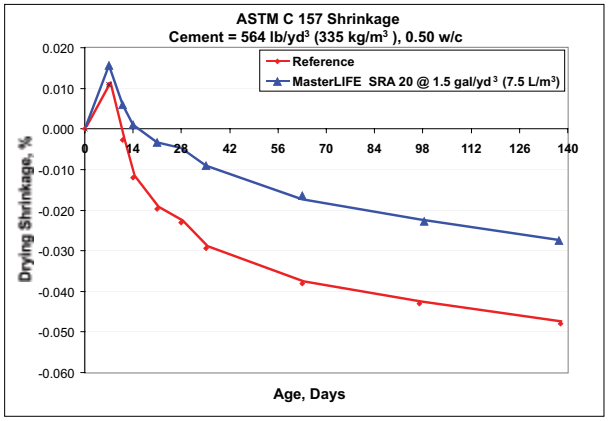
- Ready-mixed or precast concrete structures requiring shrinkage reduction and long term durability
- Wet mix shotcrete
- Mortars and grouts

MasterLIFE® SRA 20

Shrinkage-Reducing Admixture

Features

- Significantly reduces drying shrinkage by as much as 80% at 28 days, and up to 50% at one year and beyond
- Reduces stresses induced from one-dimensional surface drying in concrete slabs and floors
- Reduces carbonation



Benefits

- Reduces drying shrinkage cracking and microcracking thereby improving aesthetics, watertightness and durability
- Reduction in drying shrinkage minimizes prestress loss
- Minimizes curling

Performance Characteristics

MasterLIFE SRA 20 admixture does not substantially affect slump. MasterLIFE SRA 20 admixture may increase bleed time and bleed ratio (10% higher). MasterLIFE SRA 20 admixture may also delay time of set by 1-2 hours depending upon dosage and temperature. Compressive strength loss is minimal with MasterLIFE SRA 20 admixture.

All projects requiring MasterLIFE SRA 20 admixture in concrete applications exposed to freezing and thawing environments must be pre-approved and require field trials prior to use. Therefore, contact your local sales representative when concrete treated with MasterLIFE SRA 20 admixture is being proposed for applications exposed to freezing and thawing environments.

Guidelines for Use

Dosage: Knowledge of the shrinkage characteristics of the concrete mixture proposed for use is required prior to the addition of MasterLIFE SRA 20 admixture. The dosage of MasterLIFE SRA 20 admixture will be dependent on the desired drying shrinkage and the reduction in drying shrinkage required. Therefore, it is strongly recommended that drying shrinkage testing be performed to determine the optimum dosage for each application and each set of materials.

The typical dosage range of MasterLIFE SRA 20 admixture is 0.5 to 1.5 gal/yd^3 (2.5 to 7.5 L/m^3). However, dosages outside of this range may be required depending on the level of shrinkage reduction needed.

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Mixing: MasterLIFE SRA 20 admixture may be added to the concrete mixture during the initial batch sequence or at the jobsite.

The mix water content should be reduced to account for the quantity of MasterLIFE SRA 20 admixture used.

If the delayed addition method is used, mixing at high speed for 3-5 minutes after the addition of MasterLIFE SRA 20 admixture will result in mixture uniformity.

Product Notes

Corrosivity – Non-Chloride, Non-Corrosive: MasterLIFE SRA 20 admixture will neither initiate nor promote corrosion of reinforcing steel, prestressing steel or of galvanized steel floor and roof systems. Neither calcium chloride nor other chloride-based ingredients are used in the manufacture of MasterLIFE SRA 20 admixture.

Compatibility: MasterLIFE SRA 20 admixture is compatible with all water-reducers, mid-range water-reducers, high-range water-reducers, set retarders, accelerators, silica fume, and corrosion inhibitors. For air-entrained concrete applications, Micro-Air® admixture is the recommended air-entrainer. The dosage of Micro-Air admixture should be established through truck trial evaluations. The trials should include a simulated haul time of at least 20 minutes to assess air content stability. MasterLIFE SRA 20 admixture should be added separately to the concrete mixture to ensure desired results.

Storage and Handling

Storage Temperature: MasterLIFE SRA 20 admixture is a potentially combustible material with a flash point of 198 °F (92 °C) . This is substantially above the upper limit of 140 °F (60 °C) for classification as a flammable material, and below the limit of 200 °F (93 °C) where DOT requirements would classify this as a combustible material. Nonetheless, this product must be treated with care and protected from excessive heat, open flame or sparks. For more information refer to the MSDS.

MasterLIFE SRA 20 admixture should be stored at ambient temperatures above 35 °F (2 °C), and precautions should be taken to protect the admixture from freezing. If MasterLIFE SRA 20 admixture freezes, thaw and reconstitute by mild mechanical agitation. ***Do not use pressurized air for agitation.***

Shelf Life: MasterLIFE SRA 20 admixture has a minimum shelf life of 12 months. Depending on storage conditions, the shelf life may be greater than stated. Please contact your local sales representative regarding suitability for use and dosage recommendations if the shelf life of MasterLIFE SRA 20 admixture has been exceeded.

Packaging

MasterLIFE SRA 20 admixture is available in 55 gal (208 L) drums and 268 gal (1014 L) totes.

Related Documents

Material Safety Data Sheets: MasterLIFE SRA 20 admixture.

Additional Information

For additional information on MasterLIFE SRA 20 admixture or its use in developing concrete mixtures with special performance characteristics contact your local sales representative.

The Admixture Systems business of BASF's Construction Chemicals division is a leading provider of innovative admixtures for specialty concrete used in the ready-mixed, precast, manufactured concrete products, underground construction and paving markets throughout the North American region. The Company's respected Master Builders brand products are used to improve the placing, pumping, finishing, appearance and performance characteristics of concrete.

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	03 70 00	Mass Concrete
4	04 05 16	Masonry Grouting

MasterGlenium® 7500

Full-Range Water-Reducing Admixture

Formerly GLENIUM 7500*

Description

MasterGlenium 7500 full-range water-reducing admixture is very effective in producing concrete mixtures with different levels of workability including applications that require self-consolidating concrete (SCC). MasterGlenium 7500 admixture meets ASTM C 494/C 494M compliance requirements for Type A, water-reducing, and Type F, high-range water-reducing, admixtures.

Applications

Recommended for use in:

- Concrete with varying water reduction requirements (5-40%)
- Concrete where control of workability and setting time is critical
- Concrete where high flowability, increased stability, high-early and ultimate strengths, and improved durability are needed
- Producing self-consolidating concrete (SCC)
- Strength-on-demand concrete, such as 4x4™ Concrete
- Pervious concrete

Features

MasterGlenium 7500 full-range water-reducing admixture is based on the next generation of polycarboxylate technology found in all of the MasterGlenium 7000 series products. This technology combines state-of-the-art molecular engineering with a precise understanding of regional cements to provide specific and exceptional value to all phases of the concrete construction process.

- Dosage flexibility for normal, mid-range and high-range applications
- Excellent early strength development
- Controls setting characteristics
- Optimizes slump retention/setting relationship
- Consistent air entrainment

Benefits

- Faster turnover of forms due to accelerated early strength development
- Reduces finishing labor costs due to optimized set times
- Use in fast track construction
- Minimizes the need for slump adjustments at the jobsite
- Less jobsite QC support required
- Fewer rejected loads
- Optimizes concrete mixture costs

Performance Characteristics

Concrete produced with MasterGlenium 7500 admixture achieves significantly higher early age strength than first generation polycarboxylate high-range water-reducing admixtures. MasterGlenium 7500 admixture also strikes the perfect balance between workability retention and setting characteristics in order to provide efficiency in placing and finishing concrete. The dosage flexibility of MasterGlenium 7500 allows it to be used as a normal, mid-range, and high-range water reducer.

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Guidelines for Use

Dosage: MasterGlenium 7500 admixture has a recommended dosage range of 2-15 fl oz/cwt (130-975 mL/100 kg) of cementitious materials. For most mid- to high-range applications, dosages in the range of 5-8 fl oz/cwt (325-520 mL/100 kg) will provide excellent performance. For high performance and producing self-consolidating concrete mixtures, dosages of up to 12 fl oz/cwt (780 mL/100 kg) of cementitious materials can be utilized. Because of variations in concrete materials, jobsite conditions and/or applications, dosages outside of the recommended range may be required. In such cases, contact your local sales representative.

Mixing: MasterGlenium 7500 admixture can be added with the initial batch water or as a delayed addition. However, optimum water reduction is generally obtained with a delayed addition.

Product Notes

Corrosivity – Non-Chloride, Non-Corrosive: MasterGlenium 7500 admixture will neither initiate nor promote corrosion of reinforcing steel embedded in concrete, prestressing steel or of galvanized steel floor and roof systems. Neither calcium chloride nor other chloride-based ingredients are used in the manufacture of MasterGlenium 7500 admixture.

Compatibility: MasterGlenium 7500 admixture is compatible with most admixtures used in the production of quality concrete, including normal, mid-range and high-range water-reducing admixtures, air-entrainers, accelerators, retarders, extended set control admixtures, corrosion inhibitors, and shrinkage reducers.

Do not use MasterGlenium 7500 admixture with admixtures containing beta-naphthalene sulfonate. Erratic behaviors in slump, workability retention and pumpability may be experienced.

Storage and Handling

Storage Temperature: MasterGlenium 7500 admixture must be stored at temperatures above 40 °F (5 °C). If MasterGlenium 7500 admixture freezes, thaw and reconstitute by mechanical agitation.

Shelf Life: MasterGlenium 7500 admixture has a minimum shelf life of 9 months. Depending on storage conditions, the shelf life may be greater than stated. Please contact your local sales representative regarding suitability for use and dosage recommendations if the shelf life of MasterGlenium 7500 admixture has been exceeded.

Packaging

MasterGlenium 7500 admixture is supplied in 55 gal (208 L) drums, 275 gal (1040 L) totes and by bulk delivery.

Related Documents

Safety Data Sheets: MasterGlenium 7500 admixture

Additional Information

For additional information on MasterGlenium 7500 admixture or on its use in developing concrete mixtures with special performance characteristics, contact your local sales representative.

The Admixture Systems business of BASF's Construction Chemicals division is the leading provider of solutions that improve placement, pumping, finishing, appearance and performance characteristics of specialty concrete used in the ready-mixed, precast, manufactured concrete products, underground construction and paving markets. For over 100 years we have offered reliable products and innovative technologies, and through the Master Builders Solutions brand, we are connected globally with experts from many fields to provide sustainable solutions for the construction industry.

Limited Warranty Notice

BASF warrants this product to be free from manufacturing defects and to meet the technical properties on the current Technical Data Guide, if used as directed within shelf life. Satisfactory results depend not only on quality products but also upon many factors beyond our control. BASF MAKES NO OTHER WARRANTY OR GUARANTEE, EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO ITS PRODUCTS. The sole and exclusive remedy of Purchaser for any claim concerning this product, including but not limited to, claims alleging breach of warranty, negligence, strict liability or otherwise, is shipment to purchaser of product equal to the amount of product that fails to meet this warranty or refund of the original purchase price of product that fails to meet this warranty, at the sole option of BASF. Any claims concerning this product must be received in writing within one (1) year from the date of shipment and any claims not presented within that period are waived by Purchaser. BASF WILL NOT BE RESPONSIBLE FOR ANY SPECIAL, INCIDENTAL, CONSEQUENTIAL (INCLUDING LOST PROFITS) OR PUNITIVE DAMAGES OF ANY KIND.

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* GLENIUM 7500 became MasterGlenium 7500 under the Master Builders Solutions brand, effective January 1, 2014.

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	03 40 00	Precast Concrete
	03 70 00	Mass Concrete

MasterFiber® M 100

Monofilament Microsynthetic Fiber

Description

MasterFiber M 100 product is a high-tensile strength, high modulus of elasticity, ultra-thin monofilament homopolymer polypropylene fiber designed to quickly distribute uniformly throughout the concrete matrix. At the engineered dosage level of 0.50 lb/yd^3 (0.3 kg/m^3) MasterFiber M 100 product outperforms all other plastic shrinkage fiber reinforcements at their typical dosage of 1.0 lb/yd^3 (0.6 kg/m^3).

Applications

Recommended for use in:

- Residential slabs-on-ground
- Commercial slabs-on-ground
- Stucco
- Dry-packaged cement based products
- Precast products
- Pools and pool decks
- Water tanks
- Shotcrete

Features

- 225 million 0.75 in. (19 mm) fibers in one pound (0.45 kg) of product
- Uniform distribution throughout the concrete matrix
- Excellent finishability

Benefits

- Excellent reduction in plastic shrinkage cracking
- Transforms macro-cracks into micro-cracks
- Measurably reduces plastic settlement
- Measurably reduces the concrete permeability, thus increasing the durability and service life of the concrete
- Performs as an excellent companion in blends with macrosynthetic fibers and steel fibers

Performance Characteristics

Physical Properties

Specific Gravity	0.91
Melting Point	320 °F (160 °C)
Ignition Point	1,094 °F (590 °C)
Absorption	Nil
Alkali Resistance	Excellent
Tensile Strength	70 ksi (480 MPa)
Modulus of Elasticity	1,230 ksi (8.48 GPa)
Available Lengths	0.5 in. (13 mm) and 0.75 in. (19 mm)
Equivalent Diameter	0.00047 in. (12 microns)
Denier	1 dpf

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Guidelines for Use

Dosage: The recommended dosage of MasterFiber M 100 product is 0.50 lb/yd^3 (0.3 kg/m^3).

Mixing: Typically no modifications to the mixture proportions are required when the product is used at the engineered dosage of 0.50 lb/yd^3 (0.3 kg/m^3). MasterFiber M 100 product fibers can be introduced into the mixing system at any time except when the cement is being introduced. Mixing time will vary based on when the fibers are introduced to the mixer. The normal range is 3-5 minutes of mixing with the higher number preferred when the fibers are added after all of the standard ingredients have been introduced and mixed.

Engineering Specifications

MasterFiber M 100 product is a uniquely developed fiber to minimize plastic shrinkage cracking in concrete. With 112.5 million fibers in the engineered dosage of 0.50 lb/yd^3 (0.3 kg/m^3), MasterFiber M 100 product is capable of reducing plastic shrinkage cracking by approximately 85%. Conventional monofilament polypropylene fibers at 1.0 lb/yd^3 (0.6 kg/m^3) typically do not achieve 70% reduction in plastic shrinkage cracking.

MasterFiber M 100 product meets the requirements of ASTM C 1116/C 1116M, Section 4.1.3, Type III and Note 2 as well as ICC ES AC32, Section 3.1.1 when used at the engineered dosage of 0.50 lb/yd^3 (0.3 kg/m^3).

Product Notes

MasterFiber M 100 product is not a replacement for structural steel reinforcement and therefore, should not be used to replace any of the load-carrying steel reinforcement in a concrete element.

Packaging

MasterFiber M 100 product is packaged in pre-weighed 0.50 lb (0.23 kg) and 2.5 lb (1.13 kg) degradable bags to ensure optimum dosing and homogeneous distribution of the product.

Related Documents

Safety Data Sheets: MasterFiber M 100 product

Additional Information

For additional information on MasterFiber M 100 product, contact your local sales representative.

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We create chemistry

MasterColor®

Liquid-Coloring Admixtures

Formerly RHEOCOLOR L*

Description

MasterColor liquid-coloring admixtures are patented, engineered, high quality coloring dispersions producing enhanced decorative concrete. MasterColor liquid-coloring admixtures are ready-to-use integral liquids that come in four base colors:

- Black
- Light Red
- Medium Red
- Yellow

The four base colors can be used to make a wide range of colors including but not limited to the colors depicted on the MasterColor Decorative Concrete Color Selector.

Applications

Recommended for use in:

- Integrally colored decorative concrete
- Imprinted concrete
- Ready-mixed concrete
- Manufactured concrete products
- Stone veneer products
- Precast concrete
- Pervious concrete
- Self-consolidating concrete

Features

- Liquid-coloring admixtures formulated for the automated CAM (Coloring Admixture Measuring) System
- Compatible with BASF admixtures used in the production of durable decorative concrete
- Faster dispersion into concrete

Benefits

- Beautiful, long-lasting integrally colored concrete
- Enhanced finishing characteristics
- Color vibrancy
- Excellent color accuracy
- Batch-to-batch color consistency and verifiable color batching results
- Increased productivity and reduced labor
- Clean and simple batching
- Quality custom color services

MasterColor liquid-coloring admixtures meet the colorfastness testing of 500 hours light exposure per ASTM C 979. In addition, MasterColor liquid-coloring admixtures have successfully completed 1500 hours of aggressive Xenon Arc testing per ASTM G 155.

Typical Properties: Density: 14-16 lb/gal(1.68-1.92 kg/L) [@72 °F (22 °C)]

Guidelines for Use

General: Due to the graying effect of most cements, there are some custom colors that can only be produced using very light or white cements. Variations in water content, cement type, color variations in cementitious materials or aggregates, finish texture, timing of operations, curing or forming methods, release agents or surface treatments may produce distinct, though in many cases slight, variations in final color. All standard color matches are completed using a medium shade of portland cement.

Dosage: MasterColor color formulas for standard and other regional colors are programmed into the CAM System upon installation.

MasterColor admixtures are water neutral at loading rates of 5% or less. At loading rates greater than 5%, MasterColor admixtures may provide increased water reduction depending on local concrete materials. Therefore, at loading rates above 5%, laboratory/field evaluations of MasterColor admixtures are recommended to verify desired concrete performance.

Mixing: With the automated CAM System, MasterColor liquid-coloring admixtures are weighed or metered and dispensed prior to or while loading concrete. Product and rinse water are calculated by the CAM System and should be included as total batch water. For best results add coloring admixtures prior to batching concrete. For post addition, mix a minimum of 4-5 minutes at normal mixing speed to assure uniformity.

For best results, truck or mixer should be clean and pre-wet with no standing water. A minimum batch size equal to 1/3 of the mixer capacity should be used as a guideline for efficient mixing. Keeping the addition order, mixing time, materials and water-cementitious materials ratio constant between multiple batches is critical for color consistency.

Concrete Placement and Finishing: Final color and textures should be pre-approved with a cured jobsite mock-up. In accordance with proper construction practices, slabs-on-ground shall be placed over properly compacted and prepared subgrade. Spade formed edges and consolidate and strike off surface as normal. Care should be taken to avoid over-vibration, over-working and over-finishing, or other practices that might cause excessive bleeding or significantly increase the surface mortar content.

Trowelling or broom-finishing decorative concrete should be performed in the same direction to maintain uniform appearance. Do not add additional water to the concrete either by retempering or by adding water to the surface during the finishing process.

Curing: Proper curing of decorative concrete is required to enhance the depth of color, provide a more uniformly colored concrete, and provide surface protection. MasterKure® CC 1315 water-based curing and sealing compound from BASF or a similar, compatible curing and sealing compound is recommended.

Note: Until decorative concrete is fully cured, the color may appear darker than expected. Curing with burlap, plastic sheeting, water or other curing compounds may be detrimental to color uniformity and is not recommended. For more information on curing decorative concrete contact your local sales representative.

Maintenance: Regular cleaning of decorative concrete is recommended. In general, resealing may be required periodically as the sealed surface wears. Maintenance applications will be accelerated in areas of heavy use or frequent or aggressive cleaning. Heavily soiled interior areas may be cleaned by wet mopping or scrubbing with a stiff-bristle brush and properly diluted, high-quality commercial detergent. For large areas, automatic scrubbers may be more efficient and cost effective.

Clean-Up: MasterColor liquid-coloring admixtures are water based and can be cleaned with soap and water.

Product Notes

Corrosivity – Non-Chloride, Non-Corrosive: MasterColor liquid-coloring admixtures will neither initiate nor promote corrosion of reinforcing steel embedded in concrete. No calcium chloride or chloride-based ingredients are used in the manufacture of these products. Complete safety information can be found on the MasterColor liquid-coloring admixture Safety Data Sheets.

Compatibility: MasterColor liquid-coloring admixtures are compatible with most admixtures used in the production of quality concrete. Supplementary cementitious materials may affect color and should be checked for potential adjustments. All admixtures should be dispensed into the concrete separately. The use of calcium chloride accelerators are not recommended in decorative concrete. Final color and texture should be verified with a cured jobsite mock-up.

Storage and Handling

Storage Temperature: MasterColor liquid-coloring admixtures should be stored between 40 and 100 °F (4 and 38 °C) with regular mixing or recirculation. To prevent pigment sedimentation, recirculate the material every 90 days or less. Always mix material well prior to use. Automated recirculation is included with the CAM System. If MasterColor liquid-coloring admixtures freeze, contact your local sales representative.

Shelf Life: MasterColor liquid-coloring admixtures have a minimum shelf life of 12 months if properly stored.

Packaging

MasterColor liquid-coloring admixtures are available in 3,350 lb (1,520 kg) net returnable totes.

Related Documents

Safety Data Sheets: MasterColor liquid-coloring admixture

- Black
- Light Red
- Medium Red
- Yellow

Additional Information

For additional information on MasterColor liquid-coloring admixtures, contact your local sales representative.

The Admixture Systems business of BASF's Construction Chemicals division is the leading provider of solutions that improve placement, pumping, finishing, appearance and performance characteristics of specialty concrete used in the ready-mixed, precast, manufactured concrete products, underground construction and paving markets. For over 100 years we have offered reliable products and innovative technologies, and through the Master Builders Solutions brand, we are connected globally with experts from many fields to provide sustainable solutions for the construction industry.

Limited Warranty Notice

BASF warrants this product to be free from manufacturing defects and to meet the technical properties on the current Technical Data Guide, if used as directed within shelf life. Satisfactory results depend not only on quality products but also upon many factors beyond our control. BASF MAKES NO OTHER WARRANTY OR GUARANTEE, EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO ITS PRODUCTS. The sole and exclusive remedy of Purchaser for any claim concerning this product, including but not limited to, claims alleging breach of warranty, negligence, strict liability or otherwise, is shipment to purchaser of product equal to the amount of product that fails to meet this warranty or refund of the original purchase price of product that fails to meet this warranty, at the sole option of BASF. Any claims concerning this product must be received in writing within one (1) year from the date of shipment and any claims not presented within that period are waived by Purchaser. BASF WILL NOT BE RESPONSIBLE FOR ANY SPECIAL, INCIDENTAL, CONSEQUENTIAL (INCLUDING LOST PROFITS) OR PUNITIVE DAMAGES OF ANY KIND.

Purchaser must determine the suitability of the products for the intended use and assumes all risks and liabilities in connection therewith. This information and all further technical advice are based on BASF's present knowledge and experience. However, BASF assumes no liability for providing such information and advice including the extent to which such information and advice may relate to existing third party intellectual property rights, especially patent rights, nor shall any legal relationship be created by or arise from the provision of such information and advice. BASF reserves the right to make any changes according to technological progress or further developments. The Purchaser of the Product(s) must test the product(s) for suitability for the intended application and purpose before proceeding with a full application of the product(s). Performance of the product described herein should be verified by testing and carried out by qualified experts.

* RHEOCOLOR L became MasterColor under the Master Builders Solutions brand, effective January 1, 2014.

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SPIDERLATH Innovation

SpiderLath is the only complete lathing system that solves all the problems created by other lath systems. Billions of dollars are spent each year in lawsuits and construction costs because of DRY ROT and MOLD. One of the most critical components in the design of your building project is the prevention of dry rot and mold. Building wraps/water barriers are designed to prevent these occurrences when installed properly. All holes and voids must be sealed to prevent moisture from penetration to the substrate. If the wrap is compromised it no longer provides the protection to the wood product behind it.

SpiderLath			Metal Lath	
Square Feet.	Rolls	Weight	Sheets	Weight
300 sf	1	20 lbs	18	90 lbs
600 sf	2	40 lbs	36	180 lbs
1,200 sf	4	80 lbs	72	360 lbs
1,400 sf	8	160 lbs	144	720 lbs

SpiderLath lath system offers the best protection to the water barrier/building wrap. The patent pending strip design will stop water from penetrating due to it's gasket sealing properties. When a fastener is applied through the strip, the strip compresses around the fastener thereby sealing the fastener hole.

SpiderLath is made from AR fiberglass, eliminating corrosion, keeping the lath system intact for as long as the material being applied to it. Metal lath and cementitious material are not compatible. Metal lath has tremendous tensile strength in and by itself but cannot transfer that strength to the cementitious material because they will not adhere to each other. Because of this non compatibility, the cementitious material may crack and fail. SpiderLath is made of a fiberglass material, is compatible, and does adhere to the cementitious material. By adhering to the material it can transfer its tensile strength thereby eliminating most cracking failures.

The Future of Lath

SPIDERLATH, Inc.

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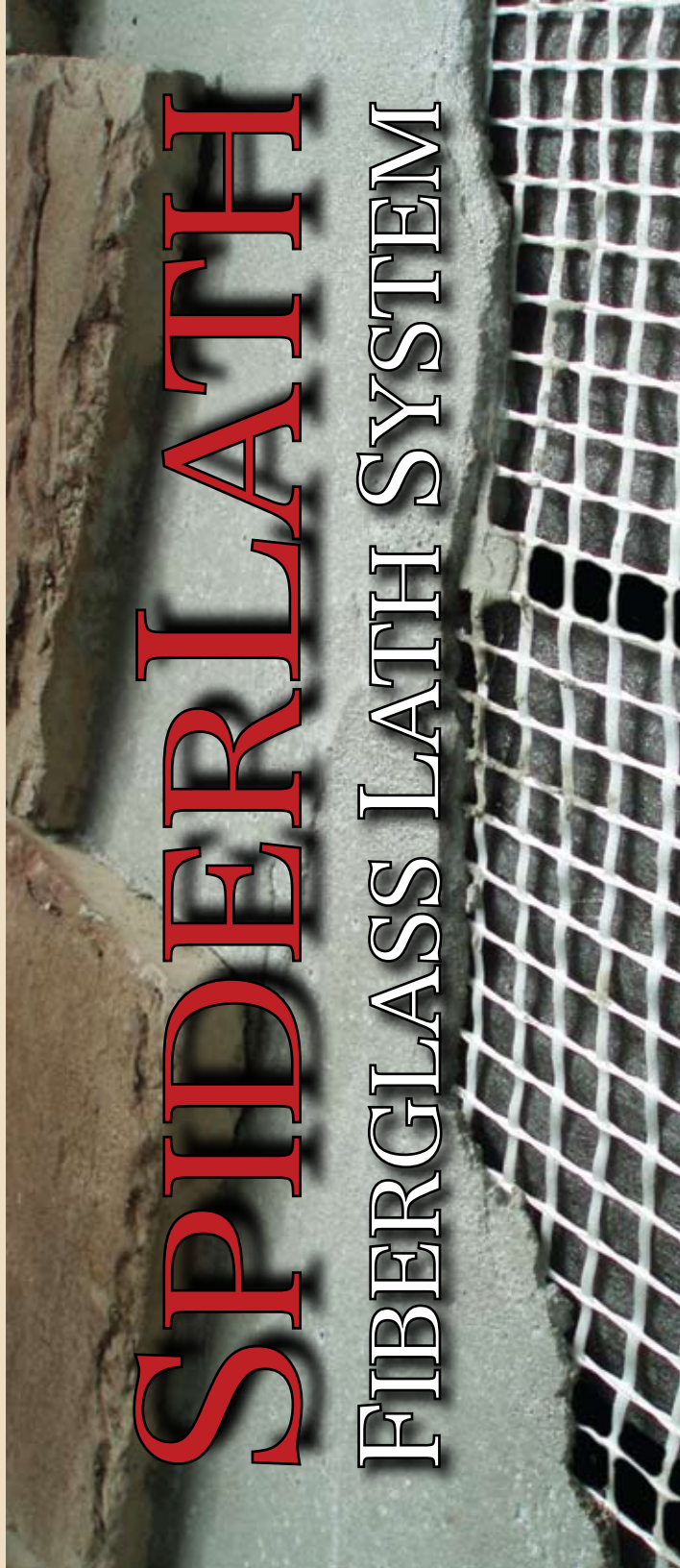
Smackover, AR 71762

Telephone: 870.725.3902
E-mail: info@spiderlath.com
www.SpiderLath.com

The most advanced lath system in the world!



SPIDERLATH

FIBERGLASS LATH SYSTEM

SPIDERLATH Technical Data

- Roll size: 4 ft. x 75 ft.
- Rolled up dimensions: 21 in. x 48 in.
- Roll weight: 20 lbs.
- Alkali Resistant (AR) fiberglass containing Zirconium Dioxide (Zr02).
- Three dimensional Leno Weave.
- Mesh weight: 8.82 oz. per sq. yd. (300 gsm).
- Mesh opening size: 0.25 in. (6.35 mm).
- Semi rigid coating.
- Stripping on back is semi rigid.
- Stripping is flexible foam.
- Stripping measurements: 9 equally spaced strips (6 in.). 0.375 in. x 0.5 in. x 75 ft.
- Each roll is wrapped in stretch wrap and contains installation instructions.

SPIDERLATH Testing

The ICC-ES AC 275 is the benchmark "Acceptance Criteria for Glass Fiber Lath Used in Cementitious Exterior Wall Coatings or Exterior Cement Plaster". SpiderLath has equalled or exceeded each of the tests required in the ICC-ES AC 275 and has recieved the appropriate Evaluation Report from IAPMO, accredited by the American National Standards Institute (ANSI).

For complete testing results and technical information, please visit our website at www.spiderlath.com/test.

IAPMO ES TM

IAPMO Evaluation #0141

SPIDERLATH Mesh Features

- SpiderLath is designed to be a replacement alternative for metal lath. Listed below are some of the applications used with SpiderLath: manufactured stone veneer, one and three coat stucco, natural stone thin veneer, concrete counter tops, plaster, tile, and water drainage systems.
- SpiderLath offers corrosion free material designed to last the life of the material being applied to it. SpiderLath is made from molten extruded Alkali Resistant fiberglass using Zirconium Dioxide.
- Cutting SpiderLath will not damage the alkaline resistant properties.
- SpiderLath uses a twisted weave to aid in keying the mortar.
- Easy to use, cuts with scissors or knife. Lath scratches and cuts are eliminated.
- SpiderLath adds tensile and flexural strength to the cementitous material providing a stronger bond.
- A thin coat of stiffening material is added to the fiberglass mesh to make the product easier to handle and faster to install.
- Very versatile, allowing it to be installed horizontally, vertically or diagonally.
- Easy to transport. Weighing only 20 lbs. per roll (300 sq. ft.) This is equivalent to 18 sheets of 2.5 metal lath which would weight about 90 lbs.
- Versatile and strong enough to use with heavy weight products such as three coat stucco and natural stone veneer.
- Installation time (labor costs) is reduced significantly because of the size and the ease at which the installer can unroll, stretch, and fasten.

Please visit the SpiderLath web site (www.SpiderLath.com) for information, installation instructions, test results, and more.

SPIDERLATH Strip System

SpiderLath strip system offers these advantages:

- **Nailing guide**. Less waste of fasteners.
- **Mesh Impact system**. Reduces the blow of the fastener, eliminating damage to the glass fibers.
- **Gasket sealer**. Seals around fastener holes, preventing penetration of water to the substrate, thus eliminating dry rot and mold.
- **Stand-off**. Allows mortar material to fill in behind the mesh and hold it on top of the mesh, forming a solid sheet of cementitious material. This allows the fiberglass mesh to be placed in the center of the cementitious material where it provides the optimal strength to assure less cracking and failures.

SPIDERLATH Installation

1. Place SpiderLath with the strip system facing the substrate/water barrier.
2. Stretch lath tight.
3. Fasten SpiderLath using large head nails, washer head screws or wide crown staples or any fastener approved by the local building code. Overlap all edges 2 inches.
4. Apply coat of mortar behind lath to fill in entire inside and coat outside of lath 0.5 inch.

INSTALLATION LABOR COSTS ARE REDUCED SIGNIFICANTLY

The following "Summary of Results" is a summary of the testing required to comply with ICC- ES Acceptance Criteria for Glass Fiber Lath Used in Cementitious Exterior Wall Coatings or Exterior Cement Plaster (AC-275).

Product Description as tested:

- Fiberglass "E Glass" lath / mesh is a three dimensional Leno Weave with a weight of 8.82 oz per sq. yard (300 gsm).
- Nominal opening size 0.25 inch square
- Semi rigid coating containing alkali resistant Zirconium Dioxide (14.5%).
- Attached to the back of the mesh is a semi rigid foam stripping spaced 9 equal times (6" o.c.) with 0.25 in x 0.5 in x 75 ft dimensions.

Summary of Results

Test Name	Reference Document	Test Method	Conditions of Acceptance	Results
Tensile Strength (Un-Exposed)	AC-275 (Section 3.1)	ASTM E-2098	120 lb/lin-ft	556 lb/lin-ft (Warp) 749 lb/lin-ft (Fill)
Tensile Strength (Exposed)	AC-275 (Section 3.2)	ASTM E-2098	120 lb/lin-ft	384 lb/lin-ft (Warp) 398 lb/lin-ft (Fill)
Transverse Load (Positive- Wood Studs)	AC-275 (Section 3.2)	AC-11 (Section 4.3)	Max Load as Reported (psf) 15% Variation (Max)	232 psf 4% variation
Transverse Load (Negative- Wood Studs)	AC-275 (Section 3.2)	AC-11 (Section 4.3)	Max Load as Reported (psf) 15% Variation (Max)	149 psf 9% variation
Transverse Load (Positive- Steel Studs)	AC-275 (Section 3.2)	AC-11 (Section 4.3)	Max Load as Reported (psf) 15% Variation (Max)	234 psf 3% variation
Transverse Load (Negative- Steel Studs)	AC-275 (Section 3.2)	AC-11 (Section 4.3)	Max Load as Reported (psf) 15% Variation (Max)	406 psf 4% variation
Attachment Test (Wood Studs)	AC-275 (Section 3.2.3)	AC-275 (Section 3.2.3.2	18 lbf (Min)	95 lbf
Attachment Test (Steel Studs)	AC-275 (Section 3.2.3)	AC-275 (Section 3.2.3.2)	48 lbf (Min)	123 lbf
Embedment Test	AC-275 (Section 3.3)	AC-191 (Section 3.7)	50% @ ¼" (Min)	Average 82% greater than ¼"
Surface Burning (Characteristics)	AC-275 (Section 3.5)	ASTM E-84	Report as Tested	Flame Spread = 0 Smoke Density = 0

Everbilt

1/16 in. Stainless Steel Uncoated Wire Rope

★★★★★ Write the first Review Questions & Answers (2)

$0.28 /feet

Overview

7 x 7 wire rope is constructed of 7 strands of 7 wires and is semi-flexible. 7 x 7 uses heavier gauge wire and offers better abrasion resistance than 7 x 19. It's superior strength allows for multiple uses, such as guy wires, net suspens... See Full Description

Specifications

Dimensions

Product Depth (in.)	12	Product Length (in.)	12
Product Height (in.)	1	Product Width (in.)	1
Product Length (ft.)	1	Rope Diameter (in.)	1/16

Details

Color Family	Metallics	Material	Steel
Double loops	No	Package Quantity	1
Fastener Type	Wire Rope	Product Weight (lb.)	1lb
Gauge	0.0625	Rope configuration	Twisted
Hooks	No	Vinyl coated	0
Load limit (lb.)	96		

Product Overview

7 x 7 wire rope is constructed of 7 strands of 7 wires and is semi-flexible. 7 x 7 uses heavier gauge wire and offers better abrasion resistance than 7 x 19. It's superior strength allows for multiple uses, such as guy wires, net suspension, animal leashes, tether lines and winches.
California residents: see Proposition 65 information ↗

- Stainless steel finish for great weather resistance
- Working load limit of 96 lbs.
- Maximum working load limit that shall be applied in direct tension to a new and undamaged wire rope
- Do not use for overhead lifting, do not exceed the working load limit

GRAINGER APPROVED

50 ft. Natural Nylon Tubing, 1/8" Outside Dia., 3/32" Inside Dia.

Item # **2VDL5** Mfr. Model # **2VDL5** Catalog Page # **2845** UNSPSC # **31231321**

How can we improve our Product Images?

Compare

Web Price
$9.00 / each

One Time Delivery
Auto Reorder

1 ADD TO CART

+ Add to List

Shipping Pickup

Expected to arrive **Thu. Mar 15**.

Ship To **86001** (Change)

Be the first to write a review

Shipping Weight **0.3 lbs.**

Country of Origin **China** | *Country of Origin is subject to change.*

Note: Product availability is real-time updated and adjusted continuously. The product will be reserved for you when you complete your order. More

TECHNICAL SPECS

Item	**Tubing**	Tube Length	**50 ft.**
Tube Material	**Nylon**	Tube Color	**Natural**
Tube Hardness	**Shore D: 60**	Tolerance	**+0.002 to -0.004"**
Inside Dia.	**3/32"**	Temp. Range	**-4 Degrees to 175 Degrees F**
Outside Dia.	**1/8"**	Burst Pressure	**675 psi**
Wall Thickness	**1/64"**	Vacuum Rating	**28 in. Hg.**
Max. Pressure	**267 psi @ 68 Degrees F**	Standards	**NFE 49.100**

How can we improve our Technical Specifications?

PRODUCT DATA

MasterFormat: 03 35 00

W. R. MEADOWS SEALTIGHT

NO. 366-B

APRIL 2014
(Supersedes August 2011)

ARIZONA SEAL

Non-Yellowing, Acrylic Quick Dry Sealing Compound

DESCRIPTION

ARIZONA SEAL is an acrylic polymer solution that dries to a transparent film, which improves abrasion resistance of the concrete surface. It is specially formulated to enhance the natural beauty of most cementitious materials and will not after-yellow. In addition, ARIZONA SEAL is also formulated to enhance the beauty of natural stone in exposed aggregate surfaces while providing maximum surface protection. When properly applied, ARIZONA SEAL produces a glossy "wet look" finish.

USES

ARIZONA SEAL can be used on exterior concrete surfaces without discoloring, checking, or peeling. Its long-lasting protective film offers improved resistance to rain, sun, freezing temperatures, oil, grease, de-icing salts, cleaning agents (except for aromatic solvents), caustics, most acids and industrial chemicals, airborne soot, dust, and other pollutants. ARIZONA SEAL is also ideal for freshly finished or existing (old) exposed aggregate surfaces.

FEATURES/BENEFITS

- Permeable film allows moisture in cured concrete to evaporate.
- Provides shiny, wet look … enhances the beauty of concrete and exposed aggregate.
- Applies easily to newly placed or existing concrete or exposed aggregate surfaces.
- Dries quickly once applied.
- Seals and dustproofs.
- Improves resistance to staining and wear.
- Accepts acrylic paint overlays.
- Ready to use.

PACKAGING

1 Gallon Units
5 Gallon Pails
55 Gallon Drums

COVERAGE

300 – 600 ft.^{2}/gal., depending on surface finish.

SHELF LIFE

When stored indoors and in original, unopened containers at temperatures between 40 - 90° F , shelf life is two years from date of manufacture.

SPECIFICATIONS

- AASHTO M 148, Type 1, Classes A & B
- ASTM C 309, Type 1 Classes A & B
- ASTM C 1315, Type I, Class A

TECHNICAL DATA

VOC Content: 653 g/L

APPLICATION

Surface Preparation … Exposed Aggregate: ARIZONA SEAL may be applied over freshly finished exposed aggregate as soon as the surface moisture has disappeared. On existing exposed aggregate, clean the surface thoroughly and rinse well. ARIZONA SEAL may be applied to damp surfaces.

Existing (Old) Concrete … Concrete surfaces must be clean and dry with all stains, oil, grease, dust, dirt, and curing compounds removed prior to application. ULTRITE® DEGREASER from W. R. MEADOWS is recommended for cleaning.

Mixing … For optimum performance, gentle mixing or agitation is recommended. CAUTION: TO AVOID FOAMING, DO NOT MIX EXCESSIVELY.

Application Method … Exposed Aggregate: Apply using a good quality natural bristle brush or a short nap roller. Spread in a thin, even coat, being careful to avoid puddling.

CONTINUED ON REVERSE SIDE…

W. R. MEADOWS, INC.
P.O. Box 338 • HAMPSHIRE, IL 60140-0338
Phone: 847/214-2100 • Fax: 847/683-4544
1-800-342-5976
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Concrete … Use a low pressure, high solids, industrial/commercial-grade sprayer, such as a Chapin 19069, that is suitable for use with high concentrations of solvents such as xylene, acetone, etc. Sprayers should be fitted with solvent-resistant Extreme Viton (encapsulated silicone Viton) **or** EPDM seals, gaskets, o-rings, etc. (Do **NOT** use garden sprayers or form oil sprayers.) The sprayer must be clean and dry prior to application. It's also important to read and follow all instructions provided by the sprayer manufacturer, PRIOR to use. Use a sprayer or short-nap roller to apply a uniform film. Avoid puddling in low areas. If puddles occur, brush or roll them out. A spray tip rated at 0.5 GPM is recommended for best results.

For optimum performance, apply first coat at 600 $ft.^2$/gal. After the first coat has thoroughly dried, apply a second coat at 600 $ft.^2$/gal. NOTE: The second coat should be applied at a right angle.

Drying Time … Drying times may be extended, depending on application rate, temperature, humidity, and project conditions. Protect the freshly coated surface from traffic, dust, condensation, and rain while drying. The surface will be slippery while drying and may become slippery under certain conditions.

Cleanup … Application equipment should be cleaned promptly after use with xylene or toluene.

PRECAUTIONS

DO NOT DILUTE. FOR EXTERIOR APPLICATION ONLY. Do not apply ARIZONA SEAL if the temperature of the surface is less than 40° F. Do not apply to painted or frozen surfaces. Apply a test patch in an inconspicuous area before applying to the intended surface.

ARIZONA SEAL should not be applied during high temperature conditions in direct sunlight. These conditions cause rapid evaporation, which does not allow the film to form properly. Under these conditions, the film may peel, bubble, and/or turn white (blush).

ARIZONA SEAL should not be applied to exposed aggregate subject to excessive moisture. Entrapped moisture in a solvent-based sealer may cause the film to peel and/or turn white (blush).

Do not apply ARIZONA SEAL over stained wood joint dividers. This may cause stain to spread while the sealer is wet. Avoid brush or roller contact with wood partitions. The surface may become slippery under certain conditions.

LEED INFORMATION

May help contribute to LEED credits:

- MR Credit 2: Construction Waste Management
- MR Credit 5: Regional Materials

For most recent data sheet, further LEED information, and MSDS, visit www.wrmeadows.com.

LIMITED WARRANTY

W. R. MEADOWS, INC. warrants at the time and place we make shipment, our material will be of good quality and will conform with our published specifications in force on the date of acceptance of the order. Read complete warranty. Copy furnished upon request.

Disclaimer

The information contained herein is included for illustrative purposes only, and to the best of our knowledge, is accurate and reliable. W. R. MEADOWS, INC. cannot however under any circumstances make any guarantee of results or assume any obligation or liability in connection with the use of this information. As W. R. MEADOWS, INC. has no control over the use to which others may put its product, it is recommended that the products be tested to determine if suitable for specific application and/or our information is valid in a particular circumstance. Responsibility remains with the architect or engineer, contractor and owner for the design, application and proper installation of each product. Specifier and user shall determine the suitability of products for specific application and assume all responsibilities in connection therewith.