

# *VolCano*

*2019 Concrete Canoe Project Overview and  
Technical Addendum*

*Northern Arizona University*

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0.07-0.84 mm.....

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4.76-6.35 mm.....

2.89-3.36 mm.....

0.07-0.84 mm.....

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# Compliance Certificate

The Northern Arizona University Concrete Canoe team, *VolCanoe*, hereby certifies that

- i) the construction and finishing of the canoe has been performed in complete compliance with the Rules and Regulations of the National Competition;
- ii) the registered participants at the Conference/National Competition are qualified student members and National Student Members of ASCE, and meet all eligibility requirements;
- iii) the canoe has been completely built within the current academic year;
- iv) the team acknowledges all Material Technical Data Sheets (MTDS) and Safety Data Sheets (SDS) have been read by the team, and
- v) the team acknowledges receipt of the Request for Information (RFI) Summary and that their entry complies with responses provided.

Registered Participants	ASCE National Member IDs
Virgilio Bareng (Sr.)	10968838
Jennifer Chavez (Sr.)	11358383
Kylie Dykstra (Sr.)	10934536
Trevor Mahoney (Sr.)	11855055
Allyson Marnocha (Sr.)	10969417
Ernesto Mauricio (Sr.)	10660981
Logan Grijalva (Jr.)	11378386
Nick Campbell (Jr.)	11855111
Marie Cook (So.)	11377521
Hannah Fischer (So.)	11850264

<i>VolCanoe</i> Canoe Parameters	
Maximum Length	219 in
Maximum Width	33 in
Maximum Depth	16 in
Average Thickness	0.75 in
Overall Weight	300 lb

<i>VolCanoe</i> Concrete Properties		
Mixes	Interior & Exterior Finishing	Structural
Wet Unit Weight	59.4 pcf	63.7 pcf
Oven-Dry Unit Weight	47 pcf	53 pcf
28-Day Compressive Strength*	1,950 psi	2,080 psi
28-Day Tensile Strength*	270 psi	300 psi
28-Day Flexural Strength*	1,330 psi	1,500 psi
Slump	5.5 in	6.75 in
Concrete Air Content	10.0%	9.1%



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# "How To..." Mold Construction

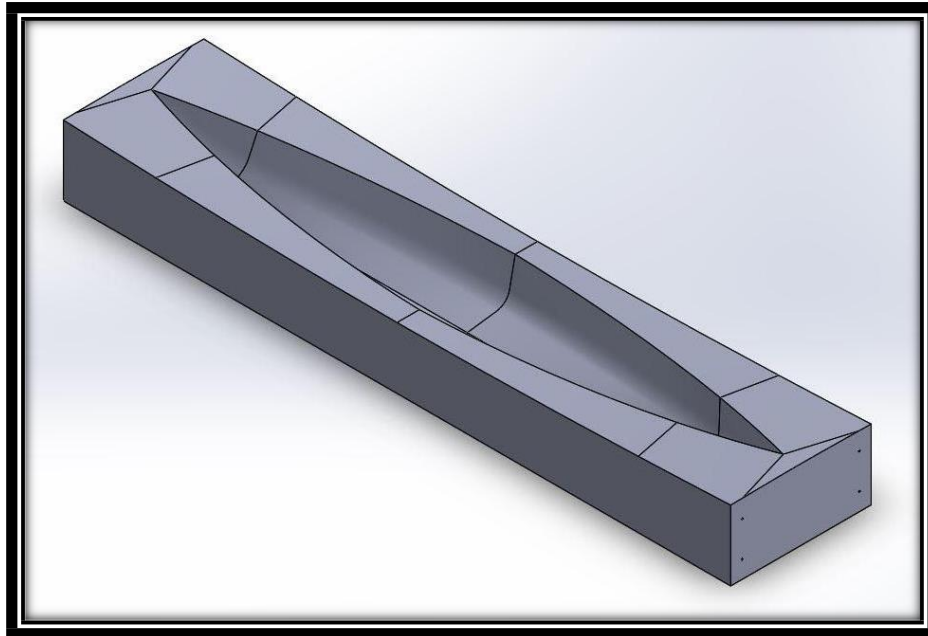


Figure 1: A Solidworks 2018 female mold hull design model was created. This was then put into 2D AutoCad and sent to XY Corp to CNC the mold and cut.

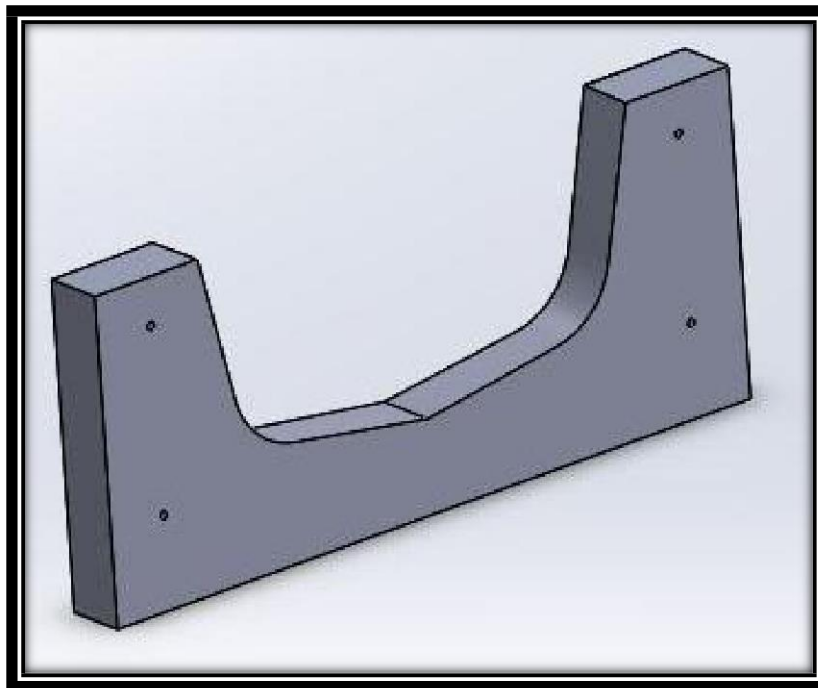


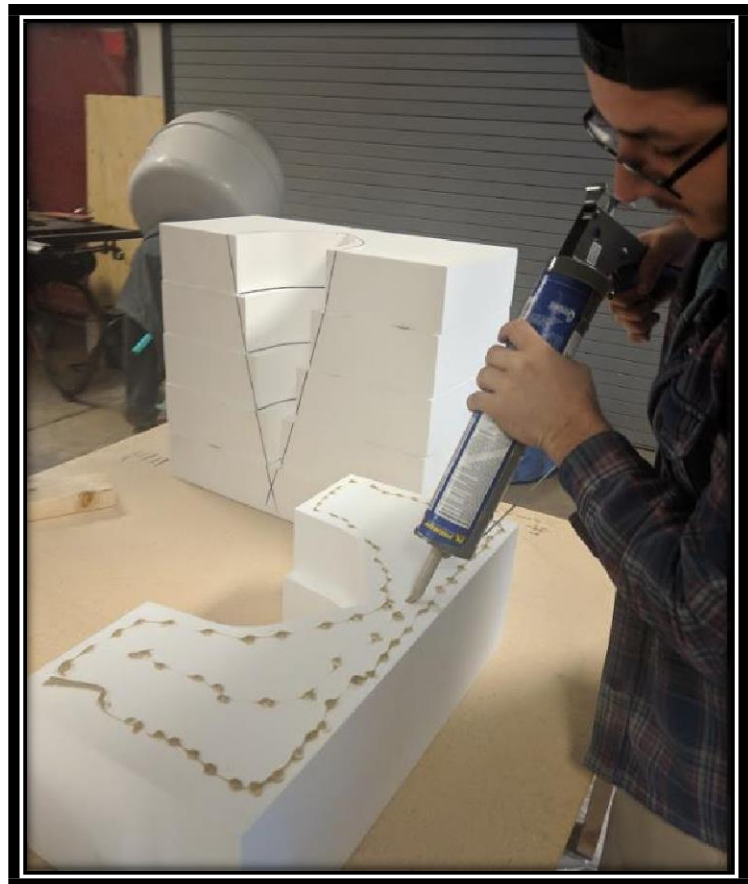
Figure 2: This is one of the 92 cross sections in Solidworks 2018 used for the female mold.

# "How To..." Mold Construction



Figure 3: Once the cross sections were brought back from Palm Springs where it was CNC'd by XY Corp Numbers were written on them to make sure they were placed together correctly. They were then carefully brought back to Northern Arizona University and placed together.

Figure 4: Heavy duty glue (Polyurethane Construction Adhesive) was placed in between the cross sections. However, not a lot of glue could be used or it would seep through the cracks into the inside of the canoe affecting the concrete placement.



# "How To..." Mold Construction

Figure 5: Since a female mold was being implemented, the team needed a way to push the cross-sections of the foam together after gluing. A hole on each of the four corners were drilled so four rods would be able to be pushed through all pieces of the cross-sections. A metal sheet is placed at the ends to avoid bolts to be impaled through the foam. Bolts are used outside of the metal sheet and tightened to compress the cross-sections together.



Figure 6: Little sections of foam were glued together so clamps could be used to push the cross sections together while it dried.



# "How To..." Mold Construction

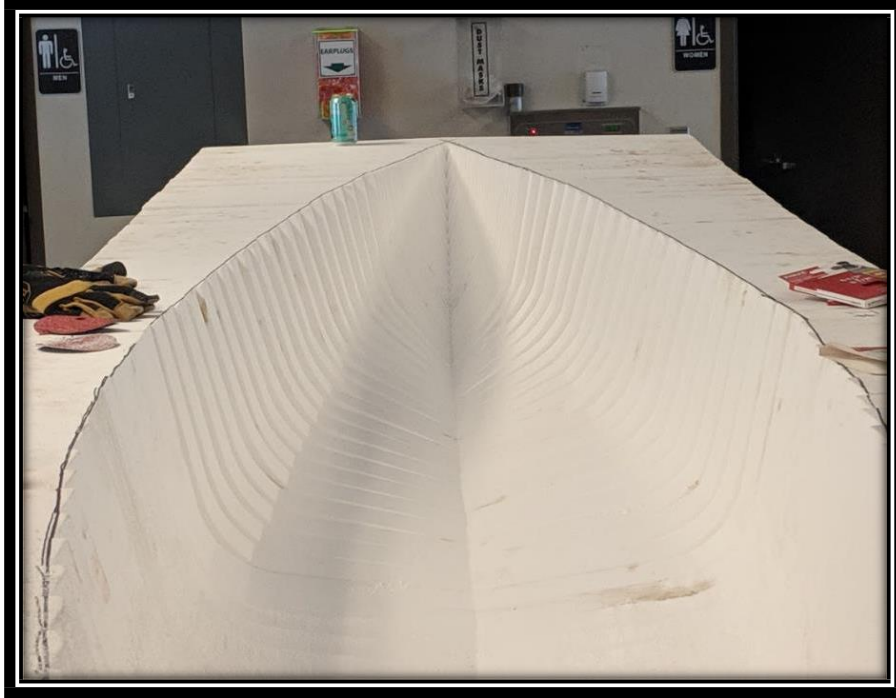


Figure 7: Once little sections were all glued, then the metal sheets and the rods come into play where bolts are used to tighten it all together. This picture shows all the cross-sections pushed together ready to be sanded.



Figure 8: The bottom part of the picture is the only part of the canoe that has been sanded.

# "How To..." Mold Construction



Figure 9: Shadow sanding was implemented by turning off all of the lights and using a single bright light to see any faults or uneven places of the foam. This helps make sure the canoe outline is smooth.

Figure 10: Once the sanding process was complete, flex seal was placed on the whole inside of the mold to help reduce the concrete from sticking. It also helps the concrete to be placed on a smooth layer.



# "How To..." Mold/Canoe Construction



Figure 11: The flex seal is then dried for at least 24 hours before the canoe construction began.

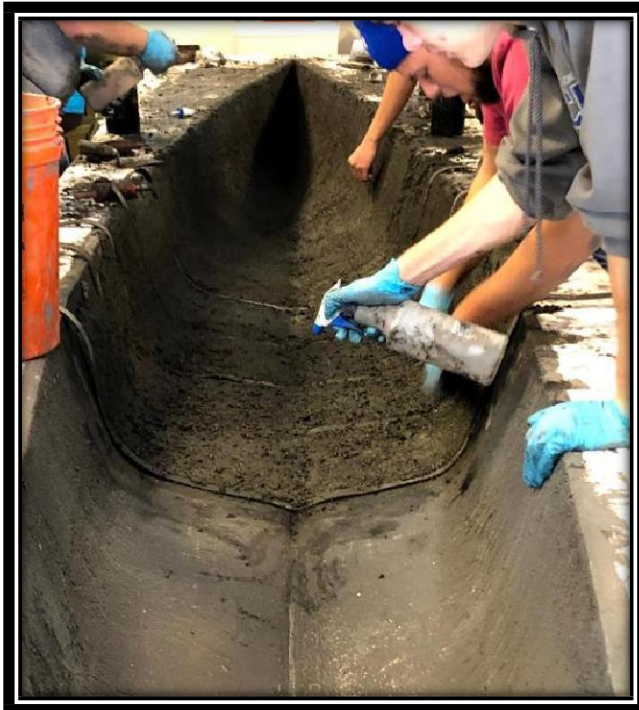


Figure 12: The construction process began here using 1/8<sup>th</sup> rubber strips to gage the quality thickness control of the placed concrete. They were pinned into the mold with small nails. This was placed every 12 inches down half of the canoe. A bubblegum release agent was also sprayed on the flex seal coated mold before the concrete placement to make sure the concrete does not stick to the mold.



# "How To..." Canoe Construction

Figure 13: This picture shows the finished first layer of concrete. This mix was the black finishing concrete.

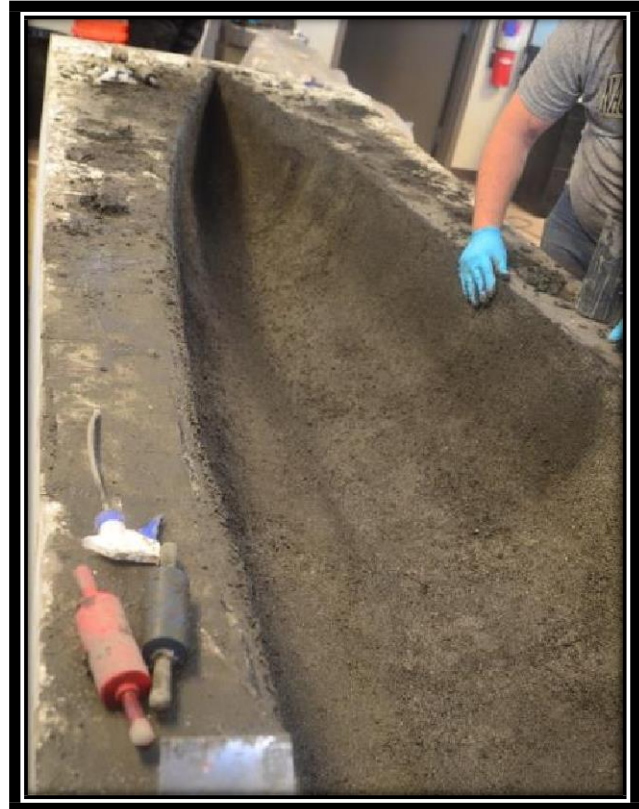


Figure 14: A single layer of Basalt mesh reinforcement was placed on the bottom of the canoe.



# "How To..." Canoe Construction

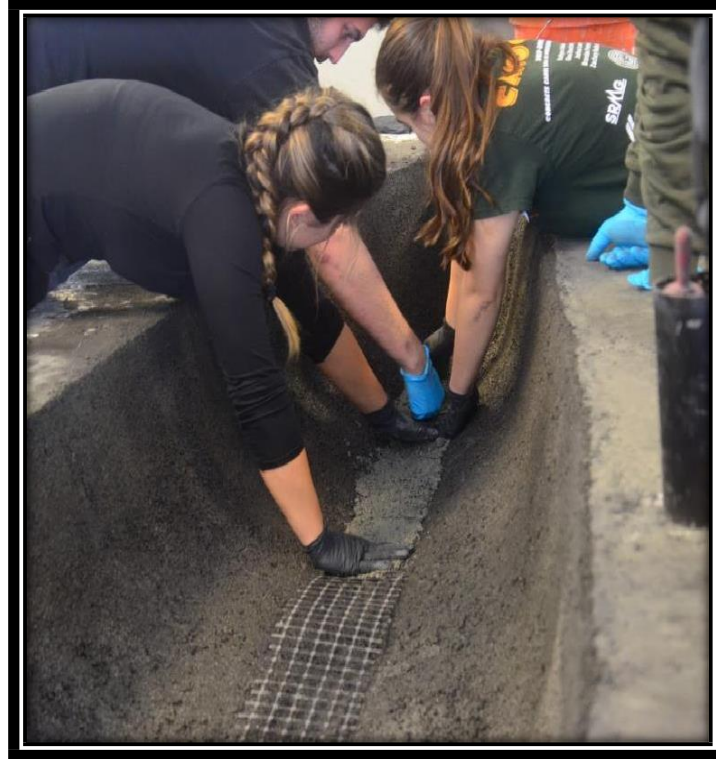


Figure 15: The reinforcement was covered with a layer of structural mix to hold it down.



Figure 16: This picture shows the finished structural mix layer of concrete.

# "How To..." Canoe Construction

Figure 17: The rest of the Basalt mesh reinforcement was then placed and cut accordingly to the size of the canoe.



Figure 18: The final finishing layer of concrete that is red is then placed on the reinforcement to hold it in place before the rest of the concrete is placed.



# "How To..." Canoe Construction



Figure 19: The finishing red layer is being carefully placed with the trowels and rollers onto the layer of reinforcement.



Figure 20: Quality assurance was done on the rim of the canoe by trowel and hand.

# "How To..." Canoe Construction



Figure 21: End caps were put in at the end of the canoe, and were then covered with the red finishing layer of concrete.



Figure 22: The end caps were covered with the red finishing concrete layer.



# "How To..." Canoe Construction



Figure 23: Once the final layer was placed on the canoe, PVC pipe was used to create a curing chamber around the canoe.



Figure 24: A plastic 6mm tarp was placed over the PVC pipe to avoid the escape of moisture.

# "How To..." Finishing Techniques

*\*\*The rest of the Finishing Techniques will be displayed at PSWC. The finishing techniques have not been completed by the date of this submittal.*



# "How To..." Finishing Techniques

**PHOTO PENDING-**

*Hardcopy of photos will be displayed at the  
Final Product Display.*

Figure 27:



Figure 28:

**PHOTO PENDING-**

*Hardcopy of photos will be displayed at the  
Final Product Display.*





# "How To..." Finishing Techniques

**PHOTO PENDING-**

*Hardcopy of photos will be displayed at the  
Final Product Display.*

Figure 29:

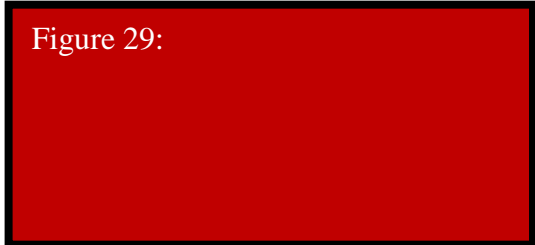


Figure 30:

**PHOTO PENDING-**

*Hardcopy of photos will be displayed at the  
Final Product Display.*



# "How To..." Finishing Techniques

**PHOTO PENDING-**

*Hardcopy of photos will be displayed at the  
Final Product Display.*

Figure 31:

Figure 32:

**PHOTO PENDING-**

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Final Product Display.*

# "How To..." Finishing Techniques

**PHOTO PENDING-**

*Hardcopy of photos will be displayed at the  
Final Product Display.*

Figure 33:

Figure 34:

**PHOTO PENDING-**

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# "How To..." Other Photos

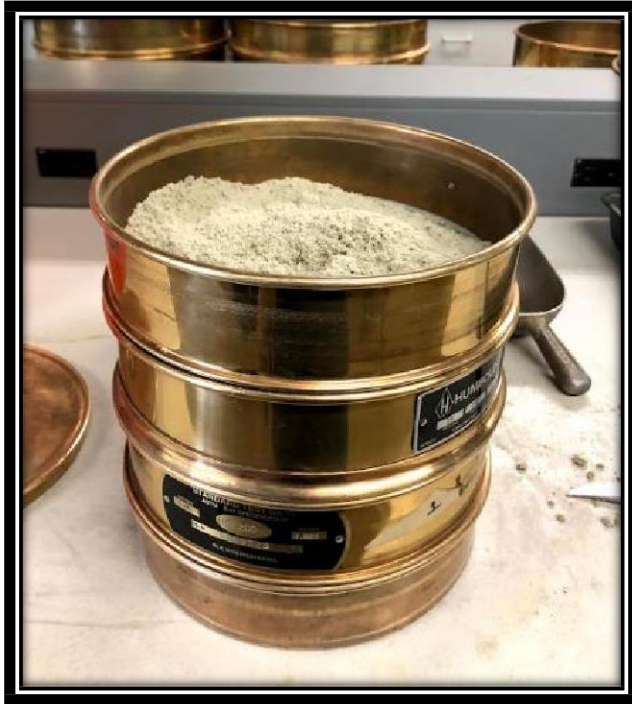
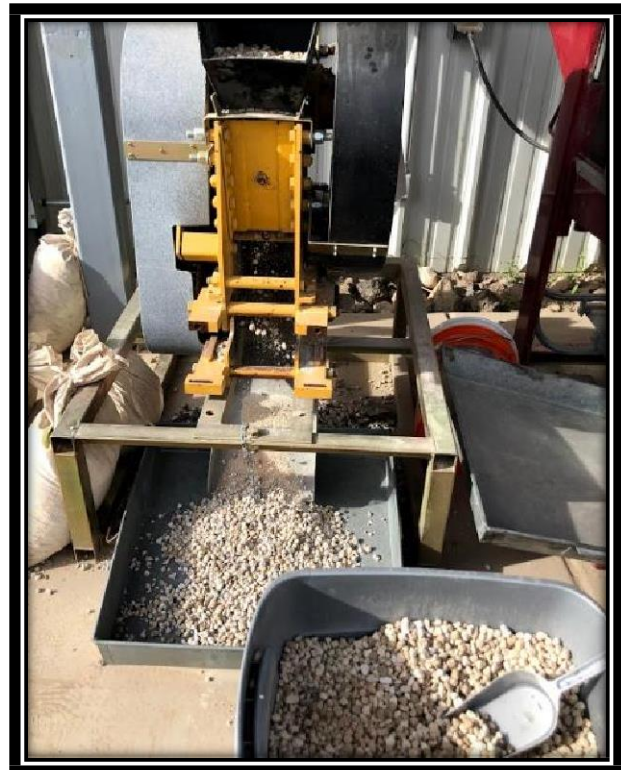


Figure 35: Cementitious material was placed in #200 sieves to make sure the material was compliant with the rules.

Figure 36: Aggregate was crushed and then sieved to specific millimeters in Tempe.



# "How To..." Other Photos



Figure 37: A slump test was conducted to analyze and test the mix.



Figure 38: Four humidifiers were placed at each corner of the mold inside the curing chamber. Salt was also put into the water of the humidifiers. This was the team's way of ensuring that the canoe was properly moist and curing correctly at all times. The humidifiers were checked and refilled every 12 hours.



# "How To..." Other Photos



Figure 39: A compression break of the finishing mix cylinder was tested for the compressive strength of the mix.

Figure 40: A tensile break of the structural mix cylinder was tested for the tensile strength of the mix.



# PHOENIX CEMENT

PORTLAND TYPE I/II/V (LA)



Phoenix Cement® Type I/II/V (LA) cement meets all chemical and physical requirements of the current ASTM Specification C 150 for Type I, II and V, low alkali cements and C 1157 for Type GU, MS, and HS. Type I/II/V (LA) is a general, all-purpose cement for use in most general construction applications.



## Strength

ASTM C 109 cement cubes made with Phoenix Cement® Type I/II/V (LA) produce compressive strengths far exceeding ASTM C 150 requirements. More importantly, compressive strengths of concrete made with Phoenix Cement® Type I/II/V (LA) are consistently competitive with those required by the marketplace.

## Set Time

Concrete set times made with Phoenix Cement® Type I/II/V (LA) are consistently competitive with that required by the marketplace.

## Durability

Phoenix Cement® Type I/II/V (LA) is safe for use in any application where protection against moderate (MS) or high sulfate (HS) attack is required. The (LA) designation indicates low alkali requirements of ASTM C 150 are met, thereby reducing the potential for damage due to alkali-aggregate reactivity.

## Uniformity

Consistency in strength, color, fineness, chemical composition and set time provides users of Phoenix Cement Type® I/II/V (LA) with consistently high-quality finished products.

Random market samples of Phoenix Cement® Type I/II/IV (LA) are tested regularly at the Salt River Materials Group concrete laboratory to monitor performance in concrete. This understanding of end product performance enhances our ability to provide predictable and consistent product meeting customer requirements.

## Availability

Phoenix Cement® Type I/II/V (LA) is produced year-round at our Clarkdale manufacturing facility 100 miles north of the metro Phoenix area. Type I/II/V (LA) is available in bulk and sack at our Clarkdale Facility and in bulk at our Phoenix area terminals.

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.



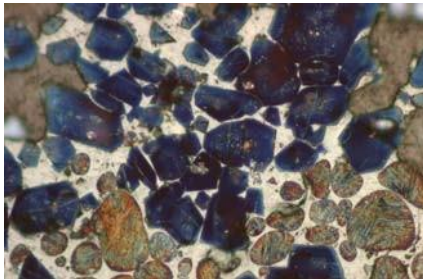
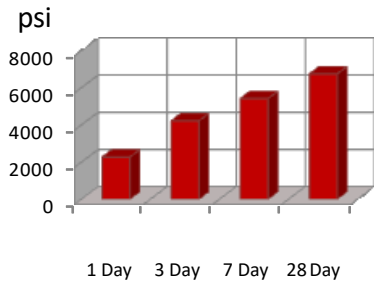


Clarkdale Shipping Facility

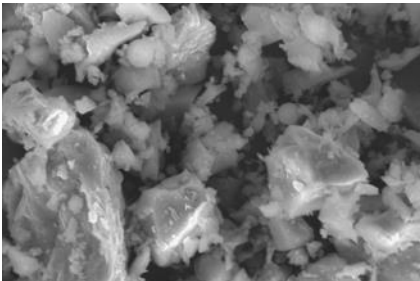


Cement Rotary Kiln, Clarkdale AZ

### ASTM C 109 Cube Strengths



Micrographs of cement crystal structure



Cement Particles 2500x

Chemical Analysis	Average Results	ASTM C 150 Specification Type II	ASTM C 150 Specification Type V
Calcium Oxide, CaO	63.83%	NA	NA
Silicon Dioxide, SiO <sub>2</sub>	21.30%	NA	NA
Aluminum Oxide, Al <sub>2</sub> O <sub>3</sub>	3.78%	6.00% Max	NA
Ferric Oxide, Fe <sub>2</sub> O <sub>3</sub>	3.75%	6.00% Max	NA
Magnesium Oxide, MgO	1.77%	6.00% Max	6.00% Max
Sulfur Trioxide, SO <sub>3</sub>	2.88%	3.00% Max	2.30% Max*
Loss on Ignition	1.34%	3.00% Max	3.00% Max
Insoluble Residue	0.30%	0.75% Max	0.75% Max
Alkalies (%Na <sub>2</sub> O+0.658% K <sub>2</sub> O)	0.42%	0.60% Max	0.60% Max
Sum of C <sub>3</sub> S+4.75C <sub>3</sub> A	77%	100% Max	NA
<b>Potential Composition</b>			
Tricalcium Silicate, C <sub>3</sub> S	59%	NA	NA
Tricalcium Aluminate, C <sub>3</sub> A	4%	8% Max	5% Max
Dicalcium Silicate, C <sub>2</sub> S	17%	NA	NA
<b>Physical Data</b>			
Fineness, Blaine cm <sub>2</sub> /gm	4000	4200 Max	2800 Min
Specific Gravity	3.15	NA	NA
Autoclave Expansion	0.01%	0.80% Max	0.80% Max
Air Content	7.00%	12.00% Max	12.00% Max
<b>Compressive Strength (psi)</b>			
1 Day	2260	NA	NA
3 Day	4220	1450 Min	1160 Min
7 Day	5420	2320 Min	2180 Min
28 Day	6740	NA	3050 Min
<b>Time of Setting, Vicat</b>			
Initial Set	1:46	0.45 Min	0.45 Min
Final Set	3:46	6:45 Max	6:45 Max
ASTM C 1038 (@14 days)	0.00%	0.020% Max*	0.020% Max*

Mission Statement  
 Creating Opportunities and  
 Solutions with Quality  
 Products and Exceptional  
 People

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

# PORTLAND POZZOLAN

## PHOENIX CEMENT® TYPE IP (25)



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 alkali-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.

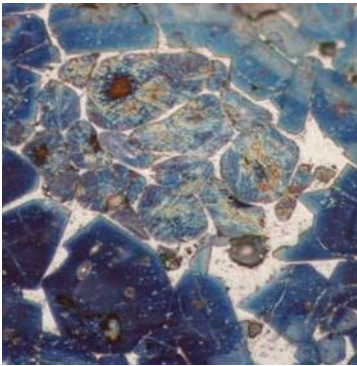
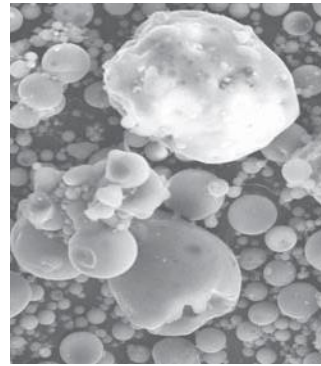


Photo micrographs of cement crystal structure



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 <sub>2</sub>	30.67%	NA
Aluminum Oxide, Al <sub>2</sub> O <sub>3</sub>	8.62%	NA
Ferric Oxide, Fe <sub>2</sub> O <sub>3</sub>	3.86%	NA
Magnesium Oxide, MgO	1.76%	6.00% Max
Sulfur Trioxide, SO <sub>3</sub>	2.73%	4.00% Max
Loss on Ignition	1.40%	5.00% Max
Physical Data		
Fineness, Blaine cm <sub>2</sub> /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





We create chemistry

MasterLife<sup>®</sup> 300D

Crystalline capillary waterproofing admixture

#### DESCRIPTION

**MasterLife 300D** admixture is an integral crystalline capillary waterproofing admixture for concrete. It is designed for use in above and below grade applications.

#### RECOMMENDED USES

- Sewage and water treatment plants
- Liquid retaining structures
- Water reservoirs and tanks for potable water
- Swimming pools
- Foundations, basements, lift pits, podiums, balconies and roofs
- Parking structures
- Precast, prestressed and post-tensioned concrete
- Culverts
- Blockfill
- Tunnel and subway systems
- Shotcrete
- Concrete subjected to wet, harsh and aggressive environments

#### BENEFITS

- Integral addition for optimum performance
- Reduces concrete permeability
- Allows concrete to breathe
- Reduces penetration of water and other liquids
- Seals hairline cracks
- Resists positive and negative side hydrostatic pressure
- Protects against sewage and industrial wastes

#### PERFORMANCE CHARACTERISTICS

##### Permeability

**MasterLife 300D** capillary waterproofing admixture is a Portland cement-based crystalline cementitious material that reacts in concrete to form non-soluble crystalline hydration products in the capillary pores of the concrete. These crystalline hydration products effectively reduce the permeability of concrete thus reducing capillary absorption and the penetration of water and other liquids.

#### Certification for use with Potable Water

**MasterLife 300D** is certified by NSF to NSF/ANSI Standard 61 – Drinking Water System Components – Health Effects, and therefore it is suitable for use in properly cured concrete structures in contact with potable water.

#### Typical data for MasterLife 300D admixture @ 2% by weight of cement

Performance characteristic	Test Method	Performance relative to untreated concrete mixture
Capillary absorption	ASTM C 1585	43% reduction
Water penetration	Modified DIN 1048	40% reduction
Moisture vapour emission rate	ASTM F 1869	Same
Electrical conductance	ASTM C 1202	Same
Compressive strength	ASTM C 39/C 39M	7% increase

#### APPLICATION

##### Dispensing & Mixing

**MasterLife 300D** admixture is batched at the concrete production plant in a manner similar to that for cement or other cementitious materials. It may be batched in either a central or truck mixer. Provide at least 5 minutes of agitating after the addition of **MasterLife 300D** admixture to ensure thorough and uniform distribution of the admixture in the concrete mixture.

##### DOSAGE

The dosage for **MasterLife 300D** admixture is 2% by weight of binder.

##### COMPATIBILITY

**MasterLife 300D** admixture can be used with Portland cements approved under Australian and New Zealand standards. It is compatible with most concrete admixtures, including all BASF admixtures. **MasterLife 300D** admixture is recommended for use with high-range water reducing admixtures, such as the MasterGlenium series, for maximum workability while maintaining a low water/binder ratio.





We create chemistry

MasterLife<sup>®</sup> 300D

**REPAIRS**

To repair and seal cracks in concrete and mortars treated with **MasterLife 300D** the use of **MasterSeal 501** is recommended. **MasterSeal 502** is a crystalline re-profiling render, which can be used in conjunction with **MasterSeal 501** for patch repairs and as render on old concrete surface.

**CORROSIVITY**

Non-chloride, non-corrosive: **MasterLife 300D** admixture will neither initiate nor promote corrosion of reinforcing or pre-stressing steel embedded in concrete or of galvanized steel floor and roof systems. Neither calcium chloride nor other chloride-based ingredients are used in the manufacture of **MasterLife 300D** admixture.

**PACKAGING**

**MasterLife 300D** admixture is available in 4 x 4 kg dissolvable bags packed in a pail.

**STORAGE**

**MasterLife 300D** admixture must be stored in a clean, dry area maintained at a minimum temperature of 7 °C. **MasterLife 300D** admixture has a shelf life of 12 months when stored under recommended conditions.

**PRECAUTIONS**

For the full health and safety hazard information and how to safely handle and use this product, please make sure that you obtain a copy of the BASF Safety Data Sheet (SDS) from BASF office or our website.

MasterLife-300D ANZ-V8-0217

**STATEMENT OF RESPONSIBILITY** The technical information and application advice given in this BASF publication are based on the present state of our best scientific and practical knowledge. As the information herein is of a general nature, no assumption can be made as to a product's suitability for a particular use or application and no warranty as to its accuracy, reliability or completeness either expressed or implied is given other than those required by law. The user is responsible for checking the suitability of products for their intended use.

**NOTE** Field service where provided does not constitute supervisory responsibility. Suggestions made by BASF either orally or in writing may be followed, modified or rejected by the owner, engineer or contractor since they, and not BASF, are responsible for carrying out procedures appropriate to a specific application.

**BASF Australia Ltd**  
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www.master-builders-solutions.basf.com.au

**BASF New Zealand Ltd**  
Level 4, 4 Leonard Isitt Drive  
Auckland Airport 2022  
Auckland, New Zealand  
**Freecall: 0800 334 877**  
www.master-builders-solutions.basf.co.nz

**BASF Emergency Advice:**  
1800 803 440 within Australia (24hr)  
0800 944 955 within New Zealand

**NYCON-PVA RECS15**  
**PVA (Polyvinyl Alcohol), Small Denier, Superior Bond**



**ULTRA-HIGH PERFORMANCE FIBERS**

PVA fibers are unique in their ability to create a fully-engaged molecular bond with mortar and concrete that is 300% greater than other



**NYCON-PVA RECS15 Physical Properties**

Filament Diameter	8 Denier (38 Microns)
Fiber Length	0.375" (8mm)
Specific Gravity	1.3
Tensile Strength	240 ksi (1600 MPa)
Flexural Strength	5700 ksi (40 GPa)
Melting Point	435° F (225° C)
Color	White
Water Absorption	<1% by Weight
Alkali Resistance	Excellent
Concrete Surface	Not Fuzzy
Corrosion Resistance	Excellent

**Description**

NYCON-PVA RECS15 fiber products are 8 denier, monofilament PVA fibers for use in fiber reinforced concrete, stucco and precast. NYCON-PVA RECS15 is specifically designed for use in concrete products for the purpose of controlling plastic shrinkage, thermal cracking and improving abrasion resistance. When NYCON-PVA RECS15 is used at high doses it can dramatically improve flexural characteristics of concrete products.

*NYCON-PVA RECS15 meets the requirements of ASTM C-1116, Section 4.1.3 and AC-32 at 1.0 lb (0.45 kg) per CY.*

**Applications**

NYCON-PVA utilizes the mixing activity to disperse the fibers into the mix. NYCON- PVA acts with a molecular bond in the concrete with a multi-dimensional fiber network. NYCON-PVA does not affect curing process chemically.

NYCON-PVA can be used in all types of concrete. Synthetic fibers help the concrete at early ages, which is especially beneficial where stripping time and handling is important.

**800-456-9266**

**[www.nycon.com](http://www.nycon.com)**

**[sales@nycon.com](mailto:sales@nycon.com)**



# NYCON-PVA RECS15

## PVA (Polyvinyl Alcohol), Small Denier, Superior Bond



- Advantages/Benefits**
- Molecular bond with the concrete
  - Reduces the formation of plastic shrinkage cracking in concrete.
  - Provides multi-dimensional reinforcement.
  - Improves impact, shatter and abrasion resistance of concrete.
  - Enhances durability and toughness of concrete.
  - Excellent, "no fuzz" finishability

**Mixing** NYCON-PVA RECS15 can be added directly to the mixing system during or after the batching of the ingredients and mixed at high speed for a minimum of five minutes. Additional mixing does not adversely affect the distribution or overall performance of NYCON-PVA. The addition of NYCON-PVA at the normal or high dosage rate does not require any mix design or application changes. A water reducer or super-plasticizer is recommended in concrete products where improved workability and finishability are desired.

**Tooling & Finishing** Fiber reinforced concrete can be finished by most finishing techniques. NYCON-PVA does not affect the finishing characteristics of concrete. NYCON-PVA can be used in power/hand troweled concrete, colored and broom finished concrete.

NYCON-PVA can be pumped and placed using conventional equipment. Hand screeds can be used, but vibratory and laser screeds are recommended to provide added compaction and bury surface fibers.

**Packaging** (30) 1 lb (0.45 kg) paper beater bags per box, 600 lbs per pallet  
(30) 1 lb (0.45 kg) water soluble bags per box, 600 lbs per pallet  
(21) 40 lb (18 kg) paper bulk bags, 840 lbs per pallet

NYCON-PVA Fibers are packaged in pre-measured 1 lb (0.45kg) degradable "toss-in" paper beater bags, water soluble bags or bulk bags.

**Storage and Shelf Life** NYCON-PVA should be stored in dry warehouse. Protect product from the rain.

**KEEP CONTAINER TIGHTLY CLOSED • KEEP OUT OF REACH OF CHILDREN • NOT FOR INTERNAL CONSUMPTION • FOR INDUSTRIAL USE ONLY**

All information provided by Nycon Corporation concerning Nycon products, including but not limited to, any recommendations and advice relating to the application and use of Nycon products, is given in good faith based on Nycon's current experience and knowledge of its products when properly stored, handled and applied under normal conditions in accordance with Nycon's instructions. In practice, the differences in materials, substrates, storage and handling conditions, actual site conditions and other factors outside of Nycon's control are such that Nycon assumes no liability for the provision of such information, advice, recommendations or instructions related to its products, nor shall any legal relationship be created by or arise from the provision of such information, advice, recommendations or instructions related to its products. The user of the Nycon product(s) must test the product(s) for suitability for the intended application and purpose before proceeding with the full application of the product(s).

Nycon reserves the right to change the properties of its products without notice. All sales of Nycon product(s) are subject to its current terms and conditions of sale which are available at [www.nycon.com](http://www.nycon.com) or by calling 800-456-9266.

Prior to each use of any Nycon product, the user must always read and follow the warnings and instructions on the product's most current Technical Data Sheet, product label and Material Safety Data Sheet which are available. Nothing contained in any Nycon materials relieves the user of the obligation to read and follow the warnings and instruction for each Nycon product as set forth in the current Product Data Sheet, product label and Material Safety Data Sheet prior to product use.

Nycon warrants this product for one year from date of shipment to be free from manufacturing defects and to meet the technical properties on the current Product Data Sheet if

**800-456-9266**

**[www.nycon.com](http://www.nycon.com)**

**[sales@nycon.com](mailto:sales@nycon.com)**

Nycon Corp. | 300 Ben Fairless Drive | Fairless Hills, PA 19030 | P: 800-456-9266 | P: 215-310-2139 | F: 215-736-2652

03 30 00	Cast-in-Place Concrete
03 37 13	Shotcrete
03 40 00	Precast Concrete
03 70 00	Mass Concrete

# MasterFiber<sup>®</sup> MAC Matrix

## Macrosynthetic Fiber

### Description

MasterFiber MAC Matrix product is a macrosynthetic fiber that is manufactured from a proprietary blend of polypropylene resins, and meets the requirements of ASTM C 1116/C 1116M “Standard Specification for Fiber-Reinforced Concrete.”

MasterFiber MAC Matrix product also meets the requirements of CSA B66-10 “Design, material, and manufacturing requirements for prefabricated septic tanks and sewage holding tanks.”

### Applications

Recommended for use in:

- ④ Shotcrete
- ④ Composite metal decks
- ④ Industrial and warehouse floors
- ④ Pavements
- ④ Precast concrete
- ④ Residential and commercial slabs-on-ground
- ④ Precast concrete pipes
- ④ Thin-wall precast
- ④ Tunnel linings
- ④ Wall systems
- ④ Whitetopping/overlays

### Features

MasterFiber MAC Matrix product is engineered for use as secondary reinforcement to control shrinkage and temperature cracking, and settlement cracking.

MasterFiber MAC Matrix product was created specifically to replace welded-wire reinforcement and No. 3 and No. 4 (10 mm and 13 mm) reinforcing bars that are typically used as temperature and shrinkage reinforcement.

MasterFiber MAC Matrix product has the following features:

- ④ Excellent flexural performance
- ④ Excellent finishability

### Benefits

- ④ Eliminates the need for welded-wire reinforcement (WWR) and small diameter bars used as secondary reinforcement, depending on the application
- ④ Effective tight crack control
- ④ Provides excellent control of settlement cracking
- ④ Improves green strengths and permits earlier stripping of forms with less rejection
- ④ Reduces construction time and overall labor and material costs
- ④ Reduces the effects of handling and transportation stresses
- ④ Increases flexural toughness, impact and shatter resistance

## Performance Characteristics

### Physical Properties

Specific Gravity	0.91
Melting Point	320 °F (160 °C)
Ignition Point	1094 °F (590 °C)
Absorption	Nil
Alkali Resistance	Excellent
Tensile Strength	85 ksi (585 MPa)
Nominal Length	2.1 in. (54 mm)
Nominal Aspect Ratio	70
Fiber Type	Embossed
Material	100% virgin polypropylene
Chemical Resistance	Excellent

### Guidelines for Use

**Dosage:** The dosage range of MasterFiber MAC Matrix product is 3 to 12 lb/yd<sup>3</sup> (1.8 to 7.2 kg/m<sup>3</sup>). The recommended dosage range for slab-on-ground applications is typically 3 to 5 lb/yd<sup>3</sup> (1.8 to 3 kg/m<sup>3</sup>). For shotcrete, the typical dosage range of MasterFiber MAC Matrix product is 8 to 12 lb/yd<sup>3</sup> (4.8 to 7.2 kg/m<sup>3</sup>).

**Mixing:** MasterFiber MAC Matrix product should be introduced at the beginning of the mixing cycle, but not at the same time as the cement. For slab-on-ground applications, the entire bag should be dispensed into the mixer to allow for easy handling, while leaving no waste on site. For shotcrete, the bag should be opened so that the fibers can be dispensed directly into the mixer. Three to five minutes of additional mixing will be required to disperse the fibers depending on when the product is added to the mixer. BASF recommends utilizing good concrete mixing practices as outlined in ASTM C 1116/C 1116M.

## Engineering Specifications

MasterFiber MAC Matrix product is an option for the replacement of WWR and is an easy-to-use secondary

reinforcing system that is rust proof, alkali resistant, and compliant with industry codes when mixed in accordance with ASTM C 1116/C 1116M. MasterFiber MAC Matrix product enhances safety and should be specified for use in

applications for:

- ④ Increased flexural toughness
- ④ Reduced rebound
- ④ Increased cohesion
- ④ Increased impact and shatter resistance
- ④ Extended pump life
- ④ Replacement of WWR and other secondary reinforcement
- ④ Improved residual strength
- ④ Improved durability
- ④ Use in areas requiring no metal

MasterFiber MAC Matrix product also conforms to the requirements of CSA B66-10 “Design, material, and manufacturing requirements for prefabricated septic tanks and sewage holding tanks”.

### Product Notes

Testing has shown that MasterFiber MAC Matrix product can be used as a partial or full replacement for primary/ structural steel reinforcement in concrete pipe. The dosage of MasterFiber MAC Matrix product to meet a specified performance level in concrete pipe should be determined in accordance with industry standard procedures. In other applications, MasterFiber MAC Matrix product may also be used as a partial or full replacement for primary/structural steel reinforcement. To explore the use of MasterFiber MAC Matrix product for such purpose, contact the Engineering Department at BASF Corporation in Beachwood, OH.

**Placement and Finishing:** BASF recommends that the standard practices detailed in ACI 302.1R, ACI 506.1R and ACI 544.3R for placing, finishing and curing concrete be followed when using MasterFiber MAC Matrix product.



## Storage and Handling

MasterFiber MAC Matrix product should be stored in a clean, dry area protected from the weather and at temperatures below 140 °F (60 °C). Avoid storing near strong oxidizers and avoid sources of ignition. Use caution when stacking to avoid unstable conditions. Store in a sprinkled warehouse.

## Packaging

MasterFiber MAC Matrix product is packaged in a 5 lb (2.3 kg) degradable bag that can be added directly to the mixing system. For shotcrete, the fibers are packaged in 11 lb (5 kg) and 15.4 lb (7 kg) bags which should be opened prior to dispensing the fibers into the mixer.

## Related Documents

Safety Data Sheets: MasterFiber MAC Matrix

## Additional Information

For additional information on MasterFiber MAC Matrix product, 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.



MasterFiber MAC Matrix fiber, as marketed by BASF Corporation, is classified by Underwriters Laboratories Inc. for use in the following fire rated assemblies: ULD700, D800 and D900 Series Designs. Fibers to be added to the concrete mix at a maximum rate of 5.0 lb of fiber for each cubic yard (3.0 kg/m<sup>3</sup>) of concrete.

## TECHNICAL DATA SHEET

Lightweight aggregate according to DIN EN 13055-1

Poraver <sup>®</sup> expanded glass	BASIC GRANULAR SIZES					SPECIAL GRANULAR SIZES	
	0.1-0.3	0.25-0.5	0.5-1	1-2	2-4	0.04-0.125	0.5-1.25
granular size in mm							
Bulk density in kg/m <sup>3</sup>	400 ± 60	340 ± 30	270 ± 30	230 ± 30	190 ± 20	530 ± 70	260 ± 30
Particle density in kg/m <sup>3</sup>	950 <sup>1)</sup> ± 150	700 <sup>1)</sup> ± 80	500 <sup>1)</sup> ± 80	400 <sup>1)</sup> ± 60	320 <sup>1)</sup> ± 40	1400 <sup>2)</sup> ± 300	490 <sup>1)</sup> ± 80
Crushing resistance in N/mm <sup>2</sup> according to DIN EN 13055-1 <sup>3)</sup>	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 <sup>4)</sup>	-	-
CE according DIN EN 13055-1	-	-	-	-	-	-	-
Approval -3.42-1894	-	-	-	-	-	-	-
Approval Z-23.11-114	-	-	-	-	-	-	-

<sup>1)</sup> apparent (relative) density according to EN 1097-6

<sup>2)</sup> Density of filler according to EN 1097-7

<sup>3)</sup> Values according to DIN V 18004 on request

<sup>4)</sup> 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 <sub>2</sub>	71.7 %	71.9 %	
Al <sub>2</sub> O <sub>3</sub>	2.5 %	2.5 %	
TiO <sub>2</sub>	0.1 %	0.1 %	
Fe <sub>2</sub> O <sub>3</sub>	0.4 %	0.4 %	
Mn <sub>2</sub> O <sub>3</sub>	0 %	0 %	
MgO	2.1 %	2.1 %	
K <sub>2</sub> O	0.8 %	0.8 %	
Na <sub>2</sub> O	13.2 %	13.2 %	coulometric
SO <sub>3</sub>	0.1 %	0.1 %	
cl	-	-	argentometric

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Malad City, ID 83252  
208-766-4777  
Fax: 208-766-4776

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## ASTM C330 Declaration

Hess Pumice Products, Inc. does hereby certify that our pumice materials comply with all of the chemical and physical properties required to meet ASTM C330 specification for Lightweight Aggregates for Structural Concrete, with the exclusion of particle size distribution which is grade specific.

A handwritten signature in black ink, appearing to read "Brian K. Jeppsen", is written over a horizontal line.

Brian K. Jeppsen  
Hess Pumice Products, Inc.  
VP R&D  
(208) 766-4777 ext 111  
brian@hesspumice.com

# Hess Grade $\frac{3}{8}$ x #8 MN

ISSUE 2007  
REVISION N/A  
REVIEW 5/2008

## PARTICLE SIZE SPECIFICATION GRADE $\frac{3}{8}$ x No.8 MN

SIZE		ALLOWABLE PERCENT PASSING
MICRON	U.S. MESH	
9525	3/8	98-100
4750	4	30-75
2360	8	0-20
300	50	0-12
150	100	0-10

TEST METHOD: ASTM C136-06

## LOOSE BULK DENSITY GRADE $\frac{3}{8}$ x No.8 MN

60 lbs/per cubic foot (ASTM C29)

## CHEMICAL ANALYSIS AND PHYSICAL PROPERTIES

**Chemical Name:** Amorphous Aluminum Silicate

### TYPICAL ANALYSIS

- Silicon Dioxide: 76.2%
- Aluminum Oxide: 13.5%
- Ferric Oxide: 1.1%
- Ferrous Oxide: 0.1%
- Sodium Oxide: 1.6%
- Potassium Oxide: 1.8%
- Calcium Oxide: 0.8%
- Titanium Oxide: 0.2%
- Magnesium Oxide: .05%
- Moisture: <1.0%
- Crystalline SiO<sub>2</sub>: None Detected

### GENERAL PROPERTIES

- Appearance: White powder
- Hardness (MOHS): 6
- pH: 7.2
- Radioactivity: None
- Softening Point: 900 degrees C
- Water Soluble Substances: 0.15%
- Loss on Ignition - 5%
- GE Brightness: 84
- Specific Gravity: 2.35
- Reactivity: Inert  
(except in the presence of calcium hydroxide or hydrofluoric acid)

## DESCRIPTION

Amorphous (non-crystalline) in structure and composed primarily of aluminum silicate, pumice is a naturally calcined volcanic glass foam consisting of highly vesicular strands permeated with tiny air bubbles. It is these frothy, friable glass vesicles that, when carefully refined to various grades, give pumice its unique and infinitely useful qualities.

## GRADE APPLICATIONS

Used for: aggregate for lightweight block and stone veneer products, soil conditioner, lightweight engineered soils, spill absorbent, bulking agent.

## PACKAGING OPTIONS

- 50 lb sacks (palletted)
- 2000 lb super sacks (palletted)
- Bulk shipped in rail car or tractor trailer

## DISTRIBUTOR NETWORK

We have stocking distributors in 23 countries on every continent except Antarctica, allowing us to deliver pumice quickly and economically worldwide.



**Hess PUMICE**

IDAHO USA

(208) 766-4777 x111 • email: rd@hesspumice.com  
www.hesspumice.com

*Mining and refining the purest commercial deposit of white pumice on the planet.*



H E S S P U M I C E P R O D U C T S


[LIST OF PUMICE GRADES](#)
[PUMICE PRODUCTS BY APPLICATION](#)
[ABOUT HESS PUMICE CO.](#)
[BELOW: PUMICE USES | TECHNICAL DATA ►](#)

## Pumice: Origins, Uses, Technical Data



Pumice from the Hess Pumice deposit in Southeast Idaho USA is an amazingly versatile stone, used in a wide variety of products and industrial processes.

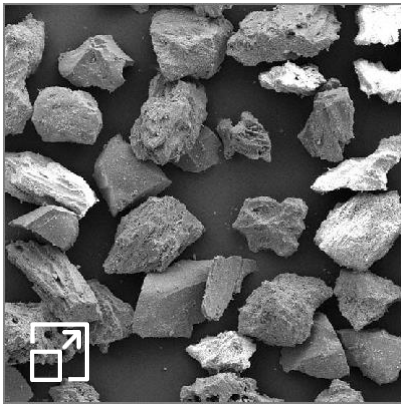
BORN OF EARTH AND FIRE, pumice is formed during volcanic pyroclastic events, typically spewed as ash that falls and drifts into deposits or as part of a massive pyroclastic flow. Many factors affect the useful quality, color, and purity of a pumice deposit, but on a chemical analysis level, pumice is basically an aluminum silicate. With no crystalline structure, pumice is a naturally calcined amorphous glass made up of a maze of air-filled vesicles.

The word *pumice* is derived from the Latin word *pumex*, meaning foam. Deep underground, molten rock incorporates water and other gases, and when the magma erupts from a volcanic vent, the gases flash off, leaving behind a frothy, vesicle-riven structure that quickly cools, solidifying the foamy structure.

Pumice enjoys a well-deserved green cred, as it is an abundant and sustainable resource, easily mined from surface deposits, and, having been naturally calcined (super-heated) in the fiery heat of a volcano, the only refining needed is to crush and screen it to grade.

### Uses for Pumice

PUMICE PROVED ITS HISTORICAL VALUE to industry when Roman engineers combined pumice aggregate and fine-grained pumice (a pozzolan) with their hydrated lime cement to make a



A micrograph of a tiny grade #2 pumice stone, showing the friable nature of pumice—ie. it holds its foamed-stone nature even when crushed to fine particles.

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[salesteam@hesspumice.com](mailto:salesteam@hesspumice.com)



SOURCED FROM THE WORLD'S  
PUREST COMMERCIAL DEPOSIT OF  
WHITE PUMICE

lightweight, enduring concrete. Many of their mighty concrete works still stand some two millennia later. Today, pumice is still being used as a superior pozzolan to super-charge concrete, but is also used widely in a variety of industrial process and product applications.

Pumice is amazingly versatile—used as a gentle polishing and cleansing abrasive, as lightweight aggregate and/or ultra-refined pozzolan in concrete, as a non-crystalline silica filler for paints, plastics and rubber compounds, as a soil conditioner, as a filtration media, and more.

That kind of versatility comes from a number of nature-blessed characteristics that combine to make it a valuable and widely applicable across a variety of industrial processes and products.

Pumice is amorphous and generally inert, has a neutral pH, yet is hard enough to be used as an abrasive. Yet, because of its porous nature, pumice is amazingly lightweight.

The friable nature of pumice is one of its most significant characteristics—meaning pumice is easily crushed and refined without losing its utility: at any grade—from half-inch aggregate to microfine powder—pumice remains abrasive, absorbent, non-compacting, lightweight.

Sustainable and abundant, pumice is indispensable.

Grouped by attribute, the following is a breakdown of where and how pumice is used.

**INDUSTRIAL ABRASIVE:** There are several key consideration criteria for selecting an exfoliant or scrub grit. One of the first is a track record: pumice has proven highly effective for use in exfoliating products.

**PRODUCT ABRASIVE:** There are several key consideration criteria for selecting an exfoliant or scrub grit. One of the first is a track record: pumice has proven highly effective for use in exfoliating products.

**MANUFACTURING AND FINISHING PROCESSES:** There are several key consideration criteria for selecting an exfoliant or scrub grit. One of the first is a track record: pumice has proven highly effective for use in exfoliating products.

**FILTRATION:** There are several key consideration criteria for selecting an exfoliant or scrub grit. One of the first is a track 2/5

record: pumice has proven highly effective for use in exfoliating products.

**ABSORBENT, SPILL CONTAINMENT:** There are several key consideration criteria for selecting an exfoliant or scrub grit. One of the first is a track record: pumice has proven highly effective for use in exfoliating products.

**HORTICULTURE, SOIL AMENDMENT:** There are several key consideration criteria for selecting an exfoliant or scrub grit. One of the first is a track record: pumice has proven highly effective for use in exfoliating products.

**FILLERS AND EXTENDERS:** There are several key consideration criteria for selecting an exfoliant or scrub grit. One of the first is a track record: pumice has proven highly effective for use in exfoliating products.

**CONCRETE AND CEMENTITIOUS GROUTS:** Pumice got its historical start as a useful agent when the Romans used it (known as pozzolan) to densify and strengthen their concrete—building enduring structures that still stand some two millenia later. Today, adding pumice pozzolan to concrete mix designs results in concrete that is highly resistant to ASR, sulfate attack, and chloride ingress, exhibits reduced thermal cracking, cures to form a nearly impermeable, highly-durable barrier that resists staining, cleans easily, and performs predictably, and continues to strengthen for years due to its pozzolanic charge.

Pumice concrete is composed of Portland Cement, pumice aggregate, pumice sand, pumice pozzolan, and water. Compared to regular concrete, pumice concrete offers roughly a one-third reduction in weight. Proportioning, mixing and placing are done in a similar manner to that of conventional concrete, as is the finishing. The applications for pumice concrete are also the same as those of standard sand-and-gravel concrete, but is particularly useful where lightweight concrete is desirable.

» Use the [PUMICE STORE APPLICATIONS DIRECTORY](#) to further explore the many uses for pumice and purchase the typical grades used for those applications.

» Learn more about [HESS PUMICE PRODUCTS](#), the company that mines and refines the purest deposit of white pumice on

the planet.

## Technical Data

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### DESCRIPTION:

Amorphous (non-crystalline) in structure and composed primarily of aluminum silicate, pumice is a naturally calcined volcanic glass foam consisting of highly vesicular strands permeated with tiny air bubbles. It is these frothy, friable glass vesicles that, when carefully refined to various grades, give pumice its unique and infinitely useful qualities.

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### PHYSICAL PROPERTIES OF PUMICE:

**Description:** Non-crystalline (amorphous) foamed glass stone of volcanic origin. Grey-white (stone grades) to white (powder grades) in appearance.

**Brightness:** (GE) 84

**Hardness:** (MOHS) 6

**Reactivity:** Inert (except in the presence of calcium hydroxide or hydrofluoric acid)

**pH:** 7.2 (neutral)

**Loose Bulk Density:** Varies with grade (Download Technical Data Sheet of specific product below)

**Specific Gravity:** 2.35

**Softening Point:** 900 Degrees C

**Water Soluble Substances:** 0.15%

**Radioactivity:** None

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### CHEMICAL OF PROPERTIES OF PUMICE:

**Chemical Name:** Amorphous Aluminum Silicate

**Composition:** Primarily made up of Silicon Dioxide and Aluminum Oxide with traces of other oxides.

**Silicon Dioxide:** 76.2%

**Aluminum Oxide:** 13.5%

**Ferric Oxide:** 1.1%

**Ferrous Oxide:** 0.1%



**Sodium Oxide:** 1.6%

**Potassium Oxide:** 1.8%

**Calcium Oxide:** 0.8%

**Titanium Oxide:** 0.2%

**Magnesium Oxide:** 0.05%

**Crystalline SiO<sub>2</sub>:** none detected

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## **ADDITIONAL INFORMATION and SUPPORT DOCUMENTS:**

» Download: [Technical Data Sheet](#) (PDF)

» Pumice [Safety Data Sheet](#) (PDF)



TECHNICAL DATA







# AeroAggregates UL-FGA G15

Ultra-Lightweight Foamed Glass Aggregate

## Density (Unit Weight)

Uncompacted dry bulk density (ASTM C29/C29M/ AASHTO T 19) <sup>1</sup>	12-15 pcf
Estimated compacted dry density	
1.11 Compression Ratio (10% Compaction of Each Lift)	13.3-16.7 pcf
1.25 Compression Ratio (20% Compaction of Each Lift)	15-18.8 pcf
Estimated buoyant unit weight	-15 pcf

## Typical Gradation Characteristics (uncompacted) [ASTM C136/ AASHTO T 27]<sup>1</sup>

D85	2.5" (maximum)
D15	0.375" (minimum)

## Physical Characteristics

Moisture Content	
Volumetric (%)	0-10 (6% typical)
Gravimetric (%) [ASTM C566/ AASHTO T 255] <sup>1</sup>	0-60 (25% typical)
Particle Specific Gravity (AASHTO T 85)	0.38
Porosity	
Uncompacted	0.5
1.25 Compression Ratio	0.38
Soundness (% Loss)	
Magnesium Sulfate (ASTM C88/AASHTOT 104) <sup>1</sup>	4.1-14
Sodium Sulfate (ASTM C88/AASHTOT 104) <sup>1</sup>	3.1- 6.9
Stability	
Angle of internal friction – loose	45°
Angle of internal friction – up to 1200 psf (ASTM D3080) <sup>1</sup>	55°
Angle of internal friction – up to 3000 psf (ASTM D3080) <sup>1</sup>	41°

<sup>1</sup>Modified test method due to particle size/density





**Physical Characteristics (cont.)**

Impurities

Clay lumps (ASTM C142)	0
Organic impurities (ASTM C40)	0
Popouts (ASTM C151)	0

Electrical Resistance

Lab (AASHTO T 288)	15,600 ohm-cm
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**Chemical Characteristics**

Ignition loss (ASTM C114)	0
Sulfates (ppm) [AASHTO T 290]	11
Chlorides (ppm) [AASHTO T 291]	<10
TCLP (SW-846)	Non-leaching

**Daily Quality Control Testing**

Bulk dry density, maximum [EN 1097-3] <sup>1</sup>	15 pcf
Compressive Strength at 20% Deformation, minimum [EN 1097-11] <sup>1</sup>	15,000 psf

**Advantages**

Good Insulator	Capillary Break	Freeze-Thaw Stable	Rodent Resistant
Highly-Permeable	Volume Stable	Non-Flammable	Accelerated Construction

**Shipping & Handling**

100 CY/Truckload

By shipping up to 100 CY per truckload, we are not only reducing the number of trucks on the road, helping logistics, but we also are reducing the carbon footprint of your aggregate needs.

Material can also be supplied in super sacks for easy placement on sites with confined access.

<sup>1</sup>Modified test method due to particle size/density

For more information, please visit [aeroaggregates.com](http://aeroaggregates.com) or call (833) 261-8499.



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504 6<sup>th</sup> Ave SW. Cascade, IA 52033  
Enstyro.com Phone: 563-542-7255

## **Recycled Shredded EPS (Expanded Polystyrene) Foam 3/32" - 3/16"**

### **Introduction**

Enstyro Shred is produced by recycling Polystyrene foam through Enstyro Shredding equipment that tears foam apart without crushing. The Enstyro shredder has many screen sizes to choose from so many particle sizes can be produced. Enstyro also offers a size separator so further size classification is easily accomplished in a single process.

The 3/32" – 3/16" foam was produced using the Enstyro Shredder in conjunction with the Enstyro Separator. All foam passed through a 3/16" screen in the Enstyro shredder and foam smaller than 3/32" was removed by the Enstyro separator.

### **Material Description**

Recycled EPS and/or XPS shredded and separated using Enstyro equipment. This polystyrene foam is from a recycled source and thus may contain packaging foam as well as insulation foam.

### **Typical Physical Properties**

Density: ~ 1 pcf

### **Additional Information**

A dust mask is recommended when working with fine particulate foams.



January 29, 2018  
Revised March 1, 2018  
Revised March 23, 2018

Utelite Corporation  
72 East 1975 North  
Centerville, Utah 84014

Attention: Mr. Darren Medeiros  
P: (801) 243-7473  
E: ucorp4@live.com

Re: Testing of Utelite Structural Fine Lightweight Aggregate  
Terracon Project No. CB171603

Dear Mr. Medeiros:

At your request, Terracon Consultants, Inc. performed tests on the Utelite Fine Lightweight Aggregate to verify conformance with ASTM Designation C330-17 "Standard Specification for Lightweight Aggregates for Structural Concrete". The Utelite Fine Lightweight Aggregate is a fine shale aggregate produced at the Utelite plant in Coalville, Utah. The results show this aggregate meets ASTM C330 quality requirements.

A. DELETERIOUS SUBSTANCES:

<u>Test</u>	<u>Test Method</u>	<u>Test Result</u>	<u>C330 Requirement</u>
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	0.17 Percent	Less than 5 Percent

B. PHYSICAL TESTS:

<u>Test</u>	<u>Test Method</u>	<u>Test Result</u>	<u>C330 Requirement</u>
Clay Lumps and Friable Particles	C142	0.24 Percent	Less than 2 Percent
Bulk Density Dry Loose Condition	C29	58.9 PCF	70 PCF Maximum
Bulk Density Saturated Loose Condition	C29	60.2 PCF	No Requirement
Absorption of Lightweight Fine Aggregate	C1761	18.9 Percent	No Requirement
Relative Density (Specific Gravity) Coarse Aggregate (SSD)	ACI 211.2-98	1.788 at 5 Minutes 1.803 at 10 Minutes 1.811 at 30 Minutes	No Requirement
Soundness of Aggregates (Sodium Sulfate)	C88	3.3 Percent	No Requirement

ACI 211.2-98 appendices A and B guidelines used.

Grading - Sieve Analysis (Test Method C136)		
<u>Sieve Size</u>	<u>Percent Passing</u>	<u>C330 Requirement</u>
3/8" (9.5 mm)	100	100
No. 4 (4.75 mm)	100	85-100
No. 8 (2.36 mm)	83	
No. 16 (1.18 mm)	58	40-80
No. 30 (600 pm)	34	
No. 50 (300 pm)	18	10-35
No 100 (150 pm)	9	5-25
No. 200 (75 pm)	5.5	

D. CONFORMANCE:

The Utelite Fine Lightweight Aggregate manufactured by Utelite Corporation at Coalville, Utah, conforms to the quality requirements of ASTM Designation: C330-17 "Standard Specification for Lightweight Aggregates for Structural Concrete" for the tests indicated.

Aggregate Testing Report  
Utelite 2018 C-330 Testing  
January 29, 2018 • Terracon Project No. CB171603

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,  
Terracon Consultants, Inc.

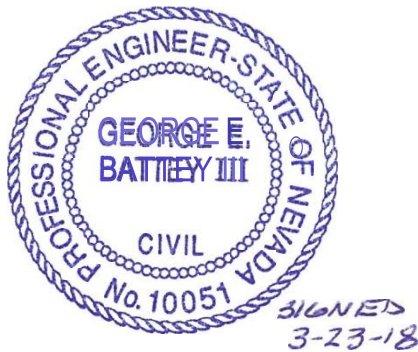
George Battey III  
Senior Consulting Engineer



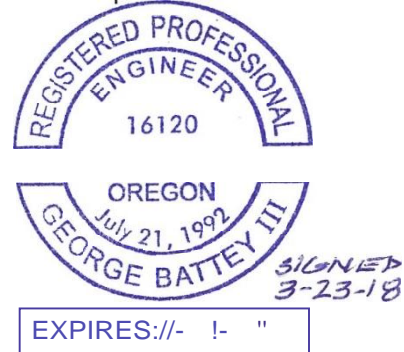
California Registered Civil Engineer No. 34323  
Registration Expires 09-30-2019



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 12-31-2019

TR/GB:jb

Distribution: Utelite Corporation — email (ucorp4@live.com)



**UTELITE CORPORATION**

Average Monthly Gradation Report  
As Per A.S.T.M. C-136

DATE : Dec-18

Material - COARSE		SIEVES						
	# 3/4	# 1/2	# 3/8	# 4	# 8			
A.S.T.M. C-330 PASSING								
COARSE ( 1/2" TO # 4 ) :	100	90 - 100	40 - 80	0 - 20	0 - 10			
TEST RESULTS :	100.00	90.73	62.26	5.00	0.95			
RETAINED %	0.00	9.27	28.47	57.26	4.05	PAN		
WT/FT3	49.92	AVG. MOISTURE %		4.55	CALC. DRY WT. FT3	47.65		
0.95								
Material - STRUCTURAL MEDIUM		SIEVES						
	# 1/2	# 3/8	# 4	#8	# 16			
A.S.T.M. C-330 PASSING								
STR-MED (3/8" TO #8)	100	80 - 100	5-40	0 - 20	0 - 10			
TEST RESULTS :	100.00	90.40	15.03	1.14	0.66			
RETAINED %	0.00	9.60	75.38	13.88	0.49	PAN		
WT/FT3	49.29	AVG. MOISTURE %		2.71	CALC. DRY WT. FT3	47.95		
0.66								
Material - FINES		SIEVES						
	# 3/8	# 4	# 8	# 16	# 30	# 50	# 100	F.M.
MANUFACTURER'S SPEC.								4.34
PERCENT PASSING ( # 4 TO 0 ) :	100	85 - 100	.....	15 - 55			..0 - 10	0 - 5
TEST RESULTS :	100.00	97.75	45.25	15.40	4.15	2.15	1.20	
RETAINED %	0.00	2.25	52.50	29.85	11.25	2.00	0.95	PAN
WT/FT3	53.80	AVG. MOISTURE %		2.68	CALC. DRY WT. FT3	52.36		1.20
1.20								
Material - CRUSHED FINES		SIEVES						
	# 3/8	# 4	# 8	# 16	# 30	# 50	# 100	F.M.
A.S.T.M. C-330 PASSING								3.23
FINE ( # 4 TO 0 ) :	100	85 - 100	.....	40 - 80	.....	10 - 35	5 - 25	
TEST RESULTS :	100.00	99.35	80.10	46.85	26.35	15.10	9.40	
RETAINED %	0	0.65	19.25	33.25	20.50	11.25	5.70	PAN
WT/FT3	57.80	AVG. MOISTURE %		9.12	CALC. DRY WT. FT3	52.53		9.40
9.40								
Material - 10 MESH		SIEVES						
	# 3/8	# 4	# 8	# 16	# 30	# 50	# 100	F.M.
A.S.T.M. C-330 PASSING								2.50
FINE ( # 4 TO 0 ) :	100	85 - 100	.....	40 - 80			.10 - 35	5 - 25
TEST RESULTS :	100.00	100.00	98.85	69.35	41.90	24.55	15.45	
RETAINED %	0.00	0.00	1.15	29.50	27.45	17.35	9.10	PAN
WT/FT3	56.20	AVG. MOISTURE %		8.85	CALC. DRY WT. FT3	51.23		15.45
15.45								





## Technical Information



Materials. Powering Ideas.

## Modifier A/NA For Performance Applications

**Polymer Type** • Non-carboxylated styrene butadiene latex

**Regulatory Standards** • Non-food contact

Typical Properties	Nominal Value (English)	Nominal Value (SI)
Solids	48.0%	48.0%
pH	10.00	10.00
Brookfield Viscosity (#2 @ 50 rpm)	< 40 cP	< 40 mPa-s
Density, 20°C	1.02 g/cm <sup>3</sup>	1.02 g/cm <sup>3</sup>
Glass Transition Temperature (Tg)	45°F	7°C

### Notes

These are typical properties only and are not to be construed as specifications.

## Applications

- Latex Modified Concrete (LMC)
- Rapid Set Latex Modified Concrete (RSLMC)
- Bridge deck overlay
- Latex Modified Mortar (LMM)
- Cement-based material modification

## Benefits

- Concrete density control
- Excellent calcium ion tolerance
- Excellent chloride ion permeation resistance
- Excellent bond strength
- Alkali resistance
- Cohesive bonding strength
- Meets the requirements of FHWA RD-78-35, “Styrene-Butadiene Latex Modifiers for Bridge Deck Overlay Concrete”





## Materials. Powering Ideas.

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# 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:

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

### Features

- ④ Reduced water content required for a given workability
- ④ Retarded setting time characteristics
- ④ Improved workability

### Benefits

- ④ Provides flexibility in the scheduling of placing and finishing operations
- ④ Offsets the effects of slump loss during extended delays between mixing and placing
- ④ Reduces waste associated with concrete washwater and returned concrete
- ④ 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.

## Guidelines for Use

**Dosage:** MasterSet DELVO admixture is recommended for use at a dosage of  $4 \pm 1$  fl oz/cwt ( $260 \pm 65$  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  $35^{\circ}\text{F}$  ( $2^{\circ}\text{C}$ ) 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.*

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

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**BASF Corporation**  
Admixture Systems

United States  
23700 Chagrin Boulevard  
Cleveland, Ohio 44122-5544



3	03 30 00	Cast-in-Place Concrete
	03 40 00	Precast Concrete
4	03 70 00	Mass Concrete
	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:

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

- ④ Dosage flexibility for normal, mid-range and high-range applications
- ④ Excellent early strength development
- ④ Controls setting characteristics
- ④ Optimizes slump retention/setting relationship
- ④ Consistent air entrainment

### Benefits

- ④ Faster turnover of forms due to accelerated early strength development
- ④ Reduces finishing labor costs due to optimized set times
- ④ Use in fast track construction
- ④ Minimizes the need for slump adjustments at the jobsite
- ④ Less jobsite QC support required
- ④ Fewer rejected loads
- ④ 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.

## 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.*

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

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**BASF Corporation**  
Admixture Systems

[solutions.basf.us](http://solutions.basf.us)

[www.master-builders-](http://www.master-builders-)





**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**

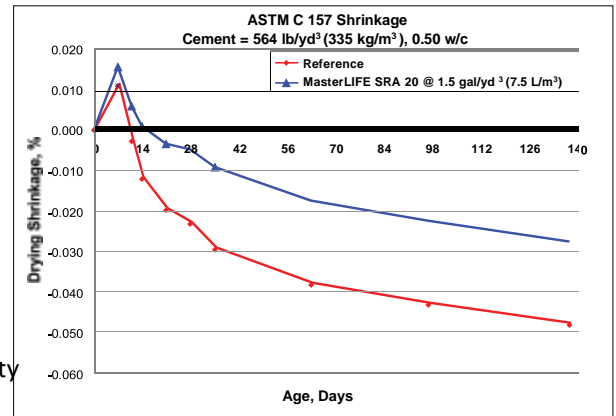
**Shrinkage-Reducing Admixture**

**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<sup>3</sup> (2.5 to 7.5 L/m<sup>3</sup>). However, dosages outside of this range may be required depending on the level of shrinkage reduction needed.

## Product Data: MasterLIFE SRA 20

**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.*

LIMITED WARRANTY NOTICE. We warrant our products to be of good quality and will replace or, at our discretion, refund the purchase price of any products proved defective. Satisfactory results depend not only upon quality products, but also upon many factors beyond our control. Therefore, except for such replacement or refund, BASF MAKES NO WARRANTY OR GUARANTEE, EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE OR MERCHANTABILITY, RESPECTING ITS PRODUCTS, and BASF shall have no other liability with respect thereto. Any claims regarding product defect must be received in writing within one (1) year from the date of shipment. User shall determine the suitability of the products for the intended use and assume all risks and liability in connection therewith. Any authorized change in the printed recommendations concerning the use of our products must bear the signature of the BASF Technical Manager.

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# 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:

- ④ Black
- ④ Light Red
- ④ Medium Red
- ④ 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:

- ④ Integrally colored decorative concrete
- ④ Imprinted concrete
- ④ Ready-mixed concrete
- ④ Manufactured concrete products
- ④ Stone veneer products
- ④ Precast concrete
- ④ Pervious concrete
- ④ Self-consolidating concrete

### Features

- ④ Liquid-coloring admixtures formulated for the automated CAM (Coloring Admixture Measuring) System
- ④ Compatible with BASF admixtures used in the production of durable decorative concrete
- ④ Faster dispersion into concrete

### Benefits

- ④ Beautiful, long-lasting integrally colored concrete
- ④ Enhanced finishing characteristics
- ④ Color vibrancy
- ④ Excellent color accuracy
- ④ Batch-to-batch color consistency and verifiable color batching results
- ④ Increased productivity and reduced labor
- ④ Clean and simple batching
- ④ 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

- ④ Black
- ④ Light Red
- ④ Medium Red
- ④ 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.



## Technical Data Sheet

### Basalt Meshes

### Window Sizes 5mm, 10mm, 25mm, 50mm

Window Size	5mm	10mm	25mm	50mm
Total Weight/ Area	220 grams/ sq. meter	110 grams/ sq. meter	350 grams/ sq. meter	370 grams/ sq. meter
	6.5 oz./sq. yard	3.85 oz./sq. yard	10.26 oz./sq. yard	10.85 oz./sq. yard
Weight Resin Coating	20 grams/ sq. meter	10 grams/ sq. meter	36 grams/ sq. meter	38 grams/ sq. meter
	0.7 oz./sq. yard	0.35 oz./sq. yard	1.3 oz./sq. yard	1.35 oz./sq. yard
Thickness	0.6-0.7 mm	0.6-0.7 mm	.08-.09 mm	.08-.09 mm
	0.021-0.025 in.	0.021-0.025 in.	0.032-0.035 in.	0.032-0.035 in.
Maximum Load-Warp	48,000 N/meter	24,000 N/meter	80,780 N/meter	114,000 N/meter
	3,290 lb. force/ foot	1,645 lb. force/ foot	5536 lb. force/ foot	7,813 lb. force/ foot
Maximum Load-Weft	45,000 N/meter	20,000 N/meter	78,900 N/meter	86,000 N/meter
	3084 lb. force/ foot	1370 lb. force/ foot	5407 lb. force/ foot	5,894 lb. force/ foot
Elongation at break-Warp	6.67 %	6.67 %	6.67 %	6.67 %
Elongation at break-Weft	3.53 %	3.53 %	3.53 %	3.53 %
Breaking Elongation- Warp	13.54 mm	13.34 mm	13.34 mm	13.34 mm
	0.53 inch	0.53 inch	0.53 inch	0.53 inch
Breaking Elongation- Weft	7.07 mm	7.07 mm	7.07 mm	7.07 mm
	0.28 inch	0.28 inch	0.28 inch	0.28 inch
Standard Roll Dimensions	1 meter x 50 meters	1 meter x 50 meters	1 meter x 50 meters	1 meter x 50 meters
	3.28 ft. x 164 ft.	3.28 ft. x 164 ft.	3.28 ft. x 164 ft.	3.28 ft. x 164 ft.
Shipping Weight	27 lbs.	17 lbs.	45 lbs.	48 lbs.
Shipping Dimensions	42" x 8" x 8"	42" x 8" x 8"	42" x 12" x 12"	42" x 12" x 12"

Different widths and roll lengths available on special order



# BRICKFORM® Liquid Release™

## Colorless Release Agent For Concrete Texturing

**BRICKFORM Liquid Release forms a colorless barrier that virtually eliminates concrete build-up on mat-type, texturing tools, keeping them flexible and minimizing wear. It evaporates and leaves no residue, making it perfect for interior applications.**

### FEATURES

- Prevents Concrete Buildup
- Prolongs Tool Life
- Decreases Friction
- Applied With Sprayer
- 100% VOC

**PRODUCT DESCRIPTION** • BRICKFORM Liquid Release is a colorless release agent, formulated and recommended for use with BRICKFORM Texture Mats™, or any decorative, mat-type concrete, texturing mats. It forms a lubricating barrier that prolongs the life of the imprinting tools by decreasing the friction between the mats and the concrete.

**USES** • BRICKFORM Liquid Release is used in the texturing process of both colored and uncolored concrete. It is also used as an alternative to powdered release agents that may not be desired in certain circumstances, such as interior projects. BRICKFORM Liquid Release should be considered for use on projects that are to be textured but colored later, with BRICKFORM Cem-Coat™ or Blush-Tone Acid Stain™, after the concrete has cured.

**LIMITATIONS** • BRICKFORM Liquid Release can only be used on the immediate area to be imprinted. If used on an extensive area at one time, it will evaporate before the concrete can realistically be textured. NEVER trowel or mix BRICKFORM Liquid Release into the plastic, concrete surface.

**CAUTION** • KEEP OUT OF REACH OF CHILDREN. Before using or handling, read the Material Safety Data Sheet and Warranty. DO NOT TAKE INTERNALLY. Do not breathe vapors or mist. Use only with adequate ventilation and use a respirator when levels are above applicable limits. If using spray equipment, a painter's mask should be worn. Avoid contact with skin and eyes. Close container after each use. Use good hygiene when handling this product and wash and bathe after each use. Be sure to wash clothing after each use.

**PACKAGING** • Available in five-gallon (18.92 L) containers.

**STORAGE** • Store in a safe place, out of direct sunlight. Keep containers tightly sealed. DO NOT allow product to freeze. Shelf life is approximately 12- 24 months.

**COVERAGE** • One gallon (3.785 L) of BRICKFORM Liquid Release will release approximately 150-250 (13.93 - 23.22 m<sup>2</sup>) square feet of concrete surface.

**PREPARATION** • Trowel and finish newly poured concrete surfaces, in preparation of the imprinting process. When the concrete has reached the plastic stage desirable for imprinting, BRICKFORM Liquid Release should be used between the texture mats and the concrete, to prevent sticking and concrete buildup.

**APPLICATION** • Apply in temperatures between 55° and 80°F (12.8°C and 26.7°C). Using a pump-type sprayer, liberally apply a mist of BRICKFORM Liquid Release on the texturing mats AND on the concrete surface but only on the area where you are going to place the next few mats. Apply over an area of approximately 10 or 15 square feet (.929 - 1.39 m<sup>2</sup>), to avoid evaporation before the mat placements are made, especially on dry, windy days. NEVER trowel or mix BRICKFORM Liquid Release into the plastic concrete surface. To make corrections on the still-plastic concrete, use the texturing tool or skins and press out unwanted impressions. When stamping is completed, wash off the BRICKFORM Liquid Release from the texturing mats, using plain water.

**SEALING** • Seal the concrete slab with Gem Cure and Seal, Gem Seal, Poly Seal, Decopoxy, Uremax, or Poly Astic depending on the expected used of the slab and desired appearance. Follow curing guidelines and installation/application guidelines, specified in the desired sealer Technical Information Sheet.

**MAINTENANCE** • The sealed surface should be inspected periodically for areas of thin or traffic-worn sealer. Brickform recommends the application of Premium Acrylic Floor Finish as a sacrificial coating on interior surfaces. Reapply as needed, according to the appropriate Technical Information Sheet. If traces of efflorescence are present, this should first be eliminated with a gentle cleaner such as BRICKFORM E-Etch™, according to the BRICKFORM E-Etch Technical Information Sheet.

**WARRANTY** • This product is not intended for public use and is intended for use by licensed contractors and installers, experienced and trained in the use of these products. It is warranted to be of uniform quality, within manufacturing tolerances. The manufacturer has no control over the use of this product, therefore, no warranty, expressed or implied, is or can be made either as to the effects or results of such use. In any case, the manufacturer's obligations shall be limited to refunding the purchase price or replacing material proven defective. The end user shall be responsible for determining product's suitability and assumes all risks and liability.

### ORDER SPECIFICATIONS

#### Product

Liquid Release

#### Shipping Weight Container Size Item No.

6.0 Lbs (2.7 kg) 1-Gallon (3.785 L) LR-1

40.0 Lbs (18 kg) 5-Gallons (18.92 L) LR-5



MasterFormat: 03 35 00

NO. 366-B

AUGUST 2011  
(Supersedes January 2010)

## 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 (3.78 L) Cans  
5 Gallon (18.93 L) Pails  
55 Gallon (208.20 L) Drums

### COVERAGE

300 – 600 ft.<sup>2</sup>/gal. (7.37 – 14.73 m<sup>2</sup>/L), depending on surface finish.

### SHELF LIFE

When stored indoors and in original, unopened containers at temperatures between 40 - 90° F (4 - 32° C), shelf life is a minimum of 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

### 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  
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FORT WORTH, TX /BENICIA, CA /POMONA, CA  
GOODYEAR, AZ / MILTON, ON /ST. ALBERT, AB

**Concrete ...** Use a low pressure, high solids, industrial/commercial-grade sprayer 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 ½ gpm is recommended for best results.

For optimum performance, apply first coat at 600 ft.<sup>2</sup>/gal. After the first coat has thoroughly dried, apply a second coat at 600 ft.<sup>2</sup>/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 (4° C). 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](http://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.