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COMPLIANCE CERTIFICATE

Michigan Technological University's 2011-2012 Concrete Canoe team hereby certifies that the construction and finishing of **Genoa**, has been completed in compliance with the rules and regulations set forth by the National Concrete Canoe Competition. Additionally, the canoe was completely built within the current academic year of the competition. The ten (10) registered participants are qualified, eligible, student members and National Student Members of ASCE as specified in the rules and regulations of the National Competition. The team acknowledges that all material safety data sheets (MSDS) have been read by the project management team and

Registered Members of the 2011-2012 Michigan Tech Concrete Canoe Team

Nina Bonanno	9146923	Alex Bomstad	9146970
Sheridan Ethen	968665	Chris Droste	1022511
Cassandra Kussow	1020416	John Laureto	9145164
Meghan Schiber	1019899	Jonathan Zalud	968666
Ashley Smokoska	968568	Michael Zukoff	936415

Genoa Dimensions	
Maximum Length	18' 5"
Maximum Width	31"
Maximum Depth	12.2"
Nominal Thickness	0.375"
Overall Weight	130 lbs
Ballast Structural Mix Properties	
Concrete Density (Unit Weight)	55.4 pcf (887 kg/m ³)
14 - day Compressive Strength	2112 psi (14.6 MPa)
14 - day Tensile Strength	323 psi (2.23 MPa)
Volumetric Air Content	23.34 %
Composite Properties	
14 - day Flexural Strength	345 psi (2.38 MPa)

We certify that the aforementioned information is valid.

Date

John Laureto
Senior Concrete Canoe Captain
(810) 701-2988

Date

Frank W. Baxandall
Michigan Tech Concrete Canoe Advisor
(906) 483-2372

MOLD CONSTRUCTION



After deriving the 2011-2012 canoe dimensions, a three-dimensional (3D) model of the canoe was created using UGS NX 7.5. The team's CNC milling industry partner used the 3D model to mill a canoe mold to the specified dimensions using 10% pre-consumer recycled



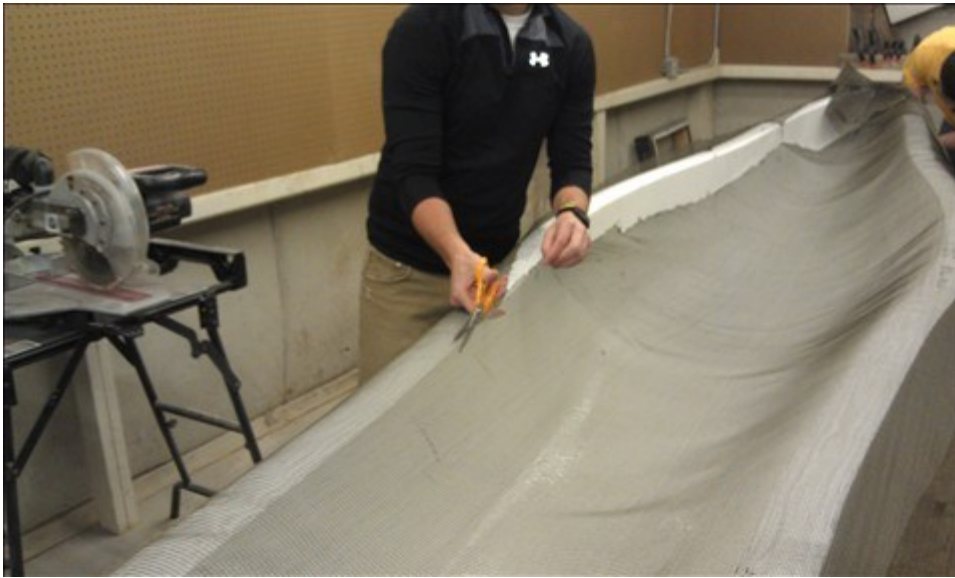
Upon arrival of the mold, both pieces were properly aligned and secured to a wooden table top to provide stability during casting day and to prevent separation of the mold.



After the mold was properly secured, four coats of epoxy were applied to the mold. The layers of epoxy provide a hardened surface for the application of the release agent and placement of the first layer of concrete.

Once the epoxy dried, members of the reinforcement committee laid out and cut the first layer of Kevlar® reinforcement. This preliminary cutting was done to ensure a faster casting day.





The second layer of Kevlar® reinforcement was then cut to follow the curved shape of the canoe. The second layer covered the bottom of the hull to increase the strength of the reinforced concrete under the paddlers.

Foam strips were cut with 5/8" grooves allowing for concrete and reinforcement placement for the gunnel caps. The foam strips were epoxied to increase their rigidity and then placed on the mold to ensure proper location during the casting process.



CANOE CONSTRUCTION

Below, the troweling team places the first layer of concrete in the mold. The troweling of the concrete was done from bow to stern to allow for QC/QA management.



Above, the reinforcement team lays the first Kevlar reinforcement sheet. The orientation of the first layer of reinforcement was from gunnel to gunnel. To ensure a continuous layer of reinforcement, 2" fringes were created at the end of each reinforcement sheet. The fringes provided proper bonding between each sheet to achieve a continuous reinforcement scheme.



Above, the second layer of concrete is being placed. The placement of the second layer started at the chine and moved longitudinally to secure the first layer of reinforcement to prevent bubbling.



Above, a rib is constructed by taking loose strand carbon fiber reinforcement and looping them together to prevent delamination. To ensure proper thickness, 5/8" grooves were cut out of foam where the concrete was to be placed.



The figure to the left shows the construction of the gunnel cap. The foam, with the 5/8" grooves, was secured by using clamps. The first layer of concrete was placed, followed by folding over the first layer of reinforcement, then a second layer was placed, followed by a strip of Kevlar® reinforcement 5/8" wide, and then the final layer of concrete was made flush with the mold and foam.

After the construction of the main part of **Genoa**, foam was inserted into the bow and stern end caps, as seen in the figure to the right.



FINISHING TECHNIQUES



The picture above depicts the process used to measure the thickness of the canoe using a caliper. After the measurements were taken, the readings were written on tape and placed over their proper location. This is to ensure a uniform 3/8" thick canoe when sanding and patching.

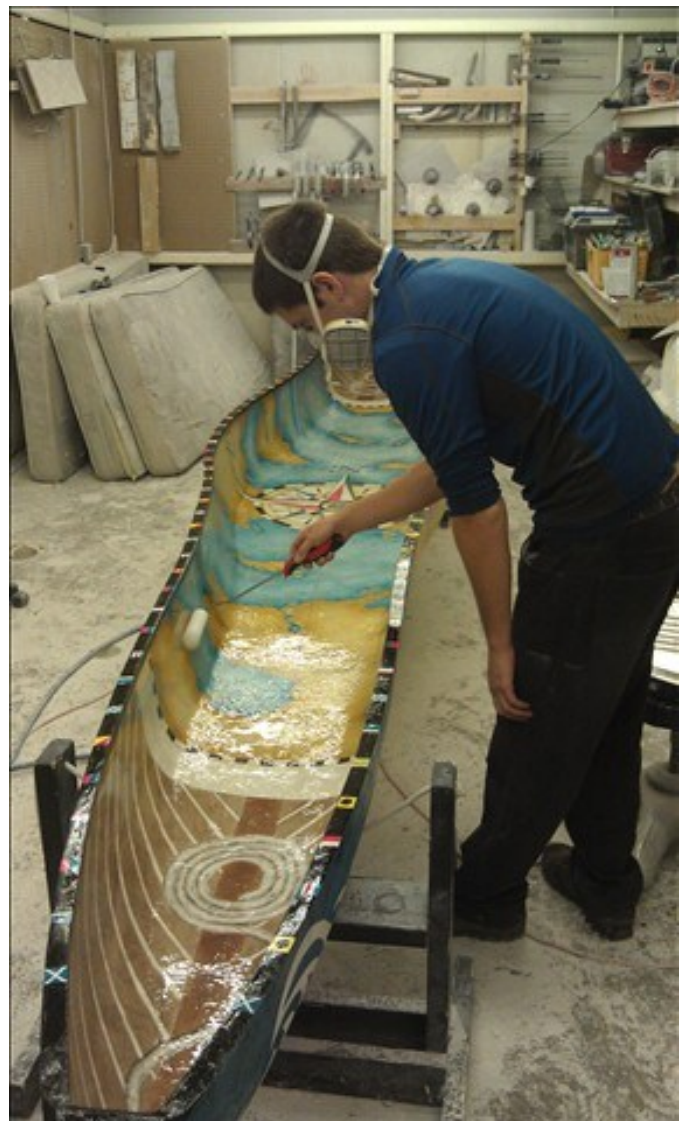
A dremel tool with a fixed restrictor plate was used to create the desired gunnel thickness. Sanding was then completed by hand up to 220 grit as shown in the picture below.





Water based stains were applied to both the interior and exterior of the hull to make **Genoa** aesthetically pleasing. The designs were created by masking the canoe with tape and cutting out the designs with a knife. The stain was then applied by hand with varying brush

The entire canoe was then sealed a week before competition to allow a full cure, completing **Genoa**.



HULL THICKNESS CALCULATIONS

Calculations per Section 4.3.1

Annotation

$T_1 = .013375$ in Average thickness of first layer of reinforcement, Kevlar® 4009-1, measured in accordance with Section 4.3.1

$T_2 = .013375$ in Average thickness of second layer of reinforcement, Kevlar® 4009-1, measured in accordance with Section 4.3.1

$T_h = .375$ in Nominal thickness of the canoe hull

Determine that the reinforcement at any point in the canoe will not exceed 50% of the total hull thickness.

Solution

Two layers of Kevlar® 4409-1 were used throughout the hull of the canoe.

The two layers of reinforcement make up approximately 7.13% of the hull. This value is less than the maximum value of 50% outlined in section 4.3.1, demonstrating compliance.

$$\frac{T_1 + T_2}{T_h} * 100 = 7.13 \%$$

GUNNEL CAP THICKNESS CALCULATIONS

Calculations per Section 4.3.1

Annotation

$T_1 = .013375$ in Average thickness of first layer of reinforcement, Kevlar® 4009-1, measured in accordance with Section 4.3.1

$T_2 = .013375$ in Average thickness of second layer of reinforcement, Kevlar® 4009-1, measured in accordance with Section 4.3.1

$T_h = .625$ in Nominal thickness of the gunnel cap

Determine that the reinforcement at any point in the canoe will not exceed 50% of the total hull thickness.

Solution

Two layers of Kevlar® 4409-1 were used throughout the gunnel cap.

The two layers of reinforcement make up approximately 4.28% of the gunnel cap. This value is less than the maximum value of 50% outlined in section 4.3.1, demonstrating compliance.

$$\frac{T_1 + T_2}{T_h} * 100 = 4.28\%$$

PERCENT OPEN AREA CALCULATIONS

Calculations per Section 4.3.2

Sample: Kevlar® 4009-1

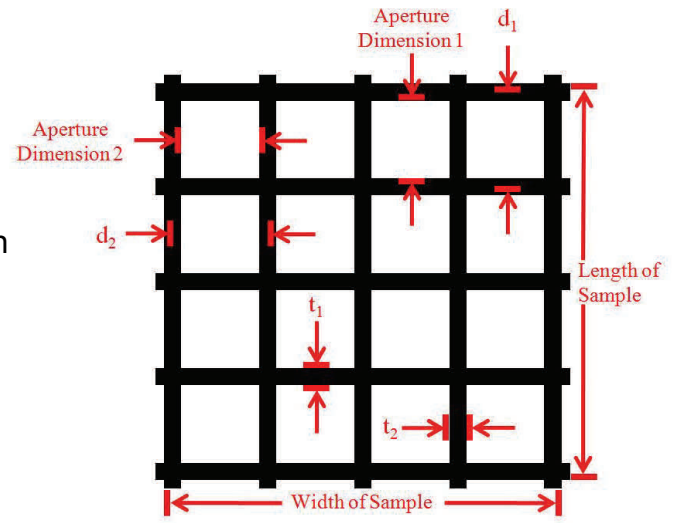
Given

$n_1 = 6$ Number of apertures along length

$n_2 = 6$

$t_1 = .03675$ in Average thickness of reinforcement along length

$t_2 = .04283$ in Average thickness of reinforcement along width



Sample of Reinforcement

Aperture_Dimension_1 = .08617 in

Aperture_Dimension_2 = .09492 in

$d_1 = \text{Aperture_Dimension_1} + 2*(t_1/2)$ $d_1 = .12292$ in

Average spacing of reinforcement (center-to-center) along the sample length.

$d_2 = \text{Aperture_Dimension_2} + 2*(t_2/2)$ $d_2 = .13775$ in

Average spacing of reinforcement (center-to-center) along the sample width.

Determine Percent Open Area (POA) for the Kevlar® 4009-1 reinforcement.

Solution

$$\text{Length}_{\text{Sample}} = n_1 * d_1$$

$$\text{Width}_{\text{Sample}} = n_2 * d_2$$

$$\text{Length}_{\text{Sample}} = .7375 \text{ in}$$

$$\text{Width}_{\text{Sample}} = .8265 \text{ in}$$

$$\text{Area}_{\text{Open}} = n_1 * n_2 * \text{Aperture_Dimension_1} * \text{Aperture_Dimension_2}$$

$$\text{Area}_{\text{Total}} = \text{Length}_{\text{Sample}} * \text{Width}_{\text{Sample}}$$

$$\text{Area}_{\text{Open}} = .2944 \text{ in}^2$$

$$\text{Area}_{\text{Total}} = .6095 \text{ in}^2$$

$$\text{POA} = (\text{Area}_{\text{Open}} / \text{Area}_{\text{Total}}) * 100$$

$$\text{POA} = 48.30\%$$

The POA is greater than the 40% minimum required, demonstrating compliance.

Technical Data Sheet

ASTM C-150

PRODUCT NAME:

White Portland Cement: Federal White Type I
ASTM Designation C-150

MANUFACTURER:

Federal White Cement
 P.O. Box 548
 Woodstock, Ontario
 Canada
 N4S 7Y5

Phone: 800-265-1806
 519-485-5410
 FAX: 519-485-5892

DESCRIPTION:

Federal White Type I Cement is a true portland cement manufactured with selected raw materials to insure negligible amounts of iron and manganese oxides so as not to produce the gray color of normal portland cement.

BASIC USE:

Federal White Cement can be used for all types of architectural or structural concrete construction where a whiter or brighter color may be needed for aesthetic or safety reasons. Such application as pre-cast panels and systems, cast-in-place, masonry units, tilt-up panel systems, roofing tiles, terrazzo floors, highway median barriers, tile grout, swimming pools, stucco, colored masonry products, cement paints and coatings and ornamental precast concrete items lend themselves to using **Federal White Cement**. **Federal White Cement** may also be used to satisfy low alkali requirements.

INSTALLATION:

Architect should approve the color and surface texture of samples submitted by the contractor or precaster. Contact **Federal White Cement** for further information or assistance.

TECHNICAL DATA:

Federal White Portland Cement is manufactured to conform to all current requirements of ASTM Designation C-150.

See table for physical properties.



AVAILABILITY AND COST:

Federal White Cement can be shipped to most destinations in the United States and Canada from our manufacturing plant or terminal. Cement shipments can be made by rail or truck in bags or in bulk.

The price, F.O.B. destination, of **Federal White Cement** will be furnished by the manufacturer upon request.

WARRANTY:

Federal White Type I Portland Cement complies with the current ASTM C-150. **Federal White Cement** makes no guarantee or warranty, expressed or implied, including, without limitation, warranties of fitness or merchantability with respect to this product.

MAINTENANCE:

Concrete and other products manufactured with **Federal White Cement** should require no additional maintenance if designed and constructed following proper and accepted procedures.

TECHNICAL SERVICES:

Technical service, consultation, and additional product information are available by contacting **Federal White Cement**.

[PRODUCTS](#)
[CONTACT US](#)
[MSDS](#)
[TRANSLOADING SERVICES](#)
[ASSOCIATIONS & LINKS](#)
[FEATURED PROJECT](#)
[HOME](#)

PHYSICAL PROPERTY	FEDERAL WHITE Typical Type I	ASTM C – 150 Specification Type I
Fineness:		
Specific Surface (sq. m / kg)	400	280 minimum
Setting Time – Vicat		
Minutes	120	
not less than		45
not more than		375
Air Content %	8	12 maximum
Compressive Strength, psi(MPa)		
1 day	2000 (13.8)	--
3 day	3900 (26.9)	1740 (12.0) minimum
7 day	4800 (33.1)	2760 (19.0) minimum
28 day	6500 (44.8)	--



LAFARGE

NewCem® Slag Cement

Provides flexibility in concrete proportioning to assist in achieving:

Reduced Permeability

Reduced Ingress of Chlorides

Sulfate Resistance

Resistance to Alkali Silica Reaction

Greater Strength Potential

Lower Temperatures for Mass Concrete

Improved Workability

A Lighter, More Pleasing Color

Reduced Impact on the Environment



Lafarge NewCem® slag cement is a finely ground, granulated blast furnace slag (GGBFS), a product of the iron-making process. Through our extensive distribution system, NewCem is available for blending with conventional portland cement at the concrete plant to produce high-quality, durable concrete.



Front cover photo:

NewCem was used to construct the thick walls and floor of the Peel Reservoir which serves the Regional Municipality of Peel, Ontario.

Slag is produced during the iron-manufacturing process. During the manufacturing process the materials are heated in a blast furnace to a molten state. The slag rises to the top and is separated from the iron for further processing. When slag is separated from iron and rapidly cooled with water (granulated), the morphology of the slag changes. This morphology change provides the slag with its cementitious properties. The granulated slag is then ground to a controlled fineness, typically greater than that of Type I portland cement, and the finished product is ready for shipment to our customers.

The NewCem® Slag Cement Advantage

To produce top-quality slag, a producer needs to have slag with an ideal chemistry from a consistent source and needs to have a granulator close to the slag source to provide rapid quenching of the slag. Lafarge plants have been designed with these criteria in mind.

Lafarge engineers and scientists have led North America in the research and development of specifications for slag. Today, Lafarge's knowledge and technical experience is unequalled by any other producer of GGBFS. Lafarge's technical staff is available to ready-mixed concrete producers, engineers and specifiers for questions about the proper use of NewCem in any application.

NewCem® Slag Cement and the Environment

NewCem is a product derived from the iron-making process. It makes use of by-product material that might otherwise be landfilled. The use of NewCem in concrete saves virgin raw materials that would otherwise be needed for the production of portland cement. NewCem also requires less energy to produce than portland cement, so the amount of greenhouse gases released into the environment is reduced when NewCem partially replaces portland cement in concrete. The result is superior concrete with less environmental impact.



Lafarge NewCem provides a significant contribution to sustainable construction. The use of NewCem in concrete production consumes less energy and offers improved efficiency and building performance. NewCem can also be used to help achieve LEED (Leadership in Energy and Environmental Design)

points in the USGBC's (U.S. Green Building Council) and CaGBC's (Canada Green Building Council) LEED programs.



Advantages of Lafarge NewCem® Slag Cement

Strength

When properly used, NewCem can increase the 28-day strength of the concrete by 5 to 25 percent. The highest strength increases are found when the replacement level approaches 50 percent. High strength for concrete subjected to repeated flexural loads is critical for the long-term service life of highways, roads and airfield runways. NewCem provides strength and enhances the placeability and finishing characteristics of low-slump concrete. NewCem can also improve the consistency of concrete strengths. Most fluctuations in concrete strengths occur in the summer when high temperatures can cause slump loss and increased water demand. NewCem naturally retards the initial setting time of concrete, which leads to more consistent strengths.

Durability

Long-term durability is a recognized need for all concrete structures. Concrete durability is affected by such variables as strength, permeability, consistency, resistance to extreme environmental conditions and resistance to chemical attack. When properly used, NewCem can increase the durability of concrete by improving resistance to sulfate attack, mitigating alkali silica reactions, reducing concrete permeability and decreasing concrete temperatures. NewCem's ability to dramatically increase the durability of concrete makes it an ideal ingredient for high-performance concrete. Many state DOT's have specified NewCem for their high-performance concrete mixes.

Permeability

A concern with concrete structures exposed to de-icing salts is deterioration of the structure due to salt-induced corrosion of the reinforcing steel. When reinforcing steel corrodes, it takes up more volume than the original steel. This places the concrete around the reinforcing steel in tension. Because concrete tensile strength is about 1/10 of the compressive strength, the corroding steel can cause the concrete to crack. Once a crack develops, chlorides or other aggressive agents are provided a path to the reinforcing steel and further deterioration can occur. When used properly, concrete containing NewCem can reduce the permeability of the concrete; this reduces the ingress of chlorides and extends the life of the structure.

ASR

The deterioration of concrete by the action of alkali silica reaction (ASR) is a concern in many areas of North America. ASR is a chemical reaction that occurs between the alkalis in portland cement and certain siliceous aggregates. These aggregates, when placed in a highly alkaline solution and in the presence of moisture, form an expansive gel that can cause the concrete to crack. If the crack reaches the surface of the concrete, a path is opened for the ingress of additional moisture, which will further fuel the reaction.

NewCem can reduce this potential expansion. It reduces the effective alkalis loading of the concrete. It reacts with the effective alkalis in portland cement and makes them unavailable to react with the reactive aggregates. Finally, NewCem can reduce the permeability of the concrete, which reduces the ingress of moisture that is available for the reaction.



Hartsfield International Airport, Atlanta, Georgia

Sulfate Resistance

Sulfates, present in seawater and in some soils and wastewater, react with the alumina in hardened portland cement paste to cause deleterious expansion. Concrete containing NewCem can provide superior resistance to sulfate attack due to a decrease in the cement compounds that can cause expansion. Also contributing to sulfate resistance is the decrease in permeability of the concrete, which reduces the movement of sulfate solutions in the concrete.

Resistance to sulfate attack may vary according to the chemistry of the cement and the slag cement used. Any combination of these materials should be tested to assure that desired sulfate resistance levels are achieved. Consult a Lafarge Cement Technical Representative before using NewCem in sulfate environments.



National Archives - Silver Spring, Maryland



Chesapeake Bay Bridge Tunnel, Virginia

Applications for Lafarge NewCem® Slag Cement

High-Strength Concrete

In 1995, after the tragedy of the Oklahoma City bombing, engineers had to take a new look at how they designed structures, especially federal buildings. For example, construction was stopped on the new FBI building in Washington, D.C. while engineers and architects worked together to develop a design that would be more resistant to terrorist attack. One of the special designs employed in the FBI building was for a very high-strength blast wall. The concrete producer used a mix of 50 percent NewCem with 50 percent portland cement.

Another high-strength concrete project utilizing 50 percent NewCem and 50 percent portland cement is Lincoln Square in Washington, D.C. The specified strengths for this project ranged on the high end from 8,000 psi to 12,000 psi. Design strengths were usually achieved in about seven days, and 28-day strength results were often over 15,000 psi.

Precast/Prestress

One of the earliest uses of NewCem was in precast and prestressed concrete. There were some initial concerns with using NewCem for these applications because of NewCem's natural tendency to reduce the early strength of the concrete. It was shown; however, that NewCem can react well when concrete is cured at elevated temperatures.

The light rail tunnels leading to the Minneapolis-St. Paul International Airport are constructed with precast concrete tunnel liners containing NewCem. This concrete met the low-permeability rating specification.

Mass Concrete

A primary consideration in designing any mass concrete structure is the development of thermal cracks due to temperature differentials within the concrete. Cement produces heat during the hydration process. In the center of a mass concrete section the temperature of the concrete can build up quickly because there is no way for the heat to dissipate. On the exterior of the concrete section the heat dissipates much more rapidly. When the temperature differential between the center of the concrete mass and the exterior of the concrete becomes large enough, thermal cracking can develop.

Used in high percentages, NewCem has been very effective in reducing both the maximum temperature of the concrete and the rate of temperature rise, resulting in a lower temperature differential between the center of the concrete mass and the exterior of the concrete.

NewCem is produced in accordance with ASTM C 989 *Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars*, AASHTO M302 *Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars*, and CSA A3000 *Cementitious Materials Compendium*.



Light rail tunnel leading to the Minneapolis-St. Paul International Airport



FBI Building, Washington, D.C.



Lincoln Square, Washington, D.C.

Properties of “Fresh Concrete” – NewCem® Slag Cement

Water Requirements: Concrete mixes containing NewCem will require about the same amount of water for a given slump as concrete containing only portland cement.

Air Content: The use of NewCem as a partial replacement for portland cement will not appreciably change the dosage rate requirements of air entraining agents. When changing mix ingredients, it is recommended to check dosage rates and adjust if necessary.

Bleeding: The bleeding characteristics of concrete containing NewCem will not be appreciably affected.

Segregation: There is no segregation issue related to the use of NewCem.

Heat of Hydration: NewCem can be used to moderate the development of heat in mass concrete. It is recommended that replacement factors of 60% or greater be used for this type of application. It is highly recommended that mix designs be assessed on an individual basis.

Setting Time: Concrete containing NewCem may have extended set times compared to straight portland mixes, especially at lower ambient/concrete temperatures and higher replacement levels. At normal summertime temperatures, set times will only be slightly affected.

Finishability: The finishability of concrete is generally improved with the use of NewCem.

Pumping: Concrete containing NewCem generally has improved pumpability.

Proportioning: NewCem has a lower specific gravity than normal portland cement. Consequently, the mix design should be modified to accommodate this change. ACI 211 should be followed for proportioning and mix proportions should be verified.

Curing: Proper curing of all concrete is essential. It is recommended that the procedures in ACI 308 *Standard Practice for Curing Concrete* and CSA A23.1 be followed.

Properties of “Hardened Concrete” – NewCem® Slag Cement

Strength: Generally, later strengths (beyond 7 days) both compressive and flexural, are enhanced with NewCem. Early strengths (up to 14 days) can be reduced when compared to straight portland mixes, especially at higher replacement rates and at cooler temperatures.

Permeability and Absorption: When properly proportioned, concrete containing NewCem is less permeable and has a lower absorption rate than mixes containing only portland cement.

Concrete Color: Concrete made with NewCem as a replacement for portland cement will be lighter in color. A green or blue-green color may occasionally be observed in freshly cured concrete; however, this is very rare and will only occur under certain conditions. This tint normally disappears once the concrete surface is exposed to air and dries out.

Alkali-Silica Reactivity: Concrete containing NewCem can help mitigate ASR. This is dependent on the qualities of the aggregate and the replacement rate as well as other variables. Concrete mixtures should be assessed on an individual basis.

Resistance to Sulfate Attack: NewCem can be used as part of a system to improve the resistance of concrete to sulfate attack. The degree of resistance achieved is dependent on the replacement rate and other factors. Mixes should be assessed individually.

Resistance to sulfate attack may vary according to the chemistry of the cement and the slag cement used. Any combination of these materials should be tested to assure that desired sulfate resistance levels are achieved. Consult a Lafarge Cement Technical Representative before using NewCem in sulfate environments.

Corrosion of Embedded Steel: There is a direct relationship between permeability and corrosion resistance. Corrosion can be reduced by replacing part of the portland cement with NewCem in concrete mixtures.

Carbonation: When used in a properly designed concrete mix, and with appropriate finishing and curing procedures applied in the field, the use of NewCem will not significantly affect the depth of carbonation.

Freeze-Thaw Resistance: When used in a properly designed concrete mix with an adequate air-void system and with proper finishing and curing procedures applied in the field, the use of NewCem will not detract from the freeze-thaw resistance of concrete.

Deicer Salt Scaling: When using NewCem as a replacement for portland cement in concrete that will be exposed to deicing salts, the limits specified in ACI 318 *Building Code Requirements for Structural Concrete*, ACI 301 *Specifications for Structural Concrete* and CSA A23.1 must be followed.

Chemical Resistance: Reduced permeability, and therefore improved chemical resistance, can be achieved through the use of NewCem in concrete mixtures.

Note: Appropriate testing should be conducted with different NewCem/portland levels to assure desired results are achieved. Results may vary with the use of different portland cements.



I-895 Interchange near Richmond, Virginia



Liberty View Towers - Jersey City, New Jersey



Ravens' Stadium, Baltimore, MD

Company Profile

Lafarge in North America is part of the Lafarge Group. The world leader in building materials, active on five continents, the Lafarge Group holds top-ranking positions in cement, aggregates, concrete and gypsum.

By focusing on the development and improvement of building materials, Lafarge puts the customer at the core of its strategy and offers the construction industry and the general public innovative solutions that will bring more safety, comfort and beauty to our everyday lives.

Please consult a Lafarge Cement Technical Representative prior to using NewCem in specialized applications.

Precautions

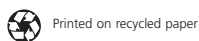
Direct contact with wet cement should be avoided. If contact occurs, the skin should be washed with water as soon as possible. Exposure can cause serious, potentially irreversible tissue destruction in the form of chemical (caustic) burns. If cement gets into the eyes, immediately rinse thoroughly with water and seek medical attention. For more information, reference the applicable Lafarge Material Safety Data Sheet (MSDS). The MSDS should be consulted prior to use of this product and is available upon request and online at www.lafarge-na.com.

Limited Warranty

Lafarge warrants that Lafarge NewCem slag cement meets the requirements of ASTM C 989 and CSA-A3001. Lafarge makes no other warranty, whether of merchantability or fitness for a particular purpose with respect to Lafarge NewCem slag cement. Having no control over its use, Lafarge will not guarantee finished work in which Lafarge NewCem slag cement is used.

PNBCE

1/07



Lafarge NewCem® Slag Cement

For more than three decades, NewCem has been used in conjunction with regular portland cement to produce improved concrete properties for architects, engineers, contractors, ready-mixed concrete and concrete products producers. Today, Lafarge maintains NewCem's market leadership through consistent product quality backed by solid technical expertise.

Please contact your Lafarge Office for specific product information, availability and ordering.

Lakes and Seaway Business Unit

Bingham Farms, Michigan
Phone: 248-594-1991

U.S. East Business Unit

Alpharetta, Georgia
Phone: 678-746-2000

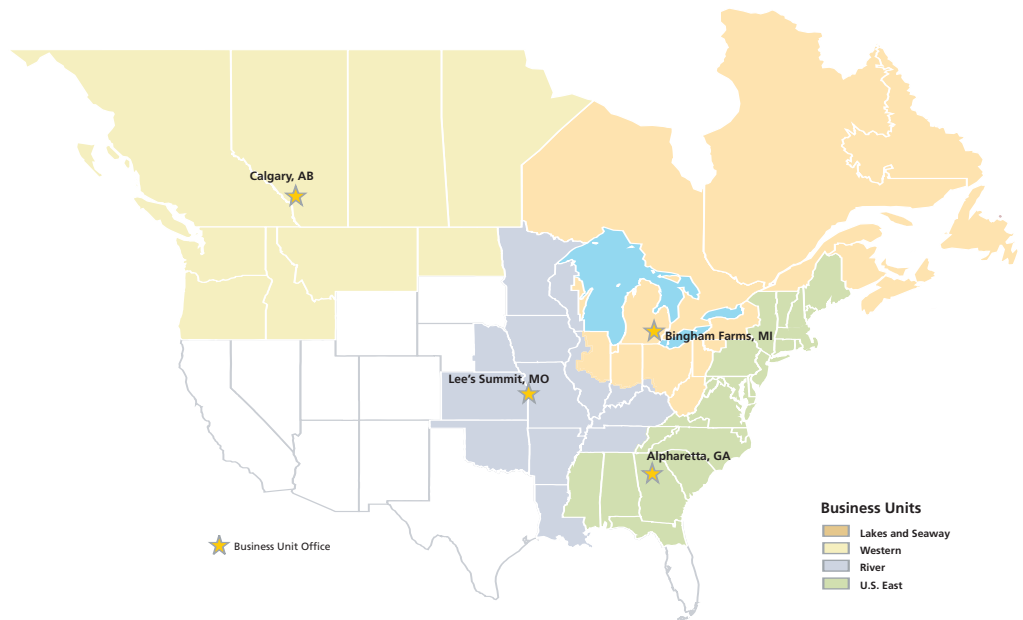
River Business Unit

Lee's Summit, Missouri
Phone: 816-251-2100

Western Business Unit

Calgary, Alberta
Phone: 403-271-9110

Lafarge North America Cement Operating Areas



CEMENT

Lafarge North America Inc.
12950 Worldgate Drive, Suite 500
Herndon, VA 20170

Lafarge Canada Inc.
606 Cathcart Street
Montréal, Québec H3B 1L7

www.lafarge-na.com

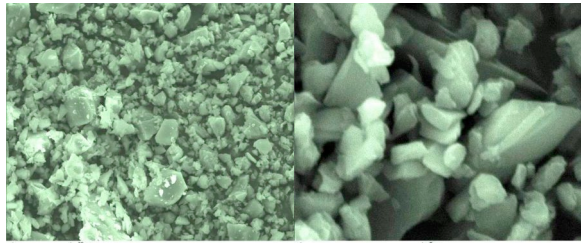
**Custom-engineered, high performance, pozzolanic mineral additives
for use in white cement, mortar, and concrete products**

www.vitrominerals.com

Product Description

VCAS™ (vitreous calcium aluminosilicate) pozzolans are new custom-engineered, high performance supplementary cementing materials for use in white Portland cement, mortar, and concrete products. They are manufactured by heating a blend of ground silica, lime, and alumina compounds to a molten state which is then solidified by quench cooling, processed, and ground to a fine white powder with highly-reactive pozzolanic characteristics.

After primary sizing and drying, the feedstock is finely ground and processed through high efficiency classifiers to produce a fine bright white powder with quality assured physical properties. The consistent chemical composition and tightly controlled particle size distribution result in highly reactive and superior quality pozzolans for concrete applications. Currently, the VCAS™ patented technology produces pozzolans in three grades, **VCAS-8**, **VCAS-140**, and **VCAS-160**, described in this technical summary.

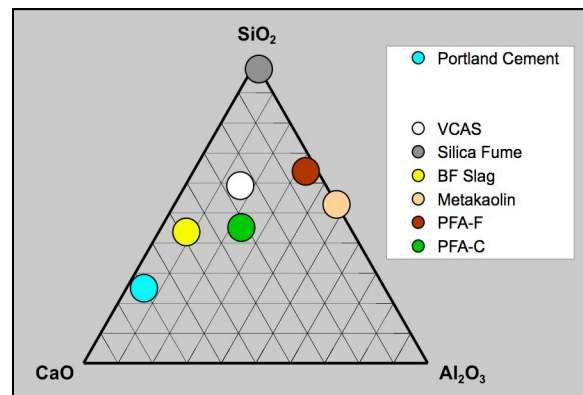


Unlike silica fume, coal fly ash, ground granulated blast furnace slag, and other by-products, VCAS™ pozzolans are free of iron, manganese, and other undesirable color-inducing impurities, making them ideally suited for all applications using white cement and in pigmented concrete.

VCAS™ pozzolans are value-added supplementary cementing materials that exhibit pozzolanic activity comparable to silica fume and metakaolin when tested in accordance with ASTM C618 and ASTM C1240. VCAS™ pozzolans react with calcium hydroxide produced during the hydration of Portland cement to form additional cementitious compounds such as calcium silicate and aluminosilicate hydrates. Pozzolans are widely used in cement and concrete technology to increase concrete strength, density, and resistance to chemical attack as well as control efflorescence.

Chemical Composition of VCAS™ Pozzolans			
Silica, SiO ₂	50–55%	Titania, TiO ₂	< 1%
Alumina, Al ₂ O ₃	15–20%	Phosphorus oxide, P ₂ O ₅	< 0.1%
Iron oxide, Fe ₂ O ₃	< 1%	Manganese oxide, MnO	< 0.01%
Calcium, CaO	20–25%	Boron oxide, B ₂ O ₃	0–6%
Magnesia, MgO	< 1%	Sulphur oxide, SO ₃	< 0.1%
Sodium oxide, Na ₂ O	< 1%	Chloride, Cl	< 0.01%
Potassium oxide, K ₂ O	< 0.2%	Loss on ignition, LOI	< 0.5%

Chemically, VCAS™ pozzolans are comprised largely of oxides of silicon, aluminum and calcium with no deleterious impurities. The CaO-SiO₂-Al₂O₃ proportions, the low alkali metal content, and the amorphous structure are ideal for a pozzolanic additive in hydraulic concrete. The low iron content makes them particularly well suited for applications using white cement, such as mortars, stuccos, terrazzo, artificial stone, and cast-in-place or precast concrete products.



Ternary diagram (CaO-SiO₂-Al₂O₃) for the composition of VCAS™ pozzolans relative to Portland cement and the common pozzolans.

VCAS™ pozzolans have superior powder handling compared with silica fume and metakaolin. Tight process control provides consistent product quality and physical properties.

Physical Properties of VCAS™ Pozzolans			
	VCAS-8	VCAS-140	VCAS-160
Specific Gravity	2.6	2.6	2.6
Bulk Density, Loose lb/ft ³	50-55	50-55	45-50
Passing No. 325 Mesh, %	95	95	98
Specific Surface Area, cm ² /g	4,000	4,000	6,000
Brightness, %	90	86	86
Melting Point, °C	1200	1200	1200
Hardness, Mohs	5.5	5.5	5.5

Benefits of VCAS™ Pozzolans

Fresh Concrete:

- Improved workability
- Reduction in water requirements
- Ease of dispersability
- Reduction in superplasticizer
- Reduction in bleeding
- Reduction in aggregate segregation

Hardened Concrete:

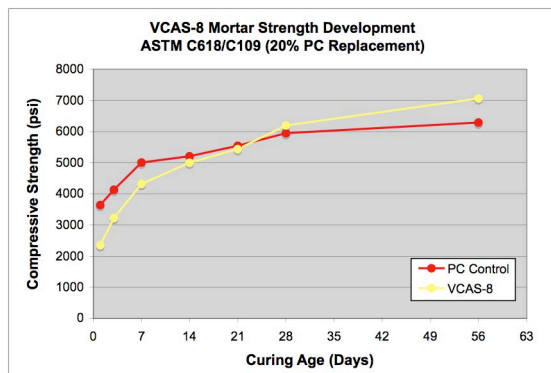
- Increased compressive strength
- Decreased permeability
- Increased durability

Added-Value:

- Mix-color neutrality and brightness
- Improved retention of mold detail
- Sustainability

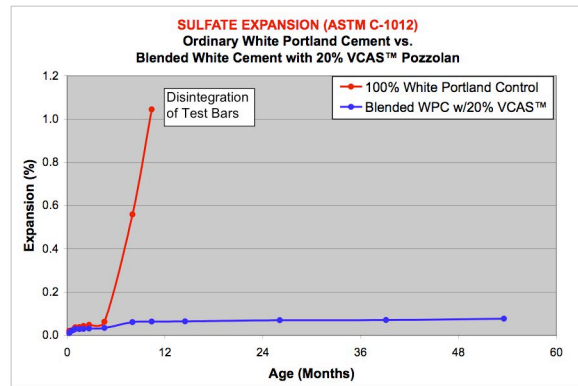
Performance

VCAS pozzolans meet the technical requirements of ASTM C618 for use as supplementary cementitious materials in concrete. Blended pozzolanic cements produced with VCAS pozzolans also exceed the requirements of ASTM C1157: Standard Performance Specification for Hydraulic Cement. A typical strength curve for VCAS-8 at 20% cement replacement is shown below. Coupled with low water demand, reduced efflorescence, and improved chloride resistance, VCAS™ pozzolans are extremely cost effective.



Enhanced Durability

VCAS™ pozzolans provide white Portland cement with superior resistance to sulfate attack (ASTM C1012). The graph below shows the excellent dimensional stability of a white cement mortar with 20% VCAS replacement after over 4 years of exposure. Under these harsh test conditions, the 100% white cement control mortar disintegrated in less than 200 days. VCAS is also very effective at controlling expansion due to the alkali-silica reaction (ASTM C441) and reducing chloride ion penetration (ASTM C1202).



Comparison with Other Pozzolans

VCAS™ pozzolans are excellent high reactivity materials for use with white cement to produce durable, high performance architectural concrete structures and reflective highway barriers.

Environmental, Health & Safety

VCAS™ pozzolans have an important role to play in sustainable construction by increasing service life and reducing the net greenhouse gas emissions (GHG) for a cubic yard of concrete.

VCAS™ pozzolans are non-toxic, contain no crystalline silica, and are classed as a nuisance dust, in common with other common fine particulate industrial minerals.

Product Availability

VCAS™ pozzolans are sold in bulk tanker trucks, 1-ton super-sacks, and 50 lb bags.

Disclaimer: The statements in this bulletin are based on data which is believed to be reliable, and is offered in good faith to be applied accordingly to the user's best judgment. Since operating conditions at customer's sites are beyond our control, Vitro Minerals will not assume responsibility for the accuracy of this data, or liability which may result from the use of its products. Likewise, no patent liability is assumed for use of Vitro Mineral products in any manner which could or would infringe on patent rights of others.

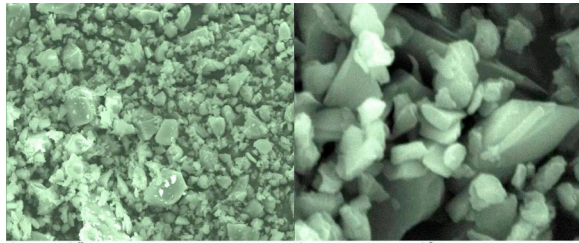
**Custom-engineered, high performance, pozzolanic mineral additives
for use in white cement, mortar, and concrete products**

www.vitrominerals.com

Product Description

VCAS™ (vitreous calcium aluminosilicate) pozzolans are new custom-engineered, high performance supplementary cementing materials for use in white Portland cement, mortar, and concrete products. They are manufactured by heating a blend of ground silica, lime, and alumina compounds to a molten state which is then solidified by quench cooling, processed, and ground to a fine white powder with highly-reactive pozzolanic characteristics.

After primary sizing and drying, the feedstock is finely ground and processed through high efficiency classifiers to produce a fine bright white powder with quality assured physical properties. The consistent chemical composition and tightly controlled particle size distribution result in highly reactive and superior quality pozzolans for concrete applications. Currently, the VCAS™ patented technology produces pozzolans in three grades, **VCAS-8**, **VCAS-140**, and **VCAS-160**, described in this technical summary.

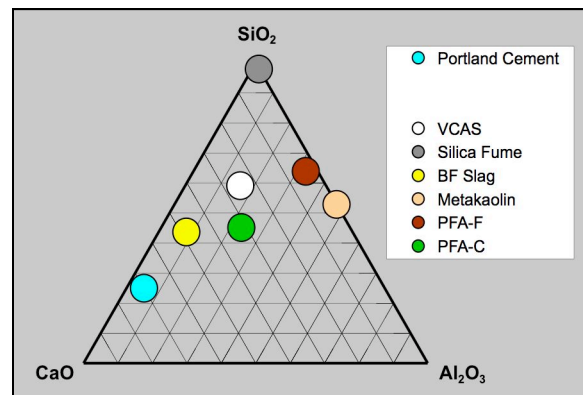


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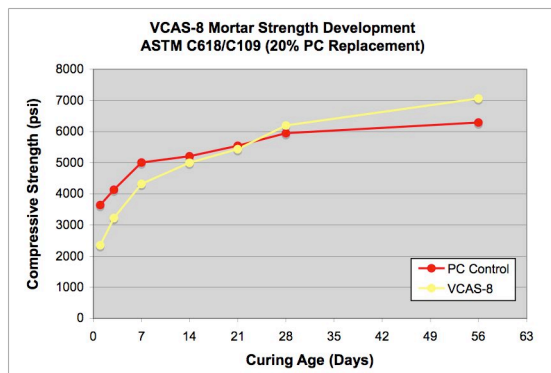
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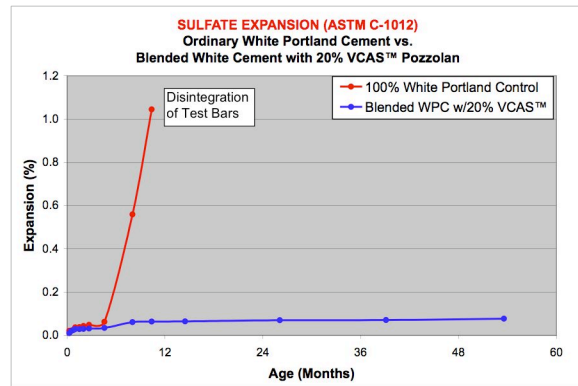
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Product specifications

according to DIN EN 13055-1

Designation	Poraver® basic granular sizes						Special granular sizes			
	0.1-0.3	0.25-0.5	0.5-1	1-2	2-4	4-8	0.04-0.125	high-strength 0.2-0.7	0.5-1.25	8-16
Granular size mm										
Bulk density lb/ft ³ Nominal	25	21.2	16.9	14.4	11.9	11.2	33.1	33.1	16.2	8.7
Apparent granular density lb/ft ³ Nominal	56.2	36.8	29.3	24.3	20	18.8	*	59.3	28.7	16.9
Compressive strength PSI	406	377	290	232	203	174	-	942.5	246.5	116
Oversize grains	≅ 10 M. %									
Undersize grains	≅ 15 M. %									

* on request

The following data are valid for all grain sizes:

pH value	9 - 12									
Moisture content on delivery	< 0.5 %									
Softening point	approx. 700° C									
Colour	creamy white									
Thermal conductivity W/mK	-	-	-	-	0.07**	0.07**	-	-	-	-

** Calculated values DIBT according to Approval Z-23.11-114

The Poraver® strengths may vary within the tolerance range of the bulk density.

The availability and delivery conditions for special grain sizes will be agreed on an individual basis.





Apparent bulk density

How to determine apparent bulk density

in accordance with DIN EN 1097-3

Pour loose Poraver[®] into a 1 litre measuring vessel and carefully level off any test material left on top.
Then weigh the test material in the vessel. The bulk density is the quotient of the weight and the volumes in lb/ft³.

Standard granular size mm	0.1 - 0.3	0.25 - 0.5	0.5 - 1	1 - 2	2 - 4	4 - 8
Apparent bulk density in lb/ft ³	25	21.2	16.9	14.4	11.9	11.2

Special granular size in mm	0.04 - 0.125	high-strength 0.2 - 0.7	0.5 - 1.25	8 - 16
Apparent bulk density in lb/ft ³	33.1	33.1	16.2	8.7

The following deviations from the given DIN apply:

- ▶ There is no drying, because Poraver[®] is generally supplied dry.
- ▶ The equilibrium moisture does not require conditioning.
- ▶ The measuring vessel indicates a volume of 1 litre even with granular sizes greater than 4 mm.
- ▶ One measuring value is given for each test.



Apparent granular density

How to determine apparent granular density

in accordance with DIN 4226

What is required to determine apparent granular density (ρ) is approx. 400ml of material that is weighed (m). Place the granular material into a cylinder with 1 litre nominal capacity and add 0.5 litre of water. Tap the measuring vessel to remove any air bubbles. Push a plunger with known volumes (Vs) into the measuring cylinder to prevent granular material from floating to the surface. After reading off the total volume (V) in cm³, you can calculate the granular density in lb/ft³ by using the following formula:

Calculation formula:

$$\rho = \frac{m}{V - (V_s + 500)}$$

Standard granular size in mm	0.1 - 0.3	0.25 - 0.5	0.5 - 1	1 - 2	2 - 4	4 - 8
Apparent granular density in lb/ft ³	56.2	36.8	29.3	24.3	20	18.8

Special granular size in mm	0.04 - 0.125	high-strength 0.2 - 0.7	0.5 - 1.25	8 - 16
Apparent granular density in lb/ft ³	*	59.3	28.7	16.9

* on request

The following deviations from the given DIN apply:

- ▶ There is no drying, because Poraver® is generally supplied dry.
- ▶ This testing method is used for Poraver® granular sizes from 0.1 – 16 mm.
- ▶ One measuring value is given for each test.



Compressive strength

How to determine granular compressive strength

in accordance with DIN EN 13055-1

To determine the compressive strength, pour 1 litre of Poraver[®] into a defined steel cylinder and compress. To do this, use an attached plunger to press down the granular material in this cylinder by 20 mm with a compressor. The force required for this is indicated as the granular strength.

Standard granular size in mm	0.1 - 0.3	0.25 - 0.5	0.5 - 1	1 - 2	2 - 4	4 - 8
Compressive strength PSI	406	377	290	232	203	174

Special granular size in mm	0.04 - 0.125	high-strength 0.2 - 0.7	0.5 - 1.25	8 - 16
Compressive strength PSI	–	942.5	246.5	116

The following deviations from the given DIN apply:

- ▶ Undersize and oversize grains are not removed within individual granular groups.
- ▶ Force is applied at a constant speed of 0.15 kN/s for all granular sizes.
- ▶ One measuring value is given for each test.



Water absorption

How to determine water absorption

in accordance with DIN V 18004

To determine water absorption, weigh approx. 0.4 litre of Poraver[®] to an accuracy of 0.1 g.

Procedure 1:

For granular sizes below 2 mm, store the water in a suction filter, and extract the water by means of a water-operated vacuum pump to dry the surface.

Procedure 2:

For granular sizes in excess of 2 mm, store the water in a density bottle. Here, dab the sample to dry the surface.

The difference between the mass of the surface-damp condition and the dry sample in relation to the dry sample is water absorption W in M.-%.

Calculation formula

$$WA [M. \%] = (M_f - M_{tr}) / M_{tr}$$

$$WA [V. \%] = WA [Vol. \%] \times KRD$$

M_w - Mass of water absorbed [g]
M_{tr} - Mass of sample dry [g]
KRD - Apparent granular density [kg/m³]

Standard granular size in mm	0.1 - 0.3	0.25 - 0.5	0.5 - 1	1 - 2	2 - 4	4 - 8
Water absorption in WA	35 M. %	30 M. %	25 M. %	20 M. %	15 M. %	10 M. %

Special granular size in mm	0.04 - 0.125	high-strength 0.2 - 0.7	0.5 - 1.25	8 - 16
Water absorption in WA	-	20 M. %	22 M. %	15 M. %

The following deviations from the given DIN apply:

- ▶ There is no drying, because Poraver[®] is generally supplied dry.
- ▶ Procedure 1 is used for granular sizes up to 2 mm, Procedure 2 only being used for granular sizes greater than 2 mm.
- ▶ Water storage of approx. 5 min. is used as standard in both procedures.



Chemical analysis

in accordance with test report 043077.1 of the MPA Hanover

Serial No.	Constituent	Applied to the sample dried at 105°C	Heat-loss-free (%)	Analysis method
1	Heat loss	0.3	–	DIN EN 1744-1
2	Insoluble residue	91.5	–	EN 196-2
3	CaO	8.9	9.0	spectrally photometric atomic emission
4	SiO ₂	71.7	71.9	
5	Al ₂ O ₃	2.5	2.5	
6	TiO ₂	0.1	0.1	
7	Fe ₂ O ₃	0.4	0.4	
8	Mn ₂ O ₃	0	0	
9	MgO	2.1	2.1	
10	K ₂ O	0.8	0.8	
11	Na ₂ O	13.2	13.2	
12	SO ₃	0.1	0.1	
13	Cl	–	–	argentometric
14	Remaining	– 0.1	– 0.1	–
15	Total 1, 3–14	100.0	100.0	–
16	Na ₂ O equivalent	13.7	–	calculated from 10+11

The analysis was conducted on a sample ground and dried to a granular size of < 0.125 mm.





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TECHNICAL SERVICE**

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1-423-629-7160

Fax 1-423-698-0614

Visit Sphere One at our website:
www.sphereone.net

EXTENDOSPHERES™ SG Hollow Spheres

EXTENDOSPHERES™ hollow spheres are efficient, lightweight additives for most resin systems. The SG series of products replaces heavier, more expensive components on an equivalent volume basis, they can reduce raw material costs as well as density.

EXTENDOSPHERES™ SG represents the general purpose version of hollow spheres. Extendospheres™ SG has a broad particle size distribution. SG makes an excellent choice for insulating roofing materials, cementitious coatings, grouts, synthetic stone, high strength anchoring compounds, and specialty cements. They can also be used in high mil-build industrial coatings, roofing materials, and mastics.

PACKAGING

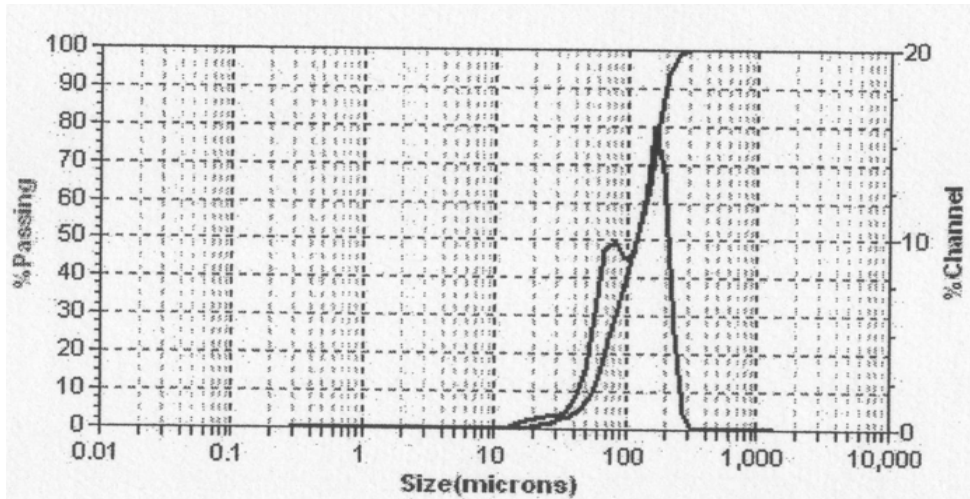
EXTENDOSPHERES™ SG hollow spheres are supplied in 50 lb multi-wall bags, 40 bags per pallet. Samples in sufficient quantity for testing are available upon request.

SAFETY INFORMATION

In areas where these hollow spheres create a dust, the use of a NIOSH-approved mask or respirator is recommended. Material Safety Data Sheet (MSDS) will be supplied upon request.

TYPICAL PROPERTIES OF EXTENDOSPHERES™ SG CERAMIC HOLLOW SPHERES

Physical Form	Free-Flowing Powder
Appearance	Gray
Particle Size SG	Microns 10-500 5-10% >150
Average Mean Particle Size SG	Microns 140 +/-30 microns
Density	0.72 +/- .05 g/cc
Bulk Density	<26 lbs/ft ³
Deformation Temperature	>1500°C
Compressive Strength	<10% @ 2500 psi
Hardness, Moh's Scale	5

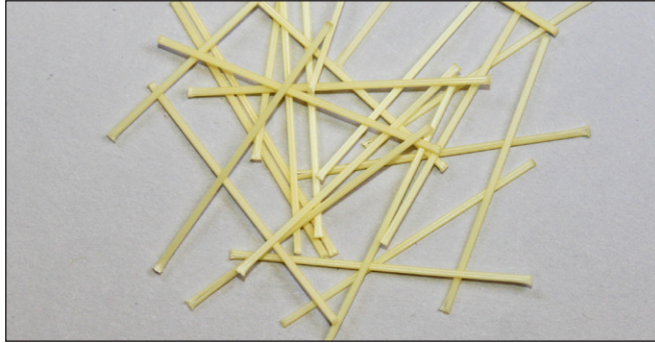


Microtrac 3500S

The technical information presented herein represents the best information available to us and is believed to be reliable. Sphere One, Inc. makes no warranties, either expressed or implied, with respect to our materials, including the warranties of merchantability or fitness for any particular purpose. We urge that users of our materials conduct tests to determine suitability for their specific end uses.

NYCON-PVA RF4000

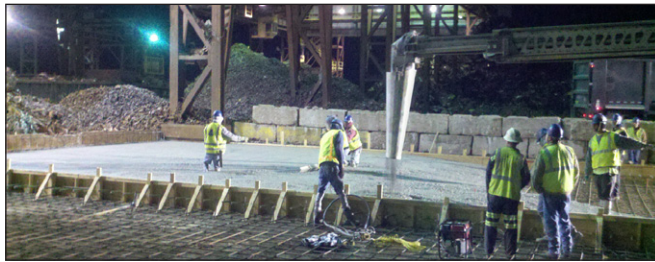
PVA (Polyvinyl Alcohol), Large Denier Macro, Superior Bond



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 fibers.

Nycon-PVA RF4000 is a component of the Nycon TUFF-SLAB™ blend.



NYCON-PVA RF4000 Physical Properties

Filament Diameter	130 Denier (660 Microns)
Fiber Length	1.25" (30 mm)
Specific Gravity	1.3
Tensile Strength	120 ksi (800 MPa)
Flexural Strength	3300 ksi (23 GPa)
Melting Point	435° F (225° C)
Color	Yellow
Water Absorption	<1% by Weight
Alkali Resistance	Excellent
Concrete Surface	Not Fuzzy
Corrosion Resistance	Excellent



Description

NYCON-PVA RF4000 fiber products are 130 denier, monofilament PVA fibers for use in fiber reinforced concrete, shotcrete, TUFF-SLAB™ and precast. NYCON-PVA RF4000 is specifically designed for use in concrete products for the purpose of controlling plastic shrinkage, thermal cracking and improving abrasion resistance.

NYCON-PVA RF4000 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. NYCON-PVA RF4000 at 6 lb (2.7 kg) per CY is the macro fiber and NYCON-PVA RSC15 at 3 lbs (1.35 kg) per CY is the micro fiber used together in Nycon's TUFF-SLAB™ product.

800-456-9266

www.nycon.com

sales@nycon.com

NYCON-PVA RF4000

PVA (Polyvinyl Alcohol), Large Denier Macro, Superior Bond



Advantages/Benefits	<ul style="list-style-type: none">• 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 RF4000 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) Melt-Away® bags per box, 600 lbs per pallet (21) 22 lb (10 kg) paper bulk bags, 462 lbs per pallet
Storage and Shelf Life	NYCON products 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 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 used as directed within shelf life. User determines suitability of product for intended use and assumes all risks. Buyer's sole remedy shall be limited to the purchase price or replacement of product exclusive of labor or cost of labor.

NO OTHER WARRANTIES EXPRESS OR IMPLIED SHALL APPLY INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Nycon SHALL NOT BE LIABLE UNDER ANY LEGAL THEORY FOR SPECIAL OR CONSEQUENTIAL DAMAGES. Nycon SHALL NOT BE RESPONSIBLE FOR THE USE OF THIS PRODUCT IN A MANNER TO INFRINGE ON ANY PATENT OR ANY OTHER INTELLECTUAL PROPERTY RIGHTS HELD BY OTHERS.

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



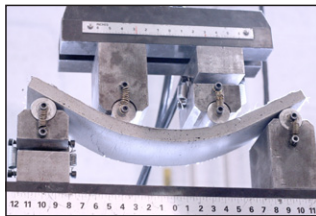
ULTRA-HIGH PERFORMANCE FIBERS

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



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.

NYCON-PVA RECS15

PVA (Polyvinyl Alcohol), Small Denier, Superior Bond



Advantages/Benefits	<ul style="list-style-type: none">• 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) Melt-Away® 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, Nycon Melt-Away® 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).

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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 used as directed within shelf life. User determines suitability of product for intended use and assumes all risks. Buyer's sole remedy shall be limited to the purchase price or replacement of product exclusive of labor or cost of labor.

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800-456-9266	www.nycon.com	sales@nycon.com
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Description

Glenium 3030 NS ready-to-use full-range water-reducing admixture is a patented new generation of admixture based on polycarboxylate chemistry. Glenium 3030 NS admixture is very effective in producing concretes with different levels of workability including applications that require the use of Rheodynamic® Self-Consolidating Concrete (SCC). Glenium 3030 NS admixture meets ASTM C 494/C 494M requirements for Type A, water-reducing, and Type F, high-range water-reducing, admixtures.

Applications

Recommended for use in:

- Concrete where high flowability, high-early and ultimate strengths and increased durability are needed
- Self-consolidating concrete
- Concrete where normal, mid-range, or high-range water-reduction is desired
- Concrete where normal setting times are required
- 4x4™ Concrete for fast track construction
- Pervious Concrete
- Self-consolidating grout

GLENIUM® 3030 NS

Full-Range Water-Reducing Admixture

Features

- Reduced water content for a given slump
- Dosage flexibility for normal, mid and high-range water reduction
- Produces cohesive and non-segregating concrete mixture
- Increased compressive strength and flexural strength performance at all ages
- Providing faster setting times and strength development
- Enhanced finishability and pumpability

Benefits

- Providing economic benefits to the entire construction team through higher productivity and reduced variable costs

Performance Characteristics

Mixture Data: 600 lb/yd³ of Type I cement (360 kg/m³); slump, 8.5-9.25 in. (210-235 mm); non-air-entrained concrete; dosage rate adjusted to obtain 25-30% water reduction.

Setting Time

Mixture	Initial Set (h:min)	Difference (h:min)
Plain	4:24	–
Conventional Superplasticizer	6:00	+ 1.36
Glenium 3030 NS admixture	5:00	+0.36

Compressive Strength

Mixture	1 day		7 days	
	psi	MPa	psi	MPa
Plain	1700	12	4040	28
Conventional Superplasticizer	3460	24	6380	44
Glenium 3030 NS admixture	4120	28	7580	52

Slump Retention - in. (mm)

Mixture	Minutes		
	15	30	45
Plain	8.5 (215)	8.5 (215)	7.5 (200)
Conventional Superplasticizer	8.5 (215)	4.25 (110)	3.5 (90)
Glenium 3030 NS admixture	9.25 (235)	9.25 (235)	8.25 (210)

Product Data: GLENIUM® 3030 NS

Rate of Hardening: Glenium 3030 NS admixture is formulated to produce normal setting characteristics throughout its recommended dosage range. Setting time of concrete is influenced by the chemical and physical composition of the basic ingredients of the concrete, temperature of the concrete and ambient conditions. Trial mixtures should be made with actual job materials to determine the dosage required for a specified setting time and a given strength requirement.

Guidelines for Use

Dosage: Glenium 3030 NS admixture has a recommended dosage range of up to 3 fl oz/cwt (195 mL/100 kg) for Type A applications, 3-6 fl oz/cwt (195-390 mL/100 kg) for mid-range use and up to 18 fl oz/cwt (1,170 mL/100 kg) for Type F applications. The dosage range is applicable to most concrete mixtures using typical concrete ingredients. However, variations in job conditions and concrete materials, such as silica fume, may require dosages outside the recommended range. In such cases, contact your local BASF Construction Chemicals representative.

Mixing: Glenium 3030 NS admixture can be batched with the initial mixing water or as a delayed addition. However, optimum water reduction is generally obtained with a delayed addition.

Product Notes

Corrosivity – Non-Chloride, Non-Corrosive: Glenium 3030 NS admixture will neither initiate nor promote corrosion of reinforcing steel embedded in concrete, prestressed concrete or of galvanized steel floor and roof systems. Neither calcium chloride nor other chloride-based ingredients are used in the manufacture of Glenium 3030 NS admixture.

Compatibility: Glenium 3030 NS 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 Glenium 3030 NS admixture with admixtures containing beta-naphthalene-sulfonate. Erratic behaviors in slump, slump flow, and pumpability may be experienced.

For directions on the proper evaluation of Glenium 3030 NS admixture in specific applications, contact your BASF Construction Chemicals representative.

Storage and Handling

Storage Temperature: If Glenium 3030 NS admixture freezes, thaw at 45 °F (7 °C) or above and completely reconstitute by mild mechanical agitation. **Do not use pressurized air for agitation.**

Shelf Life: Glenium 3030 NS admixture has a minimum shelf life of 12 months. Depending on storage conditions, the shelf life may be greater than stated. Please contact your BASF Construction Chemicals representative regarding suitability for use and dosage recommendations if the shelf life of Glenium 3030 NS admixture has been exceeded.

Packaging

Glenium 3030 NS admixture is supplied in 55 gal (208 L) drums, 275 gal (1040 L) totes and by bulk delivery.

Related Documents

Material Safety Data Sheets: Glenium 3030 NS admixture.

Additional Information

For additional information on Glenium 3030 NS admixture or its use in developing concrete mixes with special performance characteristics, contact your BASF Construction Chemicals representative.

The Admixture Systems business of BASF Construction Chemicals 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.

BASF Construction Chemicals
Admixture Systems

www.masterbuilders.com

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**Master
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XYCRYLIC ADMIX

DESCRIPTION

XYCRYLIC ADMIX is a water-based, high solids, polymer dispersion specifically designed for fortifying portland cement compositions. This liquid is milky-white in color and improves curing qualities, enhances bond, imparts excellent water and weather resistance, and reduces shrinkage cracking. Xycrylic Admix is also used to fortify Xypex Patch'n Plug.

RECOMMENDED FOR:

- Patching and Concrete Repairs
- Resurfacing Floor Underlayments
- Terrazzo Flooring
- Spray and Fill Coats
- Highway and Bridge Deck Repair

ADVANTAGES

- Hardens and toughens cement mortars for improved durability
- Enhances adhesion capabilities to a wide variety of surfaces
- Increases resistance to many industrial chemicals
- Eliminates water curing

DURABILITY AND STRENGTH

Cement mortars modified with Xycrylic Admix are hard, tough and durable. Compared with unmodified mortars, Xycrylic modified mortars have far superior flexural, adhesive and impact strengths as well as excellent abrasion resistance. They are especially useful where thin sections are desirable and where excessive vibration and heavy traffic is encountered.

ADHESION

Xycrylic Admix modified mortars have excellent adhesion to a variety of surfaces such as concrete, masonry, brick, wood, metals and others.

RESISTANCE PROPERTIES

Cement mortars modified with Xycrylic Admix are resistant to many industrial chemicals as well as ultraviolet light and heat. Mortars containing Xycrylic Admix dry to a uniform color.

PACKAGING

Xycrylic Admix is available in 128 fl. oz. (3.79 litre) and 5 gallon (18.95 litre) bottles.

STORAGE

Keep Xycrylic Admix from freezing.

MIXING

Xycrylic Admix may be used full strength or diluted with clean water depending on application requirements.

TEST DATA

PHYSICAL STRENGTH OF CEMENT MORTARS					
ASTM Standard Test Method	Mixing Liquid				
	Full Strength	1:1 Water	1:2 Water	No Xycrylic	
C-190-85 Tensile Strength	610 (4.2)	440 (3.0)	375 (2.6)	235 (1.6)	psi (MPa)
C-109-88 Compressive Strength	5700 (39.3)	4530 (31.2)	3830 (26.4)	2390 (16.5)	psi (MPa)
C-348-86 Flexural Strength	1570 (10.8)	1130 (7.8)	960 (6.6)	610 (4.2)	psi (MPa)
Shear Bond Adhesion	640 (4.4)	360 (2.5)	260 (1.8)	45 (0.31)	psi (MPa)

Note 1: Strength properties are based on cement mortar prepared as 3 parts sand to 1 part cement by volume.

Note 2: Strengths are based on a 28 day air cure. Wet cure strengths may be less.



APPLICATION PROCEDURES

Xycrylic Admix may be used full strength or diluted with clean water depending on application requirements.

FOR USE WITH CEMENT MORTAR

1. Thoroughly premix sand and cement (1 part cement to 2 parts sand).
2. Blend Xycrylic Admix with water according to strength, bonding and resistance requirements.
3. Add the Xycrylic mixing liquid (whether full strength or diluted with water) to the sand and cement.
4. Mix thoroughly until desired workable consistency is reached. Always withhold some Xycrylic mixing liquid so that the mortar will not be too fluid and so that mixing liquid can be carefully gauged near end of mixing cycle (2 - 4 minutes).

FOR USE WITH PATCH'N PLUG

1. Blend Xycrylic Admix with clean water (1 part Xycrylic to 1 part water by volume).
2. Add Xycrylic mixing liquid to the Patch'n Plug powder at a rate of 1 part liquid to 3.5 parts Patch'n Plug.
3. Mix to a stiff putty consistency. Do not mix more than can be used in three minutes.

CURING

For optimum physical properties, cement mortars modified with Xycrylic Admix should be air-cured at ambient temperature and relative humidity.

TECHNICAL SERVICES

For more instructions, alternative application methods, or information concerning the compatibility of the Xypex treatment with other products or technologies, contact the Technical Department of Xypex Chemical Corporation or your local Xypex representative.

SAFE HANDLING INFORMATION

Xycrylic Admix is alkaline and has a slight ammoniacal odor. This product may be a mild to moderate skin and eye irritant. In addition, many of the components of the cementitious products that are used in conjunction with the Xycrylic Admix may also possess significant skin and eye irritation potential. Directions for treating these problems are clearly detailed on all Xypex pails and packaging. The Manufacturer also maintains comprehensive and up-to-date Material Safety Data Sheets on all its products. Each sheet contains health and safety information for the protection of workers and customers. The Manufacturer recommends you contact Xypex Chemical Corporation or your local Xypex representative to obtain copies of Material Safety Data Sheets prior to product storage or use.

WARRANTY

The Manufacturer warrants that the products manufactured by it shall be free from material defects and will be consistent with its normal high quality. Should any of the products be proven defective, the liability to the Manufacturer shall be limited to replacement of the product ex factory. The Manufacturer makes no warranty as to merchantability or fitness for a particular purpose and this warranty is in lieu of all other warranties expressed or implied. The user shall determine the suitability of the product for his intended use and assume all risks and liability in connection therewith.



ISO 9001:2000
FM 63167



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XYPEX is a registered trademark of Xypex Chemical Corporation.



E-MAIL TRANSMISSION

To: Ryan Hoensheid

From: Dave Ross – Xypex Chemical Corp.


Re: Confirmation Regarding ASTM C-1438 Type II for Xycrylic Admix

Dear Ryan,

This letter will confirm that Xypex Xycrylic Admix will meet the requirements of ASTM C-1438 Type II and this has been verified per our material supplier, Rohm and Hass.

I hope that this letter takes care of your concerns.

Sincerely,



Dave Ross
Technical Services Manager

CONCRETE WATERPROOFING BY CRYSTALLIZATION

13731 Mayfield Place, Richmond, British Columbia, Canada V6V 2G9
Tel: 604 273-5265 Fax: 604 270-0451

Description

Delvo Stabilizer ready-to-use, liquid admixture is used for making more uniform and predictable high-performance concrete. Delvo Stabilizer admixture retards setting time by controlling the hydration of portland cement and other cementitious materials while facilitating placing and finishing operations. It can be used to stabilize returned plastic concrete and concrete washwater to reduce waste and increase profits. Delvo Stabilizer admixture meets ASTM C 494/C 494M requirements for Type B, retarding, and Type D, water-reducing and retarding, admixtures.

Applications

Recommended for use in:

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

DELVO® STABILIZER

Hydration Controlling Admixture

Features

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

Benefits

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

Performance Characteristics

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

One of the functions of Delvo Stabilizer 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 mixes should be made under approximate job conditions to determine the dosage required.

Compressive Strength: Concrete produced with Delvo Stabilizer 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 Delvo Stabilizer 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: Delvo Stabilizer admixture is recommended for use at a dosage of 4 ± 1 fl oz/cwt (260 ± 65 mL/100 kg) of cementitious materials for most concrete mixtures using average concrete ingredients. Because of variations in job conditions and concrete materials, dosages other than the recommended amounts may be required. In such cases, contact your BASF Construction Chemicals representative. For concrete washwater and returned concrete stabilization, utilize Delvo charts or the Delvomatic™ software to determine the appropriate dosage rates.

Product Data: DELVO® STABILIZER

Product Notes

Corrosivity – Non-Chloride, Non-Corrosive: Delvo Stabilizer 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: Delvo Stabilizer admixture may be used in combination with any BASF Construction Chemicals admixture. When used in conjunction with another admixture, each admixture must be dispensed separately into the mix.

Storage and Handling

Storage Temperature: If Delvo Stabilizer admixture freezes, thaw at 35 °F (2 °C) or above and completely reconstitute by mild mechanical agitation. **Do not use pressurized air for agitation.**

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

Packaging

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

Related Documents

Material Safety Data Sheets: Delvo Stabilizer admixture.

Additional Information

For more information on Delvo Stabilizer admixture, 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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BASF Corporation
Admixture Systems

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**Master
Builders**



2512 - 2516 - 2520 W. WOODLAND DRIVE • ANAHEIM, CA, 92801

DATE : November 14, 2011

CERTIFICATION OF CONFORMANCE No. 11- 1284

CUSTOMER: MICHIGAN TECHNOLOGICAL UNIVERSITY
P.O.#: VERBAL - ANGELA
SPECIFICATION #: MS80002 REV. N/C
TPI STYLE #: 4009-1
TPI LOT#: 10844
WARP & FILL FIBER: T300B-3K-40A TWISTED KEVLAR 49 195 DN. / T300B-3K-40B
WARP & FILL LOTS #: J4111F2, J4111G1
LENO FIBER: 195 DN. KEVLAR
FABRIC CONSTRUCTION: LENO
COUNT: 8.1 X 8.0
AREAL WEIGHT (G/M²): 135
FABRIC WIDTH (IN.): 51.19
ROLL #s: 24
ROLL LENGTH (YARDS): 20
TOTAL YARDS: 20

BY:
Quality Control Manager *For*



Toray Carbon Fibers America, Inc.

P.O. Box 248
Decatur, Alabama 35602
TEL: (256) 260-2626
FAX: (256) 260-2627

CERTIFICATE

Torayca Carbon Fiber

CUSTOMER	: CYTEC ENGINEERED MATERIALS
CFA REFERENCE NO.	: A-TC-11-1032
CUSTOMER ORDER NUMBER	: 305025399 ✓
PRODUCT	: T300-3000-40A 200KE3 A ✓
QUANTITY (KG)	: 1824
PLACE MANUFACTURED	: Japan <i>5/2 2YR'S DOM</i>
MFG DATE	: Jul-11 <i>7-1-13 ✓</i>

Based on random samplings, listed are the average physical properties of the lots included in this shipment.

LOT NO. ✓	YIELD G/M ✓	FIBER	TENSILE STRENGTH KSI ✓	*SACMA - YOUNG'S MODULUS	YOUNG'S	ELONGATION % ✓	SIZING (WT %) ✓
		DENSITY G/CC ✓		MODULUS MSI ✓	MODULUS MSI ✓		
J4111G1 ✓	Avg 0.199 ✓	1.77 ✓	566 ✓	33.1 ✓	34.3 ✓	1.7 ✓	1.0 ✓
	CV% 1.1	0.2	2.5		1.0	2.3	5.2
	N = 65	65	65		65	65	65
	Min 0.194	1.76	530 ✓		33.6	1.6 ✓	0.9
	Max 0.204	1.78	596 ✓		34.8	1.7	1.2

* SACMA - YOUNG'S MODULUS IS FOR REFERENCE.

The material shipped on this order is in compliance with:
PRS 30101853 Rev B, SMS 47 Issue 5, (Type 1/Class 1/Grade 3);
BMS 9-8 Rev.K, (Type 1/Class 1/Grade 3) ✓

The specified Lot(s) meet the twist requirement of 0 - 0.8 tpi ✓
Sizing Type 4 is equivalent to UC-309. ✓
The material was tested in a GE approved S450 lab. ✓



*K.K.
9-15-11*

Nancy E. Vancil
Nancy E. Vancil

Manager, Quality Assurance
Decatur, Toray Carbon Fibers America

300034062
0001-0013



AUG 22 2011



3K, 2 x 2 Twill Weave Carbon Fiber

Part # - 1069

5.7 oz/sq yd, 50" Wide, .012" Thick, 3K, 2x2 Twill Weave.

This 2x2 twill weave fabric offers the cosmetic appearance so desirable on modern composite parts. But don't just use it for looks, this fabric is highly formable and slightly stronger than the plain weave.

Product Properties	
Warp Raw Material	3K –Multifilament Continuous Tow
Filling Raw Material	3K –Multifilament Continuous Tow
Weave Pattern	2 x 2 Twill
Fabric Areal Weight	5.7 oz/ yd ² (200 gsm approx.)
Warp Ends/ Inch	13.0 ± 1.0
Pick / Inch	13.0 ± 1.0
Nominal Thickness	.012 inches
Fabric Width	50 ± .25/-0 inches

DESCRIPTION

Graphite fibers contain up to 95% carbon and yield the highest tensile strength in the FRP industry. These fibers woven together form graphite fabric. These fabrics offer higher strength and stiffness-to-weight ratios than any other commonly available reinforcements. While there are hundreds of types to choose from, we have selected three styles of standard modulus carbon fiber which are suitable for use in racing, aircraft, competition marine, and light industrial applications. To maximize the fiber properties we recommend using only epoxy or vinyl ester resin, although polyesters will bond to the fabrics. This 2x2 twill weave fabric offers the cosmetic appearance so desirable on modern composite parts. But don't just use it for looks, this fabric is highly formable and slightly stronger than the plain.

Weave Pattern Rankings:

	Thickness	Weight	Strength	Porosity
Plain	3	1	3	1
Twill	2	1	4	2
4-Harness Satin	3	1	4	2
8-Harness Satin	1	1	7	4
Leno	7	7	1	7
Mock Leno	6	1	2	4

This was a scale from 1 to 7, with 1 being the lowest and 7 being the highest

Resin Compatibility:

1069, Carbon Fiber Fabric, is compatible with Polyester, Vinyl Ester, and Epoxy Resins.

General Properties for Carbon Fiber Fabrics:

- Lightweight
- High Modulus
- Fire Resistant
- Dimensionally Stable
- Fatigue Resistant



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OCERA™ NATURE'S COLORS OPUS™ SERIES

SEMI-TRANSPARENT STAINS FOR CONCRETE AND MASONRY SURFACES

PRODUCT DESCRIPTION: OCERA Opus™ Series Stains are water based, breathable, semi-transparent formulations designed to color to concrete and masonry structures, while retaining both the texture and the natural characteristic of the surface. Opus™ stains are designed using recently developed nano-pigment technology, which allows a higher degree of permeability and color distribution into the substrate due to their fine size and non-settling properties. Opus™ stains are pigment based formulation and contain no dyes, thereby exhibiting high resistance to fading from sunlight. Opus™ stains contain minimal amounts of volatile petroleum solvents and do not exhibit any objectionable odors, making them safe to use in enclosed, interior applications. Opus™ stains contain no waxes that can yellow, discolor or inhibit bond to subsequent applied coatings or sealants.

APPLICATIONS: OCERA Opus™ Stains can be used for decorative concrete including flatwork, stamped and textured concrete, concrete counter tops, concrete masonry units, stucco, mortar, grout, and most any other Portland based surface. They can be used safely in either indoor or outdoor applications.

BENEFITS:

- Achieve beautiful, natural colors that exhibit mottled hues and tone
- Exhibit a high degree of reaction equal to alternative acid stains without the additional hazards of transport, use and personal protection
- Can be used to make quick and easy color corrections over existing stains for routine maintenance
- Contain no light sensitive dyes or additives that will fade over time, making them safe for outdoor applications with a few color exceptions

LEED CREDIT CONSIDERATIONS: Materials and Resources: **MR Credit 1.2**-Building re-use. Indoor Environmental Quality: **EQ Credit 4.2:** Low emitting materials (VOC < 25 g/L). **MR Credit 5.2:** Regional materials- Greater than 20% extracted, processed and manufactured regionally at production location: Lemont, Illinois 60439. 90% Content- Harvested within 500 miles.

COMPOSITION: OCERA Opus™ Stains contain water, proprietary resins, rheology modifiers, and specially engineered nanopigment dispersions.

COLORS AND FINISHES: OCERA Opus™ Stains are available in 21 standard shades that can be mixed together for additional translucent color tones or effects. Custom colors are available upon request. Concrete Earth recommends that a test application be made on the actual surface to be treated, to accurately determine coverage rates and for customer approval of both color and appearance.

SURFACE PREPARATION: Surface must be structurally sound, clean, dry and free of dust, dirt efflorescence, mortar smear, laitance, curing or form release compounds or other contaminants. New concrete should be allowed to cure for a minimum of 12-14 days, preferably up to 28 days, to allow maximum penetration of the stain. Cementitious microtopping or overlay application products should be allowed to cure for a minimum of 48-72 hours at ambient temperatures before applying any Opus™ stains. Provide an absorptive surface on all smooth, dense, or hard troweled substrates by mechanical abrasion or chemical etching. Use our GREEN organically engineered Enviro Clean & Etch C-30 cleaner to remove contaminants and increase porosity and stain penetration. Do NOT use muriatic acid type cleaners. Make sure to rinse the cleaned surface thoroughly and allow it to dry prior to applying any Opus™ stains.

MIXING: OCERA Opus™ Stains are concentrated formulas designed to be diluted with 1 to 3 equal parts of water for typical color consistency. All colors should be shaken well before use and poured into a separate, clean mixing pail. The empty bottle should be filled with potable water from one to three times depending on the depth of color tone and penetration desired, using less dilution for deeper, richer colors. The dilution step ensures that any remaining pigment residue that may still be inside the container is flushed from the bottle and full transfer of the concentrate is complete.

COVERAGE: Coverage rates will vary on above dilution sequence, however, they are approximately 150-200 square feet per gallon depending on concrete porosity. Coverage will typically be at the higher range for hard troweled or mechanically finished concrete, and at the lower range if concrete is broom finished, very rough or absorptive, or if application conditions are hot or windy. For slightly lighter shades or cost reduction reasons, the OCERA Opus™ Stains can be cut with water 1 to 3 by volume. For slightly darker hues, OCERA Opus™ Stains should be applied "as is", or can be re-applied with an additional coat after the first coat has fully penetrated (usually 30-40 minutes).





ChemMasters

SPECIALTY CONSTRUCTION PRODUCTS

CRYSTAL CLEAR-A

LOW VOC, SOLVENT-BASED
HIGHEST GLOSS SEALER & CURING
COMPOUND FOR CONCRETE

P R O D U C T D A T A

DESCRIPTION

Crystal Clear-A is premium quality, super high gloss, non yellowing, curing and sealing compound. Crystal Clear-A is a state-of-the-art proprietary formulation which creates the highest gloss possible on concrete.

Crystal Clear-A is a solvent based product which meets the VOC requirements of the Ozone Transport Commission, in effect as of Jan. 1st, 2005.

Crystal Clear-A coats concrete with a chemically bonded siliconized acrylic film that deepens the color and enhances the look of pigmented or decorative concrete. Crystal Clear-A completely resists discoloration from ultraviolet light exposure. It keeps its high gloss finish much longer than standard concrete sealers. Crystal Clear-A will retard efflorescence while resisting oil, grease and food stains. Crystal Clear-A eliminates concrete dusting, while protecting concrete against salt and water penetration.

USES

Use on exterior plain, colored, textured or exposed aggregate concrete to

- Cure freshly poured concrete where superior curing efficiency is required
- Seal, harden and dustproof existing concrete, particularly architectural or residential concrete exposed to freeze-thaw or Ultra Violet light.
- Enhance the color and and gloss of pigmented or stamped concrete

ADVANTAGES

- Crystal Clear-A is much tougher than acrylic sealers. The high gloss created by Crystal Clear lasts up to 70% longer.
- Crystal Clear-A completely resists discoloration from ultraviolet light exposure.

- Complies with the VOC standards for concrete sealers in the following states: California, Delaware, New Jersey, New York, Oregon, Pennsylvania, Virginia, Washington and other area that require the VOC limits on curing & sealing compounds to be less than 350 grams per liter
- Crystal Clear-A cures concrete to ASTM C1315 standards to minimize cracking and increase the strength of concrete.
- Protects surfaces against deicing chemicals, fertilizers, salts, grease, oil, alkalies, mild acids and detergents.

TECHNICAL DATA

Crystal Clear-A has been tested for gloss retention and non yellowing against standard concrete sealers with the following results.

Gloss Retention

After 1,000 hours QUV exposure
(All panels begin with 95 gloss rating)

	Gloss	Percent Original
Crystal Clear-A	89.8	95%
Moisture Cure Urethane	79.1	83%
Pure Acrylic	73.6	77%
Styrene Acrylic	55.4	58%

Yellowing Index

After 1,000 hours QUV exposure
Equivalent to approx 10 years of Florida sunlight
(All panels begin with 0 yellow rating)

	Yellowing
Crystal Clear-A	0.00
Moisture Cure Urethane	3.00
Pure Acrylic	4.77
Styrene Acrylic	9.48

(Visable yellowing begins at 3.00)



ChemMasters

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- ASTM C-1315, Type I , Class A & B,
- ASTM C-309, Type I, Class A & B,
- USDA approved, when cured, for incidental contact

V.O.C. content	350 gr/L
Moisture retention (ASTM C-156)	0.035 gms/cm ²
Flash point	over 0°F (-18°C)
Drying time@70°F (21°C) and 50% RH	
Tack free	2 hours
Light foot traffic	8 hours
Maximum hardness	7 days

PACKAGING

Crystal Clear-A is available in 5 gallon (18.9 liter) metal pails and 55 gallon (208 liter) drums.

ESTIMATING GUIDE

Coverage is dependent upon surface texture and porosity. These are guidelines only

	Ft. ² /gal	M ² /L
Curing	300	7
Sealing Concrete		
First Coat	350	8
Second coat	450	11

DIRECTIONS

MIXING: Do not dilute. Crystal Clear-A is packaged ready to use and requires no mixing.

APPLICATION: Always test application in a small area to verify appearance. In cold temperatures (below 50°F), warm material to room temperature to ease application. In hot weather avoid applying in direct sunlight or in windy conditions. In hot weather, apply Crystal Clear-A early in the morning.

Because Crystal Clear-A dries very quickly, a low pressure, spray application is recommended. A pump up sprayer equipped with a slit-type orifice rated between 0.5 - 1.0 gallons per minute is recommended. If spraying, hold spray tip 6-8 inches from the surface and apply a continuous film leaving no pinholes or gaps. The optimum spray pattern is an 8-12 inch fan. When using a hand pressurized sprayer it is important to maintain as high an air pressure as possible to aid in spraying. Do not allow material to puddle. If roller application is necessary, regularly dip the

roller in a solvent like xylene or Polyseal Solvent to keep the roller from drying. If the roller dries out, cob-webbing or stringiness will result.

CURING: Apply Crystal Clear-A after all bleed water has dissipated and application will not mar the surface. For maximum gloss and protection, apply a second sealer coat after curing process is completed (minimum 28 days later).

SEALING: When sealing older concrete, clean concrete thoroughly removing any dirt, dust, paints, oil, grease or other contaminants that prevent adhesion. Allow the surface to dry before application of Crystal Clear-A. For best protection and highest gloss, apply two thin coats of Crystal Clear-A. Allow first coat to dry tack free before application of second coat.

CLEANUP

Clean tools immediately after use with Polyseal Solvent™ or xylene.

STORAGE

Store tightly sealed containers in cool, dry area away from direct sunlight and sources of heat. Shelf life is one year from date of manufacture.

LIMITATIONS

- Strong organic solvents, xylene, toluene, lacquer thinner, will lift Crystal Clear-A. Gasoline, hydraulic fluids, peanut oil and cooking oils soften and lift Crystal Clear if spills are not removed quickly.
- Do not apply to joints or channels scheduled to receive elastomeric caulks.
- Do not use if ambient or surface temperature is below 40°F (4°C). For best results, condition material to a minimum of 50°F (10°C) prior to application.
- Quality curing or sealing compounds and floor treatments darken or highlight the subtle color variations naturally present in concrete. When the difference in shading caused by absorptive deviation or finishing techniques is objectionable, consult ChemMasters technical staff prior to concrete placement for recommendations.

CAUTION

FLAMMABLE LIQUID: Keep away from heat or open flames. Use with adequate ventilation. May cause skin, eye and respiratory tract irritation. Do not take internally.

This Product is Formulated and Labeled for Industrial and Commercial Use Only

FOR BEST RESULTS AND SAFEST USAGE, USER IS SPECIFICALLY DIRECTED TO CONSULT THE CURRENT MATERIAL SAFETY DATA SHEET AND PACKAGE LABEL FOR THIS PRODUCT

We warrant our products to meet our published specifications and to be free from defects in materials and workmanship to the acceptable quality levels defined in these specifications. If acceptable quality levels are not specified, the acceptable quality levels will be those normally supplied by us for the product. We make no guarantee of the results to be obtained from the use of our products. The determination as to the adaptability of any of our products to the specific needs of the Buyer is solely Buyer's prerogative and responsibility. We are glad to offer suggestions on the use of our products. Nevertheless, there are no warranties given except such expresses warranties offered in connection with the sale of a particular product. Our liability shall be limited to replacement of, or refund of an amount not to exceed the purchase price attributed to, the goods as to which such claim is made. Our selection of one of these alternatives shall be Buyer's exclusive remedy. IN NO CASE SHALL WE BE LIABLE FOR CONSEQUENTIAL OR SPECIAL DAMAGES, EVEN IF WE HAVE BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. THE FOREGOING WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES, GUARANTEES, CO-CONDITIONS AND REPRESENTATIONS, EITHER EXPRESSED OR IMPLIED, WHETHER ARISING UNDER ANY STATUTE, COMMON LAW, USAGE OR TRADE, COURSE OF DEALING OR OTHERWISE, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.