MTDS Addendum

Michigan Technological University
Dozer

Summary Table

Product Name	Type	ASTM	Link
Lafarge - Portland Cement	Cement	C-150	https://www.lafargeholcim.us/our-solutions-and-products
Lafarge - Blast Furnace Slag	Cementitious Material	C-989	https://www.lafarge.ca/en/newcem
Lafarge - Class C Fly Ash	Cementitious Material	C-618	https://www.lafargeholcim.us/our-cement-solutions
NORCHEM - Undensified Silica Fume	Cementitious Material	C-1240	https://www.norchem.com/technical-data-sheet.html
NYCON - RFS400 PVA	Secondary Reinforcement	C-1116	https://nycon.com/collections/pva-fibers/products/rfs400
SIKA - ENDURO PRIME	Secondary Reinforcement	C-1116, C-1116M	https://fibermesh.com/wp-content/uploads/2018/04/FIB-EnduroPrime_ProdData_PCS1229E005_042019.pdf
GlasGrid® 8511	Reinforcement	C-338, D-276, D-5261, D-6637	https://www.tensarcorp.com/Search?query=8511%20msds
SpiderLath	Reinforcement	D-3775, D-1777, D-5035	https://spiderlath.com/installation/#testing
3/16" Steel Cable	Reinforcement	D-695, D-790, D-2344, D-3039, D-3518	https://www.toray.com/#/
Trinity Haydite	Aggregate	C-330, C-331	www.stlohio.com
DOW Extruded Polystyrene Foam	Flotation	NONE	https://www.dupont.com/products/thermax-sheathing.html
3M - Glass Bubbles K1	Aggregate	D-281-84	https://www.3m.com/3M/en_US/company-us/all-3m-products/~/3M-Glass-Bubbles-K1/?N=5002385+3292670809&rt=rud
3M - Glass Bubbles K37	Aggregate	D-281-84	https://www.3m.com/3M/en_US/company-us/all-3m-products/~/3M-Glass-Bubbles-K37/?N=5002385+3292670827&rt=rud
Poraver 1-2 mm	Aggregate	DIN EN 13055-1	https://www.poraver.com/us/technical-data-poraver/

Poraver 0.5-1 mm	Aggregate	DIN EN 13055-1	https://www.poraver.com/us/technical-data-poraver/
Poraver 0.25-0.5 mm	Aggregate	DIN EN 13055-1	https://www.poraver.com/us/technical-data-poraver/
Poraver 0.1-0.3 mm	Aggregate	DIN EN 13055-1	https://www.poraver.com/us/technical-data-poraver/
Elemix	Aggregate	C-39, C-78, C-143, C-469, C-1611	www.SYNTHEONInc.com
Recycled Concrete Aggregate	Aggregate	C-128, C-136	https://docs.google.com/document/d/11puNym5EQQGIeLvAF9Bm86Gwx2OwclEdZ8f7k78iFd8/edit?usp=sharing
Direct Colors Concrete Pigments	Pigment	C-979	https://directcolors.com/concrete-pigment/
Distilled Water	Water	NONE	
BASF Glenium 3030 NS	Superplasticizer	C-494, C-494M	https://www.master-builders-solutions.basf.us/en-us/products/concrete-admixtures/water-reducers/water-reducers-high-range/masterglenium-3030
Sealkrete Clear-Seal	Sealer	D-1640, D-3359B, D-3363, G-53	https://www.rustoleum.com/product-catalog/consumer-brands/seal-krete/horizontal-sealing/clear-seal
3M - Silhouette Glossy Permanent Vinyl Tape 471	Lettering Tape	D-3652, D-3759	https://www.3m.com/3M/en_US/company-us/all-3m-products/~/3M-Vinyl-Tape-471/?N=5002385+3293242769&preselect=3293786499&rt=rud

Product Data Sheet

Lafarge Portland Cement

LAFARGE

Lafarge Portland Cement is a high quality, cost-effective basic building material used in virtually all forms of construction, from hospitals and homes to schools, tunnels and airports. Lafarge Portland Cement meets or exceeds all applicable chemical and physical requirements of ASTM C 150.

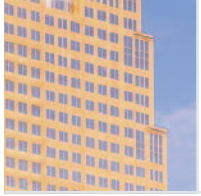
Product Description

Portland Cement
ASTM C 150 Type I, Type IA, Type II, Type III, Type V

Basic Use: Lafarge Portland Cement is a cost-effective basic building material. It can be used in a wide variety of commercial and architectural concrete construction applications. Uses include cast-in-place, pre-cast, tilt-up, water tanks, drains, bridges, roads, pipes, concrete masonry units, pre-stressed concrete members, masonry mortars and grouts.

LAFARGE

Product Data Sheet



LAFARGE PORTLAND CEMENT

Type I – This is a general-purpose cement suitable for all uses where the special properties of other types of portland cement are not required.

Type IA – This cement contains an additive that will entrain air bubbles to aid in durability when concrete is exposed to freezing temperatures.

Type II – For general use, especially when moderate sulfate resistance or moderate heat of hydration is desired.

Type III – This cement provides high early strength when compared with Type I.

Type V – This is for use when high sulfate resistance is desired. Type V generally gains strength more slowly than Type I.

Options
Select Lafarge North America manufacturing plants produce air-entrained (Type IA) portland cement that contains an additive that will entrain air bubbles to aid in durability when concrete is exposed to freezing temperatures. Certain locations manufacture cements meeting the optional physical and chemical requirements of ASTM. AASHTO cements are available in certain geographic areas. Contact your Lafarge Cement representative for product use and availability.

Technical data
Lafarge Portland Cement meets or exceeds all applicable chemical and physical requirements of ASTM C 150.

Use and limitations
Lafarge North America manufactures all products in accordance with strict QA/QC (quality assurance and quality control) procedures to ensure optimum product performance and uniformity. There are many variables that affect concrete performance that are beyond the control of the cement manufacturer. Good concreting practices in accordance with the American Concrete Institute are required to achieve desired results. Skilled persons should use these products with special attention given to formwork, batching, mixing, placing, finishing and curing. In most applications, quality aggregates, admixtures and additives should be utilized. For detailed information, contact your Lafarge North America sales office.

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.lafargenorthamerica.com.

Product Name
Lafarge Portland Cement

Manufacturer
Lafarge North America Inc.
12950 Worldgate Drive, Suite 500
Herndon, Virginia 20170
www.lafargenorthamerica.com

Contact your Lafarge Regional Office for specific product information, availability and ordering.

Great Lakes Region
Bingham Farms, Michigan
Phone: 248-594-1991

Northeast Region
Montréal, Québec
Phone: 514-861-1411

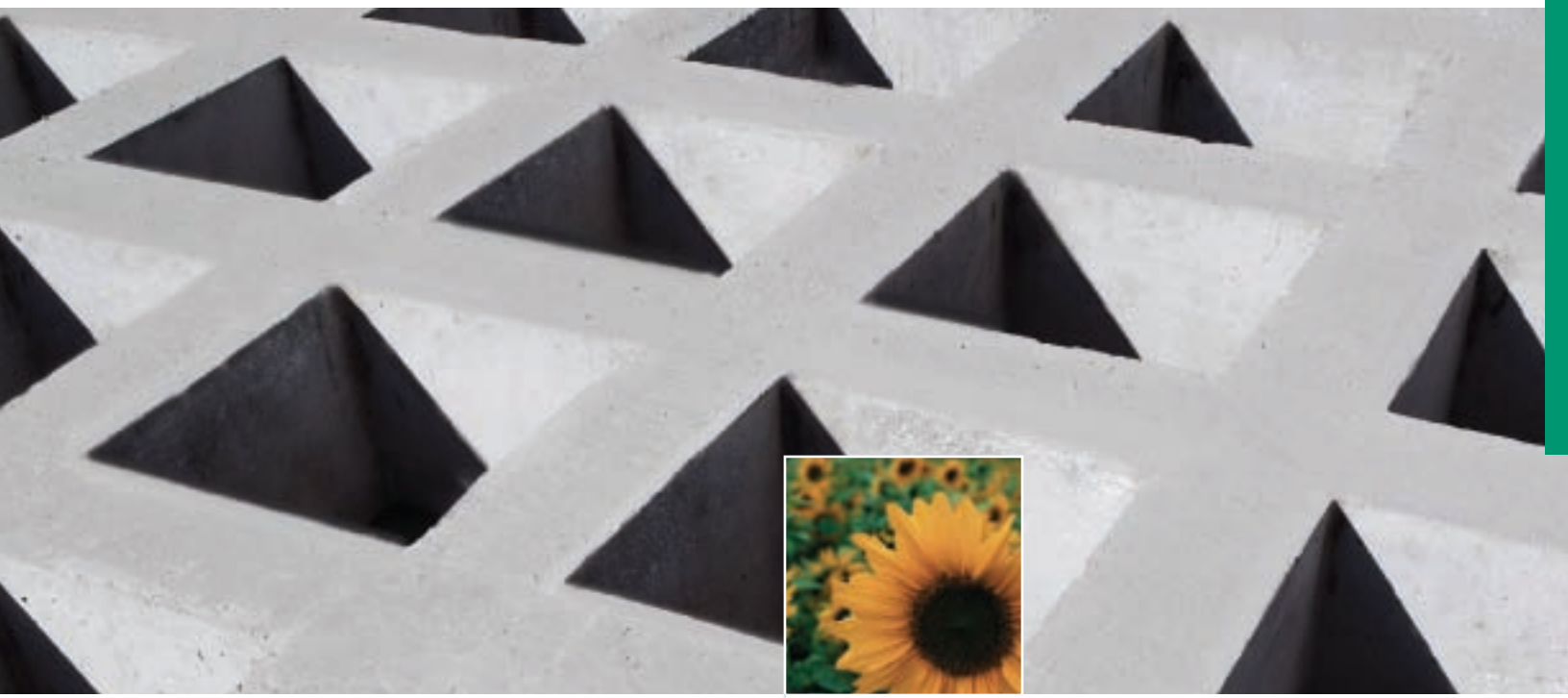
River Region
Lee's Summit, Missouri
Phone: 816-251-2100

Southeast Region
Alpharetta, Georgia
Phone: 678-746-2000

Western Region
Calgary, Alberta
Phone: 403-271-9110

Limited Warranty
Lafarge warrants that Lafarge Portland Cement meets all applicable requirements of ASTM C 150. Lafarge makes no other warranty, whether of merchantability or fitness for a particular purpose, with respect to Lafarge Portland Cement. Having no control over its use, Lafarge will not guarantee finished work in which Lafarge Portland Cement is used.

LAFARGE NORTH AMERICA



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

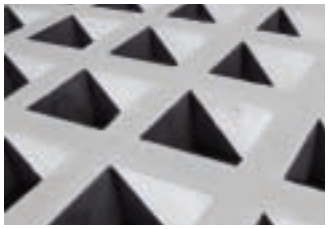
Improved Workability

A Lighter, More Pleasing Color

Reduced Impact on the Environment

LAFARGE

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 unequaled 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

Hartsfield International Airport, Atlanta, Georgia

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 alkalies 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 alkalies loading of the concrete. It reacts with the effective alkalies 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.

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.

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

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.

FBI Building, Washington, D.C.

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*.

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.

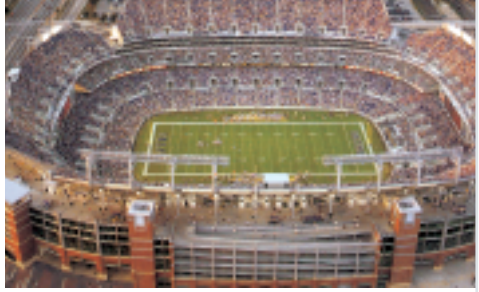
Deicer Salt Scaling: When using NewCem as a replacement for portland cement in concrete that will be exposed to deicing salts, the limits specified in ACI 318 *Building Code Requirements for Structural Concrete,* ACI 301 *Specifications for Structural Concrete* and CSA A23.1 must be followed.

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

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.

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.

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

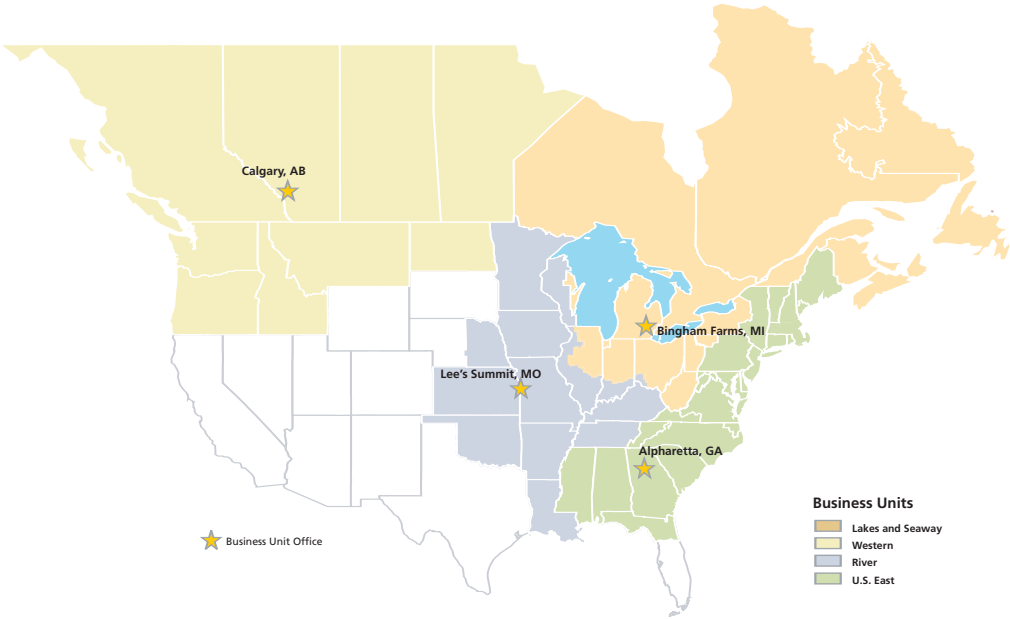
Lakes and Seaway Business Unit
Bingham Farms, Michigan
Phone: 248-594-1991

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

U.S. East Business Unit
Alpharetta, Georgia
Phone: 678-746-2000

Western Business Unit
Calgary, Alberta
Phone: 403-271-9110

Lafarge North America Cement Operating Areas



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.

PBNCE 1/07

LAFARGE NORTH AMERICA

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

Lafarge Material Performance Center 1263 Lakeview Drive Romeoville, IL 60446 1-630-243-4699

FLY ASH SOURCE: PLEASANT PRAIRIE CLASS C
COMPOSITE DATE: 20-Jan-18 to 23-Jan-18
SAMPLE IDENTIFICATION: PPX180120-0123

CHEMICAL ANALYSIS			SPECIFICATIONS ASTM C 618 CLASS C	SPECIFICATIONS AASHTO M 295 CLASS C
SiO2 (silicon dioxide), %	=	41.75		
Al2O3 (aluminum oxide), %	=	16.86		
Fe2O3 (iron oxide), %	=	5.30		
SiO2+Al2O3+Fe2O3, %	=	63.9	50 Min	50 Min
CaO (calcium oxide), %	=	21.46		
MgO (magnesium oxide), %	=	6.30		
SO3 (sulfur trioxide), %	=	1.39	5.0 Max	5.0 Max
Moisture content, %	=	0.07	3.0 Max	3.0 Max
Loss On Ignition, %	=	0.41	6.0 Max	5.0 Max
Na2O (sodium oxide), %	=	1.15		
K2O (potassium oxide), %	=	1.23		
Total Equivalent Na2O, %	=	1.95		
PHYSICAL ANALYSIS				
Fineness, amount retained on #325 sieve, %	=	16.4	34 Max	34 Max
variation, points from average	=	2	5 Max	5 Max
Density, Mg/m3	=	2.65		
variation from average, %	=	0	5 Max	5 Max
Strength Activity Index with Portland Cement at 7 days, % of cement control	=	84	75 Min	75 Min
Cement: LafargeHolcim Ste.Genevieve Type I/II				
Water Requirement % of cement control	=	94	105 Max	105 Max
Soundness, autoclave expansion or contraction, %	=	0.04	0.8 Max	0.8 Max

The test results for this composite sample comply with the applicable specifications of ASTM C 618 and AASHTO M 295. This fly ash source is approved for use by the following state agencies:

2/9/2018
Report Date

Brian Borowski
Quality Assurance Manager
Lafarge North America
Brian.Borowski@LafargeHolcim.com

ASTM C 618 Note 1 - Finely divided materials may tend to reduce the entrained air content of concrete. Hence, if a mineral admixture is added to any concrete for which entrainment of air is specified, provision should be made to ensure that the specified air content is maintained by air content tests and by use of additional air-entraining admixture or use of an air-entraining admixture in combination with air-entraining hydraulic cement.

SILICA FUME -TECHNICAL DATA SHEET

SILICA FUME is a very fine pozzolanic material, composed of amorphous silica produced by electric arc furnaces as a byproduct of the production of elemental silicon or ferro silicon alloys.

SILICA FUME can be used in a variety of applications such as concrete, grouts, mortars, fibre cement products, refractory, oil/gas well cements, ceramics, elastomer, and polymer applications.

SILICA FUME is produced in conformance with the ASTM C-1240 specifications. The quality is controlled and monitored throughout the entire production process to ensure that it meets or exceeds specification requirements.

PROPERTIES	
State	Amorphous - Sub-micron powder
Color	Gray to medium gray powder
Specific Gravity	2.25
Solubility	Insoluble
Bulk Density - Densified (bulk and bagged products)	41 to 48 lb/ft^3 (655 to 770 kg/m^3)
Bulk Density - Undensified (bulk & paper bags)	16 to 22 lb/ft^3 (256 to 352 kg/m^3)
Bulk Density - Undensified (supersacks)	22 to 26 lb/ft^3 (252 to 416 kg/m^3)

SPECIFICATIONS		
Chemical Requirements	**ASTM**	**Typical**
Silicon Dioxide (SiO_2) %	85.0 % Minimum	**93.74 %**
Moisture Content %	3.0 % Maximum	**0.45 %**
Loss on Ignition (LOI) %	6.0 % Maximum	**3.75 %**
Physical Requirements	**ASTM**	**Typical**
Oversize percent retained on 45-µm (325 sieve)	10.0 % Maximum	**1.91 %**
Accelerated Pozzolanic Strength Activity Index with Portland cement (7 day)	105.0 % Minimum	**139 %**
Specific Surface	15 m^2/g Minimum	**22.49 m^2/g**

POZZOLANIC REACTION IN A CEMENTITOUS SYSTEM

SILICA FUME in contact with water goes into solution within an hour. The silica in solution forms an amorphous silica rich, Ca poor, gel on the surface of the silica fume particles and agglomerates. After time the silica rich, Ca poor, coating dissolves and the agglomerates of silica fume reacts with free lime ($CaOH_2$) to form calcium silicate hydrates (CSH). This reaction is called the ***pozzolanic reaction***.

Email: *info@norchem.com* Website: *www.norchem.com*

SILICA FUME – TECHNICAL DATA SHEET

PACKAGING, STORAGE AND HANDLING

PRODUCT FORM	PACKAGING	WEIGHT
Silica Fume – Densified	Bulk Truckload	46,000 lbs. max
	Super Sack	2,200 lbs.
	Paper Bag	50 lbs.
	Paper Bag	25 lbs.
Silica Fume - Undensified	Super Sack	1,000 lbs.
	Paper Bag	50 lbs.

STORAGE

SILICA FUME should be kept dry, out of weather and the elements.

SAFETY AND HANDLING PRECAUTIONS

SILICA FUME is generally considered a nuisance dust. Use and handling of silica fume does not represent a health risk when normal safety rules are observed. Direct contact may cause irritation of eyes. Prolonged contact may cause skin irritation. Inhalation may cause respiratory irritation resulting in coughing and shortness of breath. This product may be harmful if swallowed. Do not get in eyes and avoid prolonged skin contact. Do not take internally. Wash thoroughly with water after handling. For more detail, see our **SDS.**

WARRANTY STATEMENT

The information given here is based on our best knowledge, and we believe it to be true and accurate. Norchem assumes no responsibility for the use of these statements, recommendations or suggestions, nor are they intended as a recommendation for any use, which would infringe any patent or copyright.

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Revised September - 2019

NYCON-PVA RFS400

PVA (Polyvinyl Alcohol), Medium Denier, Superior Bond

NYCON
OVER 25 YEARS OF REINFORCING FIBERS

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 RFS400 Physical Properties

Filament Diameter	40 Denier (200 Microns)
Fiber Length	0.75" (19 mm)
Specific Gravity	1.3
Tensile Strength	150 ksi (1000 MPa)
Flexural Strength	4200 ksi (29 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 RFS400 fiber products are 40 denier, monofilament PVA fibers for use in fiber reinforced concrete, stucco, shotcrete and precast. NYCON-PVA RFS400 is specifically designed for use in concrete products for the purpose of controlling plastic shrinkage, thermal cracking and improving abrasion resistance.

NYCON-PVA RFS400 meets the requirements of ASTM C-1116, Section 4.1.3 and AC-32 at 1.0 lb (0.45 kg) per CY.

Applications

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

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

800-456-9266 | **www.nycon.com** | **sales@nycon.com**

NYCON-PVA RFS400

PVA (Polyvinyl Alcohol), Medium Denier, Superior Bond

NYCON
OVER 25 YEARS OF REINFORCING FIBERS

Advantages/Benefits	• Molecular bond with the concrete • Reduces the formation of plastic shrinkage cracking in concrete. • Provides multi-dimensional reinforcement. • Improves impact, shatter and abrasion resistance of concrete. • Enhances durability and toughness of concrete. • Excellent, "no fuzz" finishability
Mixing	NYCON-PVA RFS400 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	(35) 1 lb (0.45 kg) paper beater bags per box, 700 lbs per pallet (35) 1 lb (0.45 kg) water soluble bags per box, 700 lbs per pallet (21) 40 lb (18 kg) paper bulk bags, 693 lbs per pallet
Storage and Shelf Life	NYCON-PVA should be stored in dry warehouse. Protect product from the rain.

800-456-9266 | **www.nycon.com** | **sales@nycon.com**

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

PRODUCT DATA • SIKA® ENDURO® PRIME

ADVANTAGES OF SIKA ENDURO PRIME FIBERS:

- Non-magnetic
- Rustproof
- Alkali proof
- Requires no minimum amount of concrete cover
- Always positioned in compliance with codes
- Safe and easier to use than traditional reinforcement.
- Saves time
- Packaged for easy dosing into the concrete mix
- Fiber engineered for improved performance characteristics over other macro synthetic fibers

SIKA ENDURO PRIME MACRO-SYNTHETIC FIBER

SIKA ENDURO PRIME **(formerly ENDURO HAR)** is the latest high performance macro-synthetic fiber developed from the innovative HPP technology which was pioneered and patented by Fibermesh - A Sika Brand. ENDURO PRIME has been specifically designed to reinforce a concrete slab on grade with extremely high performance characteristics. Specifically engineered and manufactured in ISO 9001 certified manufacturing facility for use as concrete reinforcement.

FEATURES & BENEFITS

- Geometrically engineered to resist matrix pullout
- Superior increase in flexural toughness
- Increases cohesion and reduces segregation
- Increases impact and shatter resistance
- Reduced wear on concrete pumps and hoses
- Safe and easy to handle
- Simplified logistics
- Optimized balance between high aspect ratio, performance and finishing
- Economical alternative to steel wire mesh and/or steel fibers

PRIMARY APPLICATIONS

- Industrial Slab on ground
- Precast
- Pavement
- Overlays

COMPLIANCE

- Complies with ASTM C 1116/C1116M Type III Fiber Reinforced Concrete
- Complies with European Standard EN 14889-2: 2006 Fibres for Concrete Part 2: Class II
- ISO 9001 Quality Assured Facility

CHEMICAL AND PHYSICAL PROPERTIES

Absorption	Nil	Ignition Point	1100°F (593°C)
Acid & Salt Resistance	High	Melt Point	320°F (160°C)
Alkali Resistance	Alkali Proof	Specific Gravity	0.91
Electrical Conductivity	Low	Thermal Conductivity	Low
Fiber Length	1.97, 2.17 or 2.36 in (50, 55 or 60 mm)	Equivalent Diameter	0.022 in (0.56 mm)

PRODUCT DATA • SIKA® ENDURO® PRIME

PRODUCT USE

MIXING: The specified dosage per m3 or yd3 should be added to the mixer after batching the other concrete materials. After the addition of the fibers, the concrete should be mixed for sufficient time (batch plant: minimum 5 minutes or 70 revolutions) at full mixing speed to ensure uniform distribution of the fibers throughout the concrete mix. Mixing times may vary, please contact Sika Fiber representative.

PLACING: ENDURO PRIME macro synthetic polyolefin fibers can be pumped or placed using conventional equipment.

FINISHING: Conventional techniques and equipment can be used when finishing ENDURO PRIME fiber concrete.

APPLICATION RATE: The application rate for ENDURO PRIME macro-synthetic fibers will vary depending on the application, mix design and the toughness requirements of each particular project. ENDURO PRIME macro synthetic fiber will have a minimum dosage of 3 pcy (1.8 kg/m^3) in concrete. For specific performance and dosage recommendations see your local Sika Fiber representative.

COMPATIBILITY

ENDURO PRIME fibers are compatible with all concrete admixtures and performance enhancing chemicals.

SAFETY

No special handling is required with ENDURO PRIME macrosynthetic fibers. Full Safety Data Sheets are available upon request.

PACKAGING

ENDURO PRIME macrosynthetic fibers are collated in degradable water soluble wrapped bundles (pucks), packaged in a range of box weights. Other packaging options are available such as bulk bags. Store materials in a cool dry place. Do not store in direct sunlight.

TECHNICAL SERVICES

Trained Sika Fiber specialists are available worldwide to assist and advise in specifications and field service. Sika Fiber representatives do not engage in the practice of engineering or supervision of projects and are available solely for service and support of our customers.

REFERENCE DOCUMENTS

- ACI 304 Guide for Measuring, Mixing, Transporting and Placing Concrete
- ASTM C1116/C1116M Standard Specification for Fiber-Reinforced Concrete and Shotcrete
- ASTM C 1436 Standard Specification for Materials for Shotcrete
- ASTM C 1609 /C 1609M Standard Test Method for Flexural Performance of Fiber-Reinforced Concrete (Using Beam With Third-Point Loading).
- Concrete Society (UK) Technical Report 65 Guidance on the use of Macro-synthetic Fibre Reinforced Concrete
- Concrete Society (UK) Technical Report 66 External In-situ Concrete Paving
- European Standard EN 14889-2: 2006 Fibres for Concrete

SPECIFICATION CLAUSE

Fibers for concrete shall be SIKA ENDURO PRIME polyolefin high performance macro-monofilament fiber conforming to ASTM C1116 Type III and manufactured specifically for the reinforcement of concrete.

or

Fibers for concrete shall be SIKA ENDURO PRIME polyolefin high performance macro-monofilament fiber conforming to EN14889-2: 2006 Class II and manufactured specifically for the reinforcement of concrete.

The fibers shall be manufactured in an ISO 9001 certified manufacturing facility. Unless otherwise stated, SIKA ENDURO PRIME macro-synthetic fibers shall be mixed at the batch plant, at the recommended rate of ... lbs/yd^3 (.... kgs/m^3), and mixed for sufficient time (minimum 5 minutes) to ensure uniform distribution of the fibers throughout the concrete mix. Fibrous concrete reinforcement shall be manufactured by Sika Fibers LLC, 4019 Industry Drive, Chattanooga, TN. 37416 USA, tel: 833.236.1255, web site: www.Fibermesh.com.

Sika Fibers, LLC • 4019 Industry Drive • Chattanooga, TN 37416 • SIKAFIBERS@US.SIKA.COM
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PCS-1229E-005 (04/2019)

GLASGRID®
ASPHALT REINFORCEMENT SYSTEM

GlasGrid® Asphalt Reinforcement System

Specification Sheet – GlasGrid® 8501/8511 Asphalt Reinforcement System

Specifications for Use in Asphalt Overlays					
Property	**Test Method**	**8501**		**8511**	
		Metric	Imperial	Metric	Imperial
Tensile Strength (Ultimate) (MD x XD)	ASTM D6637 EN-ISO 10319	100 x 100 kN/m	571 x 571 lbs/in	100 x 100 kN/m	571 x 571 lbs/in
Tensile Elongation (Ultimate)	ASTM D6637 EN-ISO 10319	< 3%	< 3%	< 3%	< 3%
Tensile Resistance @ 2% Strain (MD x XD)	ASTM D6637 EN-ISO 10319	80 x 80 kN/m	456 x 456 lbs/in	80 x 80 kN/m	456 x 456 lbs/in
Young's Modulus E		73,000 MPa	10.6×10^6 psi	73,000 MPa	10.6×10^6 psi
Mass/Unit Area	ASTM D5261 ISO 9864	405 g/m²	12.0 oz/yd²	405 g/m²	12.0 oz/yd²
Melting Point Coating **Melting Point Glass**	ASTM D276/EN-ISO 3146 ASTM C338	>232° C >820° C	>450° F >1508° F	>232° C >820° C	>450° F >1508° F
Roll Length		100 m	328 ft	100 m	328 ft
Roll Width		1.5 m	5 ft	1.5 m	5 ft
Roll Area		150 m²	179 yd²	150 m²	179 yd²
Adhesive Backing		Pressure Sensitive		Pressure Sensitive	
Grid Size (Center to Center of Strand)		12.5 x 12.5 mm	0.5 x 0.5 in	25 x 25 mm	1.0 x 1.0 in
Material		Fiberglass reinforcement with modified polymer coating and pressure-sensitive adhesive backing			

The values and tolerances given are obtained in our laboratories and in accredited testing institutions. All imperial values are approximate. The information given in this data sheet is to the best of our knowledge true and correct. However new research and practical experience can make revisions necessary. We reserve the right to make changes at any time. Statements concerning possible use of our product are not intended as recommendations for their use in the infringement of any patent. No patent warranty of any kind, expressed or implied, is made or intended.

Tensar®

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Suite 500
Alpharetta, GA 30009
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tensarcorp.com

Exclusive distributors in the Americas for: ADFORS SAINT-GOBAIN

SpiderLath
THE FUTURE OF LATH

Technical Data Sheet

Property		Imperial	Metric	
Construction:	Warp:	3.0 (per inch)	11.8 (per 10cm)	ASTM D-3775
	Weft:	2.5 (per inch)	10.2 (per 10cm)	
Weight:		8.9 (oz/yd^2)	300 (g/m^2)	ASTM D-3776
Thickness:		0.041 (per inch)	1.05 (per mm)	ASTM D-1777
Weave:		Full Leno	Full Leno	
Minimum Tensile:	Warp:	674 (lb/in)	3000 (N/2.54cm)	ASTM D-5035
	Weft:	674 (lb/in)	3000 (N/2.54cm)	

Date: May 12, 2016

TECHNICAL DATA SHEET
No. CFA-005

TORAYCA®

T700S DATA SHEET

Highest strength, standard modulus fiber available with excellent processing characteristics for filament winding and prepreg. This never twisted fiber is used in high tensile applications like pressure vessels, recreational, and industrial.

FIBER PROPERTIES

		English	Metric	Test Method
Tensile Strength		711 ksi	4,900 MPa	TY-030B-01
Tensile Modulus		33.4 Msi	230 GPa	TY-030B-01
Strain		2.1 %	2.1 %	TY-030B-01
Density		0.065 lbs/in^3	1.80 g/cm^3	TY-030B-02
Filament Diameter		2.8E-04 in.	7 µm	
Yield	6K	3,724 ft/lbs	400 g/1000m	TY-030B-03
	12K	1,862 ft/lbs	800 g/1000m	TY-030B-03
	24K	903 ft/lbs	1,650 g/1000m	TY-030B-03
Sizing Type & Amount	50C	1.0 %		TY-030B-05
	60E	0.3 %		TY-030B-05
	F0E	0.7 %		TY-030B-05
	Twist	Never twisted		

FUNCTIONAL PROPERTIES

CTE	-0.38	$\alpha \cdot 10^{-6}$/°C
Specific Heat	0.18	Cal/g·°C
Thermal Conductivity	0.0224	Cal/cm·s·°C
Electric Resistivity	1.6 x 10^{-3}	Ω·cm
Chemical Composition: Carbon	93	%
Na + K	<50	ppm

COMPOSITE PROPERTIES*

Tensile Strength	370 ksi	2,550 MPa	ASTM D-3039
Tensile Modulus	20.0 Msi	135 GPa	ASTM D-3039
Tensile Strain	1.7 %	1.7 %	ASTM D-3039
Compressive Strength	215 ksi	1,470 MPa	ASTM D-695
Flexural Strength	245 ksi	1,670 MPa	ASTM D-790
Flexural Modulus	17.5 Msi	120 GPa	ASTM D-790
ILSS	13 ksi	9 kgf/mm^2	ASTM D-2344
90° Tensile Strength	10.0 ksi	69 MPa	ASTM D-3039

* Toray 250°F Epoxy Resin. Normalized to 60% fiber volume.

T700S

COMPOSITE PROPERTIES**

Tensile Strength	355 ksi	2,450 MPa	ASTM D-3039
Tensile Modulus	18.0 Msi	125 GPa	ASTM D-3039
Tensile Strain	1.7 %	1.7 %	ASTM D-3039
Compressive Strength	230 ksi	1,570 MPa	ASTM D-695
Compressive Modulus	--- Msi	--- GPa	ASTM D-695
In-Plane Shear Strength	14 ksi	98 MPa	ASTM D-3518
ILSS	15.5 ksi	11 kgf/mm^2	ASTM D-2344
90˚ Tensile Strength	10.0 ksi	70 MPa	ASTM D-3039

** Toray Semi-Toughened 350˚F Epoxy Resin. Normalized to 60% fiber volume.

See Section 4 for Safety & Handling information. The above properties do not constitute any warranty or guarantee of values. These values are for material selection purposes only. For applications requiring guaranteed values, contact our sales and technical team to establish a material specification document.

PACKAGING

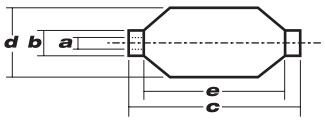
The table below summarizes the tow sizes, twists, sizing types, and packaging available for standard material. Other bobbin sizes may be available on a limited basis.

Tow Sizes	Twist[1]	Sizing	Bobbin Net Weight (kg)	Bobbin Type[2]	Bobbin Size (mm) a	b	c	d	e	Spools per Case	Case Net Weight (kg)
6K	C	50C	2.0	III	76.5	82.5	280	140	252	12	24
12K	C	50C	6.0	III	76.5	82.5	280	200	252	4	24
	C	60E	6.0	III	76.5	82.5	280	200	252	4	24
	C	F0E	6.0	III	76.5	82.5	280	200	252	4	24
24K	C	50C	6.0	III	76.5	82.5	280	200	252	4	24
	C	60E	6.0	III	76.5	82.5	280	200	252	4	24
	C	F0E	6.0	III	76.5	82.5	280	200	252	4	24

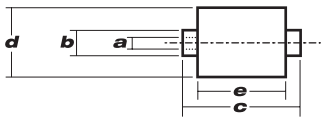
1 **Twist** A: Twisted yarn B: Untwisted yarn made from a twisted yarn through an untwisting process C: Never twisted yarn

2 **Bobbin Type** See Diagram below

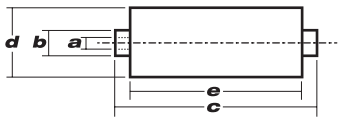
TYPE I



TYPE II



TYPE III



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Geotechnical and Environmental Engineering, Materials Testing, and Construction Inspection
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TRINITY LIGHTWEIGHT PLANT #1683
C330 EVALUATION

STL File No. S018019
Report No.

February 2018

Samples of "C" (1/2-inch x #4), "AX" (4 x 0), "B" (3/8-inch x #8), and "BX" (3/8-inch x 0) Haydite were delivered from the Trinity lightweight Plant in Brooklyn, Indiana, for material analyses in accordance with Specifications ASTM C330 and C331. The test results are as follows:

AGGREGATE ANALYSIS

Sieve Size (ASTM C136)	% Passing (Passing Specification)			
	"AX" Haydite	"BX" Haydite	"B" Haydite	"C" Haydite
3/4"	---	---	---	100.0 (100)
1/2"	---	100.0 (100)	100.0 (100)	92.5 (90-100)
3/8"	100.0 (100)	99.9 (90-100)	96.5 (80-100)	64.2 (40-80)
#4	97.2 (85-100)	87.5 (65-90)	17.2 (5-40)	10.1 (0-20)
#8	63.9	65.0 (35-65)	4.0 (0-20)	3.7 (0-10)
#16	40.1 (40-80)	42.2	3.3 (0-10)	2.6
#30	24.7	25.0	3.0	1.9
#50	14.2 (10-35)	14.3 (10-25)	2.8	1.5
#100	7.2 (5-25)	8.5 (5-15)	2.4	1.1
#200	5.0	6.1 (0-10)	1.9 (0-10)	0.8 (0-10)

Fineness Modulus	3.53	3.58	5.71	6.22
Loose Unit Weight (dry), pcf (ASTM C29)	45.5 (70 max)	52.4(65 max)	38.3 (55 max)	38.9 (55 max)
Loose Unit Weight (damp), pcf (ASTM C29)	48.4	53.6	39.2	42.5
Rodded Weight (dry), pcf (ASTM C29)	50.4	57.6	42.2	43.0
Rodded Weight (damp), pcf (ASTM C29)	55.7	63.2	43.9	49.0
Organic Impurities (ASTM C40)	Lighter than standard (Standard)	Lighter than standard (Standard)	---	---
% Loss, Sodium Sulfate Soundness (5 cycles) (ASTM C88)	4.4	3.9	2.7	1.9
% Loss, Magnesium Sulfate Soundness (5 cycles) (ASTM C88)	6.6	6.2	3.2	2.6
% Loss on Ignition (dry basis) (ASTM C114)	0.16 (5 max)	0.13 (5 max)	0.00 (5 max)	0.01 (5 max)
% Clay Lumps/Friable pieces (ASTM C142)	0.79 (2 max)	1.56 (2 max)	0.08 (2 max)	0.16 (2 max)
Staining Index (ASTM C641)	20.00	20.00	0.00	0.00

% Absorption (after 72 hr. soak) (ASTM C127/C128)	9.2	7.0	12.2	9.7
Relative Density (specific gravity) (OD) (ASTM C127/C128)	1.43	1.65	1.17	1.17
Relative Density (specific gravity) (SSD) (ASTM C127/C128)	1.56	1.77	1.32	1.28
Apparent Relative Density (specific gravity) (ASTM C127/C128)	1.65	1.87	1.37	1.32
Density (oven dry) lb/ft^3	89.1	102.8	72.9	72.9
Density (SSD) lb/ft^3	97.2	110.3	82.2	79.7
Apparent Density lb/ft^3	102.8	116.5	85.4	82.2

Description	"C" Haydite and Concrete Sand	"A" and "C" Haydite	"B" Haydite and Concrete Sand
Concrete Mix Proportions (Mix Design)			
Cement Type I, Sack	6.00	6.00	6.00
Shalersville Sand, ft^3	14.00	---	14.00
"A" (4 x 0) Haydite, ft^3	---	18.00	---
"B" (3/8" x #8) Haydite, ft^3	---	---	17.50
"C" (1/2" x #4) Haydite, ft^3	17.50	15.00	---
BASF AE 200 Air, oz/cwt	0.10	0.10	0.10
Water, gal/bag	6.50	8.60	6.90
Slump, in	3.75	3.25	3.75
Air, %	6.00	5.75	6.00
Oven-Dry Weight (ASTM C567), pcf	101.90	78.70	102.60
Approximate Equilibrium Weight (ASTM C567), pcf	104.90	81.70	105.60
Measured Equilibrium Weight (ASTM C567), pcf	***	***	***
Specification (Maximum), pcf	110.00	100.00	110.00
Compressive Strength, psi			
7-Day Test	4,120	2,000	3,920
7-Day Test	4,110	1,890	4,010
7-Day Test	4,030	1,900	3,890
Average of 3 Tests	**4,090**	**1,930**	**3,940**
28-Day Test	5,000	2,890	5,080
28-Day Test	4,820	2,970	4,830
28-Day Test	4,900	2,950	4,890
Average of 3 Tests	**4,910**	**2,940**	**4,930**
Tensile Splitting Strength (ASTM C496), psi			
28-Day Test	448	345	477
28-Day Test	357	325	426
28-Day Test	475	367	448
28-Day Test	452	305	551
28-Day Test	355	286	441
28-Day Test	372	394	461
28-Day Test	363	344	528
28-Day Test	443	301	496
Average of 8 Tests	**408**	**333**	**479**
Popouts (ASTM C330)	**No Popouts**	**No Popouts**	**No Popouts**
Modulus of Elasticity (ASTM C469) Average of 2 Cylinders	**2,630,000**	**2,051,000**	**2,771,000**
Shrinkage (ASTM C330), % 35 Days (Specification: 0.07 % Maximum)	**0.026**	**0.021**	**0.026**

*** Results will be reported when complete

TECHNICIAN: DONALD HOLLENBAUGH

SOLAR TESTING LABORATORIES, INC.

_____
Dennis L. Sanderson
Vice President/General Manager

Dow Building Solutions

Manufacturer's Insulation Fact Sheet

Extruded Polystyrene Foam Home Insulation Products

This fact sheet contains important information about STYROFOAM™ brand insulation, BLUECOR™ brand Underlayment and DOW High Performance Underlayment insulation. These products, available from Dow Building Solutions, are made of extruded polystyrene foam insulation and are clearly identified by the DOW Diamond Logo.

Aged R-Value (Measured at 75° Mean Temperature)

Product Thickness (nominal inches)	0.38	1/4	3/8	1/2	0.55	5/8	3/4	0.78	1	1 1/2	2	2 1/2	3
STYROFOAM™ Brand Square Edge Insulation	–	–	–	–	2.8*	–	3.8	4.0*	5.0	7.5	10.0	–	–
STYROFOAM™ Brand Tongue & Groove Insulation	–	–	–	–	–	–	3.8	–	5.0	7.5	10.0	–	–
STYROFOAM™ Brand Residential Sheathing	–	–	–	3.0	–	–	4.0	–	5.0	–	–	–	–
STYROFOAM™ Brand Residing Board	–	–	–	2.8	–	–	–	–	–	–	–	–	–
STYROFOAM™ UTILITYFIT™ PSI 15	–	–	–	–	–	–	–	–	5.0	7.5	10.0	–	–
STYROFOAM™ DURAMATE™ Plus Brand Insulation	2.0	–	–	3.0	–	–	–	–	–	–	–	–	–
STYROFOAM™ WALLMATE™ Brand Insulation	–	–	–	–	–	–	–	–	–	7.5	10.0	–	–
STYROFOAM™ PERIMATE™ Brand Insulation	–	–	–	–	–	–	–	–	–	7.0	10.0[1]	–	–
STYROFOAM™ STUCCOMATE™ Brand Insulation	–	–	–	–	–	–	–	–	5.0	–	–	–	–
STYROFOAM™ Scoreboard Brand Insulation	–	–	–	–	–	–	3.8	–	5.0	7.5	10.0	12.5	15
STYROFOAM™ BLUEGUARD™ Brand Insulation	–	–	–	–	–	–	–	–	5.0	7.5	10.0	–	–
BLUECOR™ Brand Underlayment	–	1.0	–	–	–	–	–	–	–	–	–	–	–
DOW™ High Performance Underlayment	–	1.0	1.5	–	–	–	–	–	–	–	–	–	–

[1] *Nominal 2" thickness.* ** Available in Florida only*

Board Coverage Area

Standard Size (feet) sizes vary by product	2 x 8	4 x 8	4 x 9	4 x 50
Coverage per board (sq. ft.)	16	32	36	200

READ THIS BEFORE YOU BUY

The chart shows the R-value of this insulation. R means resistance to heat flow. The higher the R-value, the greater the insulating power. Compare insulation R-values before you buy.

There are other factors to consider. The amount of insulation you need depends mainly on the climate you live in. Also, your fuel savings from insulation will depend upon the climate, the type and size of your house, amount of insulation already in your house, and your fuel use patterns and family size. If you buy too much insulation, it will cost you more than what you'll save on fuel.

To get the marked R-value, it is essential that this insulation be installed properly.

NOTICE: Changes to the International Residential Code require the installation of a weather-resistive barrier (WRB) within most exterior wall assemblies in residential construction. The following Dow insulated sheathing products qualify as a WRB when installed according to the installation instructions developed for "installation of foam sheathing as a weather-resistive barrier": STYROFOAM™ DURAMATE™ Brand Plus, STYROFOAM™ Brand Residential Sheathing, STYROFOAM™ Brand Tongue and Groove, STYROFOAM™ Brand Square Edge, STYROFOAM™ Brand Residing Board, DOW™ High Performance Underlayment, THERMAX™ Sheathing, TUFF-R™ and Super TUFF-R™ and therefore do not require the use of a building paper or a housewrap as a WRB. When a WRB is not needed, these Dow foam sheathings may be installed according to standard installation instructions for foam sheathing from Dow. Be sure products and installation instructions meet code requirements for your particular location. Note: WEATHERMATE™ and WEATHERMATE™ Plus housewraps have already qualified as weather-resistive alternatives to the prescribed felt (see Evaluation Reports NER-593 and NER-640 for approved alternative).

COMBUSTIBLE: Protect from high heat sources. Local building codes may require a protective or thermal barrier. For more information, consult MSDS, call Dow at 1-866-583-BLUE (2583) or contact your local building inspector. In an emergency, call 1-989-636-4400.

Building and/or construction practices unrelated to building materials could greatly affect moisture and the potential for mold formation. No material supplier including Dow can give assurance that mold will not develop in any specific system.

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Dow Building Solutions

Manufacturer's Insulation Fact Sheet

Polyisocyanurate Foam Home Insulation Products

This fact sheet contains important information about DOW Polyisocyanurate insulation. These products, available from Dow Building Solutions, are clearly identified by the DOW Diamond Logo.

Product R-Value

Product Thickness (nominal inches)	0.38	0.5	0.59	0.625	0.75	1.0	1.25	1.5	1.55	1.75	2.0
THERMAX™ Sheathing	–	3.3	–		5.0	6.5	–	9.8	10.1	–	13.0
Reflective system R-Value with 3/4" vertical air space	–	6.1	–	6.9	7.8	9.3	–	12.6	–	–	15.8
THERMAX™ White Finish	–	3.3	–	–	5.0	6.5	–	9.8	10.1†	–	13.0
TUFF-R™	–	3.3	–	4.1††	5.0	6.5	–	9.8	–	–	–
Reflective system R-Value with 3/4" vertical air space	–	6.1	–	6.9	7.8	9.3	–	12.6	–	–	–
TUFF-R™ C	–	–	–	–	–	–	–	9.8	–	–	13.0
Reflective system R-Value with 3/4" vertical air space	–	–	–	–	–	–	–	12.6†††	–	–	15.8
Super TUFF-R™	2.0	3.3	–	4.1††	5.0	6.5	–	9.8	–	–	–
STURDY-R™	–	2.5	3.0	–	4.0	5.0	–	–	–	–	–
QUIK-R™	–	–	3.0	–	4.0	5.0	–	–	–	–	–

† *Only 1.55" THERMAX™ White Finish standard offering. All other sizes available under non-standard business rules.*
†† *Available under non-standard business rules.*
††† *Reflective System R-value is the sum of the product R-value plus additional R-value calculated when the aluminum foil surface is installed next to a non-ventilated 3/4" air space (R-value = 2.8). All values from the ASHRAE Fundamentals Handbook.*

Board Coverage Area

Standard Size (feet) sizes vary by product	4x8	4x9	4x10	4x12
Coverage per board (sq. ft.)	32	36	40	48

READ THIS BEFORE YOU BUY

The chart shows the R-value of this insulation. R means resistance to heat flow. The higher the R-value, the greater the insulating power. Compare insulation R-values before you buy.

There are other factors to consider. The amount of insulation you need depends mainly on the climate you live in. Also, your fuel savings from insulation will depend upon the climate, the type and size of your house, amount of insulation already in your house, and your fuel use patterns and family size. If you buy too much insulation, it will cost you more than what you'll save on fuel.

To get the marked R-value, it is essential that this insulation be installed properly.

NOTICE: Changes to the International Residential Code require the installation of a weather-resistive barrier (WRB) within most exterior wall assemblies in residential construction. The following Dow insulated sheathing products qualify as a WRB when installed according to the installation instructions developed for "installation of foam sheathing as a weather-resistive barrier": STYROFOAM™ DURAMATE™ Brand Plus, STYROFOAM™ Brand Residential Sheathing, STYROFOAM™ Brand Tongue and Groove, STYROFOAM™ Brand Square Edge, STYROFOAM™ Brand Residing Board, DOW™ High Performance Underlayment, THERMAX™ Sheathing, TUFF-R™ and Super TUFF-R™ and therefore do not require the use of a building paper or a housewrap as a WRB. When a WRB is not needed, these Dow foam sheathings may be installed according to standard installation instructions for foam sheathing from Dow. Be sure products and installation instructions meet code requirements for your particular location. Note: WEATHERMATE™ and WEATHERMATE™ Plus housewraps have already qualified as weather-resistive alternatives to the prescribed felt (see Evaluation Reports NER-593 and NER-640 for approved alternative).

THERMAX Products
COMBUSTIBLE: THERMAX products should be used only in strict accordance with product application instructions. THERMAX products, when used in a building containing combustible materials, may contribute to the spread of fire. For more information, consult MSDS and/or call Dow at 1-866-583-BLUE (2583). In an emergency, call 1-989-636-4400.

Dow Polyisocyanurate Insulation Other than THERMAX™ Products
COMBUSTIBLE: Protect from high heat sources. Local building codes may require a protective or thermal barrier. For more information, consult MSDS, call Dow at 1-866-583-BLUE (2583) or contact your local building inspector. In an emergency, call 1-989-636-4400.

Building and/or construction practices unrelated to building materials could greatly affect moisture and the potential for mold formation. No material supplier including Dow can give assurance that mold will not develop in any specific system.

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3M™ Glass Bubbles
K Series
S Series

Introduction

3M™ Glass Bubbles are engineered hollow glass microspheres that are alternatives to conventional fillers and additives such as silicas, calcium carbonate, talc, clay, etc., for many demanding applications. These low-density particles are used in a wide range of industries to reduce part weight, lower costs and enhance product properties.

The unique spherical shape of 3M glass bubbles offers a number of important benefits, including: higher filler loading, lower viscosity/improved flow and reduced shrinkage and warpage. It also helps the 3M glass bubbles blend readily into compounds and makes them adaptable to a variety of production processes including spraying, casting and molding.

The chemically stable soda-lime-borosilicate glass composition of 3M glass bubbles provides excellent water resistance to create more stable emulsions. They are also non-combustible and non-porous, so they do not absorb resin. And, their low alkalinity gives 3M glass bubbles compatibility with most resins, stable viscosity and long shelf life.

3M Glass Bubbles K Series and S Series are specially formulated for a high strength-to-weight ratio. This allows greater survivability under many demanding processing conditions, such as injection molding. They also produce stable voids, which results in low thermal conductivity and a low dielectric constant. 3M glass bubbles are available in a variety of sizes and grades to help you meet your product and processing requirements.

Typical Properties

Not for specification purposes

Isostatic Crush Strength

	Product	Test Pressure (psi)	Target Fractional Survival	Minimum Fractional Survival
K Series	K1	250	90%	80%
	K15	300	90%	80%
	K20	500	90%	80%
	K25	750	90%	80%
	K37	3,000	90%	80%
	K46	6,000	90%	80%
S Series	S15	300	90%	80%
	S22	400	90%	80%
	S32	2,000	90%	80%
	S35	3,000	90%	80%
	S38	4,000	90%	80%
	S38HS	5,500	90%	80%
	S60	10,000	90%	80%
	S60HS	18,000	90%	90%
	iM30K	28,000	90%	90%

True Density

	Product	True Density (g/cc) Typical	Minimum	Maximum
K Series	K1	0.125	0.10	0.14
	K15	0.15	0.13	0.17
	K20	0.20	0.18	0.22
	K25	0.25	0.23	0.27
	K37	0.37	0.34	0.40
	K46	0.46	0.43	0.49
S Series	S15	0.15	0.13	0.17
	S22	0.22	0.19	0.25
	S32	0.32	0.29	0.35
	S35	0.35	0.32	0.38
	S38	0.38	0.35	0.41
	S38HS	0.38	0.35	0.41
	S60	0.60	0.57	0.63
	S60HS	0.60	0.57	0.63
	iM30K	0.60	0.57	0.63

Typical Properties

Chemical Resistance

In general, the chemical properties of 3M™ Glass Bubbles resemble those of a soda-lime-borosilicate glass.

Thermal Conductivity

	Product	Calculated Thermal Conductivity (W·m-1·K-1) at 70°F (21°C)
K Series	K1	0.047
	K15	0.055
	K20	0.070
	K25	0.085
	K37	0.124
	K46	0.153
S Series	S15	0.055
	S22	0.076
	S32	0.108
	S35	0.117
	S38	0.127
	S38HS	0.127
	S60	0.200
	S60HS	0.200
	iM30K	0.200

Conductivity increases with temperature and product density. The thermal conductivity of a composite will depend on the matrix material and volume loading of 3M glass bubbles.

Thermal Stability

Appreciable changes in bubble properties may occur above 1112°F (600°C) depending on temperature and duration of exposure.

Flotation

	Product	Floaters (% by bulk volume) Typical	Minimum
K Series	K1	96%	90%
	K15	96%	90%
	K20	96%	90%
	K25	96%	90%
	K37	94%	90%
	K46	92%	90%
S Series	S15	96%	90%
	S22	96%	90%
	S32	94%	90%
	S35	96%	90%
	S38	94%	90%
	S38HS	96%	90%
	S60	92%	90%
	S60HS	92%	90%
	iM30K	92%	90%

Packing Factor (Ratio of bulk density to true particle density)

Averages about 60%.

Oil Absorption

0.2-0.6 g oil/cc of 3M™ Glass Bubbles, per ASTM D281-84.

Volatile Content

Maximum of 0.5 percent by weight.

Alkalinity

Maximum of 0.5 milliequivalents per gram

pH

Because 3M glass bubbles are a dry powder, pH is not defined. The pH effect will be determined by the alkalinity as indicated above. When 3M glass bubbles are mixed with deionized water at 5 percent volume loading, the resulting pH of the slurry is typically 9.1 to 9.9, as measured by a pH meter.

Dielectric Constant

K Series: 1.2 to 1.7 @ 100 MHz, based on theoretical calculations.

S Series: 1.2 to 2.0 @ 100 MHz, based on theoretical calculations.

The dielectric constant of a composite will depend on the matrix material and volume loading of 3M glass bubbles.

Particle Size

	Product	Particle Size (microns, by volume) 3M QCM 193.0 Distribution 10th%	50th%	90th%	Effective Top Size
K Series	K1	30	65	115	120
	K15	30	60	105	115
	K20	30	60	90	105
	K25	25	55	90	105
	K37	20	45	80	85
	K46	15	40	70	80
S Series	S15	25	55	90	95
	S22	20	35	65	75
	S32	20	40	70	80
	S35	20	40	65	80
	S38	15	40	75	85
	S38HS	19	44	70	85
	S60	15	30	55	65
	S60HS	12	29	48	60
	iM30K	8.6	15.3	23.6	26.7

Particle Size (continued)

Hard Particles (3M QCM 93.4.3)

No hard particles (e.g. glass slag, flow agent, etc.) greater than U.S. number 40 (420 microns) standard sieve will exist.

Oversize Particles (3M QCM 93.4.4)

For *K1, K15, K20* and *K25* glass bubbles:
Using a 10 gram sample on a U.S. number 80 standard sieve (177 microns), a maximum of five (5) percent by weight glass bubbles will be retained on the sieve.

For *K37* and *K46* glass bubbles:
Using a 10 gram sample on U.S. number 100 standard sieve (149 microns), a maximum of one (1) percent by weight glass bubbles will be retained on the sieve.

For *S15, S32, S35, S38, S38HS, S60, S60HS* and *iM30K* glass bubbles:
Using a 10 gram sample on a U.S. number 140 standard sieve (105 microns), a maximum of three (3) percent by weight glass bubbles will be retained on the sieve.

For *S22* glass bubbles:
Using a 10 gram sample on a U.S. number 200 standard sieve (74 microns), a maximum of five (5) percent by weight glass bubbles will be retained on the sieve.

Appearance (3M QCM 22.85)

White to the unaided eye.

Flow (3M QCM 22.83)

3M™ Glass Bubbles remain free flowing for at least one year from the date of shipment if stored in the original, unopened container in the minimum storage conditions of an unheated warehouse.

Labeling

3M glass bubbles will be packaged in suitable containers to help prevent damage during normal handling and shipping. Each container will be labeled with:

1. Name of manufacturer
2. Type of 3M glass bubbles
3. Lot number
4. Quantity in pounds

Storage and Handling

To help ensure ease of storage and handling while maintaining free flowing properties, 3M™ Glass Bubbles have been made from a chemically stable glass and are packaged in a heavy-duty polyethylene bag within a cardboard container.

Minimum storage conditions should be unopened cartons in an unheated warehouse.

Under high humidity conditions with an ambient temperature cycling over a wide range, moisture can be drawn into the bag as the temperature drops and the air contracts. The result may be moisture condensation within the bag. Extended exposure to these conditions may result in "caking" of the 3M glass bubbles to various degrees. To minimize the potential for "caking" and prolong the storage life, the following suggestions are made:

1. Carefully re-tie open bags after use.
2. If the polyethylene bag is punctured during shipping or handling, use this bag as soon as possible, patch the hole, or insert the contents into an undamaged bag.
3. During humid summer months, store in the driest, coolest space available.
4. If good storage conditions are unavailable, carry a minimum inventory, and process on a first in/first out basis.

Dusting problems that may occur while handling and processing can be minimized by the following procedures:

1. For eye protection wear chemical safety goggles. For respiratory system protection wear an appropriate NIOSH/MSHA approved respirator. (For additional information about personal protective equipment, refer to Material Safety Data Sheet.)
2. Use appropriate ventilation in the work area.
3. Pneumatic conveyor systems have been used successfully to transport 3M glass bubbles without dusting from shipping containers to batch mixing equipment. Static eliminators should be used to help prevent static charges.

   Diaphragm pumps have been used to successfully convey 3M glass bubbles. Vendors should be consulted for specific recommendations.

3M glass bubble breakage may occur if the product is improperly processed. To minimize breakage, avoid high shear processes such as high speed Cowles Dissolvers, point contact shear such as gear pumps or 3-roll mills, and processing pressures above the strength test pressure for each product.

Health and Safety Information

For product Health and Safety Information, refer to product label and Material Safety Data Sheet (MSDS) before using product.

Packaging Information

Small Box (10 Cubic ft.)

A single corrugated box with a plastic liner. All boxes are banded together and to the wooden pallet. 4 boxes per pallet.

Each box inside diameter is 22 in. × 19 in. × 39 in.
Pallet size is 42 in. × 48 in.

Large Box (50 Cubic ft.)*

A single corrugated box with a plastic liner. Top enclosed with interlocking double cover banded. Bottom is normal box closure, entire box banded to wooden pallet.

Each box inside diameter is 48 in. × 42 in. × 44 in. Overall load size is $48\frac{3}{4}$ in. × $42\frac{3}{4}$ in. × 50 in. including pallet.
Pallet size is 42 in. × 48 in.

*S60 and S60HS large boxes are 38 cubic ft.

Box Weights

	Product	Small Box	Large Box*	Truckload Large Box* 44 Pallets
K Series	K1	40 lb.	210 lb.	9,240 lb.
	K15	50 lb.	265 lb.	11,660 lb.
	K20	60 lb.	350 lb.	15,400 lb.
	K25	80 lb.	430 lb.	18,920 lb.
	K37	100 lb.	660 lb.	29,040 lb.
	K46	125 lb.	815 lb.	35,860 lb.
S Series	S15	50 lb.	265 lb.	11,660 lb.
	S22	60 lb.	385 lb.	16,940 lb.
	S32	100 lb.	525 lb.	23,100 lb.
	S35	100 lb.	630 lb.	27,720 lb.
	S38	100 lb.	680 lb.	29,920 lb.
	S38HS	100 lb.	680 lb.	29,920 lb.
	S60	125 lb.	850 lb.	37,400 lb.
	S60HS	125 lb.	850 lb.	37,400 lb.
	iM30K	125 lb.	850 lb.	37,400 lb.

*Box weights may vary due to manufacturing tolerances on each product.

Resources

3M™ Glass Bubbles are supported by global sales, technical and customer service resources, with fully-staffed technical service laboratories in the U.S., Europe, Japan, Latin America and Southeast Asia. Users benefit from 3M's broad technology base and continuing attention to product development, performance, safety and environmental issues.

For additional technical information on 3M glass bubbles, please call 0845 607 6648 or visit www.3Moilandgas.co.uk.

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Berkshire RG12 8HT
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poraver® North America

Product specifications

according to DIN EN 13055-1

Designation	Poraver® basic granular sizes						Special granular sizes			
Granular size mm	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
Bulk density lb/ft³ Nominal	25	21.2	16.9	14.4	11.9	11.2	33.1	33.1	16.2	8.7
Apparent granular density lb/ft³ 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.

The ball that does it all

poraver North America

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/ft³	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/ft³	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.

The ball that does it all

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 cm^3, you can calculate the granular density in lb/ft^3 by using the following formula:

Calculation formula:

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

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.

The ball that does it all

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.

poraver North America

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

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

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

Mw - Mass of water absorbed [g]
Mtr - Mass of sample dry [g]
KRD - Apparent granular density [kg/m³]

Standardgranular 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.

The ball that does it all

poraver North America

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	
4	SiO_2	71.7	71.9	
5	Al_2O_3	2.5	2.5	
6	TiO_2	0.1	0.1	spectrally
7	Fe_2O_3	0.4	0.4	photometric
8	Mn_2O_3	0	0	atomic emission
9	MgO	2.1	2.1	
10	K_2O	0.8	0.8	
11	Na_2O	13.2	13.2	
12	SO_3	0.1	0.1	coulometric
13	Cl	–	–	argentometric
14	Remaining	– 0.1	– 0.1	–
15	Total 1, 3–14	100.0	100.0	–
16	Na_2O 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.

The ball that does it all

READY MIX APPLICATIONS

ELEMIX® concrete additive is comprised of innovative polymeric spheres that have been specially formulated for use in concrete. This additive distributes uniformly in concrete to dramatically reduce weight and enhance durability in structural and non-structural applications.

APPLICATONS

ELEMIX concrete additive has been successfully used in numerous commercial applications. Markets include: grouts and fills, cast in place, elevated decks, toppings and low-density fill.

SUSTAINABLE SOLUTION

- Delivers reduced weight designed to targeted units while achieving structural strengths.
- Improves concrete performance through enhanced thermal properties and resistance to cracking.
- Increases efficiencies with easy placement, pumping and finishing while reducing building and transportation costs.
- Reduces variability of concrete, resulting in fewer lost loads.

TYPICAL MIX DESIGNS

A variety of mix designs have been studied, yielding a range of densities and strengths. The following table depicts typical ranges of ingredients:

Typical Ranges of Ingredients for Structural Mixes

Ingredient	lb/yd³	kg/m³
Cement*	525–800	311–475
SCM**	0–225	0–133
Fine aggregate	950–1,700	564–1,008
Coarse aggregate	225–1,000	133–593
Water	250–420	148–249
ELEMIX concrete additive	1–13	0.6–7.7
Admixtures as directed by manufacturer		

*Recommended minimum total cementitious level 640 lb/yd³ (380 kg/m³)
**Dosage is approximate and will depend on mix designs and the specific gravity of the raw materials.

CODE COMPLIANCE

ELEMIX concrete additive is compliant to ICC-ES AC-408 Acceptance Criteria of Structural Concrete with Lightweight Synthetic Particles.

RANGES OF DENSITY

(STRUCTURAL AND NON-STRUCTURAL)

- Wet Density 145-30 pcf (2400-1200 kg/m³)
- Corresponding ELEMIX additive dosage 1-28 lb/yd³ (1-17 kg/m³)

ELEMIX®
CONCRETE ADDITIVE

READY MIX APPLICATIONS

TECHNICAL CHARACTERISTICS

Concrete made with ELEMIX additive meets applicable requirements for many concrete applications.

ASTM C39 Compressive Strength

ELEMIX additive combined with normal weight aggregates

120 pcf (1920 kg/m^3)
2500–4500 psi (17–31 MPa)

130 pcf (2080 kg/m^3)
2500–5900 psi (17–41 MPa)

135 pcf (2160 kg/m^3)
2500–7000 psi (17–48 MPa)

ELEMIX additive combined with lightweight aggregates

100 pcf (1600 kg/m^3)
2500–5400 psi (17–37 MPa)

120 pcf (1920 kg/m^3)
2500–7000 psi (17–48 MPa)

ASTM C78 Flexural Strength

(Properties are density dependent)

120 pcf (1920 kg/m^3)
350–980 psi (2.4–6.8 MPa)

130 pcf (2080 kg/m^3)
700–800 psi (5–6 MPa)

ASTM C143 / ASTM C1611 Consistency

Slump 0–8 inches (0–203 mm)
Slump Flow <26 inches (<660 mm)

ASTM C666 Freeze–Thaw Resistance (Procedure A & B)

Structural mixes greater than 80% Durability Factor

ASTM C672 Scaling–Deicing

Visual Rating of Surface ~2
(slight to moderate scaling)

ASTM E119 Fire Rating

(ANSI/UL 263 — CAN/ULC S101)
Fire Testing of Building Construction and Materials

UL Design No. D974, D976, D977
ULC Design No. F915, F916, F917

ASTM C469 Modulus of Elasticity and Poisson's Ratio

Modulus of Elasticity
e_c = 1920–3120 ksi (13,238–21,512 MPa)

Poisson's Ratio: .18 –.25

NOTES: Results are affected by coarse aggregate type and loading.
Strength results are based on 28 days.

DURABILITY

The use of ELEMIX concrete additive has been found to provide durable concrete in freeze–thaw degradation. Mixtures using ELEMIX additive without traditional air-entraining admixtures have also produced durable concrete.

ASTM C666 >80% relative dynamic modulus

ASTM C672 ~2 rating without use of sealer

NOTE: Performance is dependent on dosage of ELEMIX.

PLACING AND FINISHING

Concrete made with ELEMIX concrete additive can be placed and finished using traditional tools and equipment.

ELEMIX®
CONCRETE ADDITIVE

www.SYNTHEONInc.com

ELEMIX Concrete Additive
25 Avenue A
Leetsdale, PA 15056-4076 USA
888-922-2353

MTU Concrete Canoe
Recycled Concrete Aggregate

Certification

We certify the aggregate described here, meets the physical requirements of the current ASTM C-136 for Sieve Analysis of Aggregates and ASTM C-128 for Specific Gravity and Absorption of Fine Aggregate. Test results are as follows:

Material Description: Crushed light-weight concrete test cylinders. Aggregate was made by the Michigan Technological University Concrete Canoe Organization.

Sieve Analysis

Sieve Size *ASTM C-136*	% Passing	
	RCA "#8 Sieve"	RCA "#16 Sieve"
1"	---	---
¾"	---	---
½"	---	---
⅜"	---	---
#4	---	---
#8	100	---
#16	0	100
#30	---	---
#50	---	---
#100	---	---
#200	---	0

Data:

	RCA "#8 Sieve"	RCA "#16 Sieve"
SG OD, *ASTM C-128*	1.10	1.10
SG SSD, *ASTM C-128*	1.342	1.342
Absorption, *ASTM C-128*	0.22%	0.22%

Direct Colors, Inc.

1. Product Name
Direct Colors Concrete Pigments

2. Manufacturer
Direct Colors, Inc. (DCI)
430 East 10th Street
Shawnee, OK 74801
(877) 255-2656
(405) 275-6657
Fax: (405) 275-2815
E-mail: info@directcolors.com
www.directcolors.com

3. Product Description

BASIC USE

Direct Colors Concrete Pigment, also known as Integral Color, is designed to color concrete, stucco, plaster, mortar, grout, overlay and other cementitious materials. Integral Colors have been used in thousands of different commercial and residential applications to create beautiful and unique surfaces.

DCI Concrete Pigments are widely used to color cultured and architectural stone, statuary and an assortment of other garden decor.

DCI Pigments are also added to tint concrete sealers and Liquid Antique Release Solutions in order to bring rich color to a variety of indoor and outdoor flooring applications. Additionally, concrete dyes made with DCI Concrete Pigments are applied to existing concrete surfaces that cannot be acid stained or colored by any other means.

COMPOSITION & MATERIALS

Direct Colors Pigments are made from metal oxides of iron, chromium, cobalt or titanium. They are man-made, synthetic, inorganic pigments that are tested to and meet ASTM C979 standards. They do not contain carbon black, or other materials that may be unstable or non-lightfast in many cementitious applications.

SIZES

Direct Colors Concrete Pigments are available in 1 lb (0.5 kg), 5 lb (2 kg), 10 lb (4.5 kg), 20 lb (9 kg), 50 lb (23 kg), 500 lb (227 kg) and 2000 lb (907 kg) quantities. Custom batch quantities are also available.

Stamped concrete colored with Direct Colors Concrete Pigment dispersed in Antique Release and Tinted Sealer (Photo Courtesy of Decocrete)

COLOR

Direct Colors Concrete Pigments deliver superior uniformity in color, strength and lightfastness and are available in over 100 colors. See Tables 1 and 2. Accurate traceability is provided by use of batch identification codes. View visual color representations online at www.directcolors.com.

BENEFITS

- High quality pigments at an affordable price
- Superior customer service and technical support
- Free freight in the lower 48 states
- No minimum orders

ACCESSORIES

- Concrete sealers
- Multipurpose wax
- Concrete dyes
- DCI overlays
- Colored Liquid Antique
- Release agent
- Decorative aggregates
- Stamps and stencils

LIMITATIONS

- Direct Colors, Inc., color charts for integral color/concrete pigments are intended to match what can generally be expected from a final color as closely as possible. However, the color and condition of preexisting concrete will affect the final result of the new concrete color, so color samples are approximations only

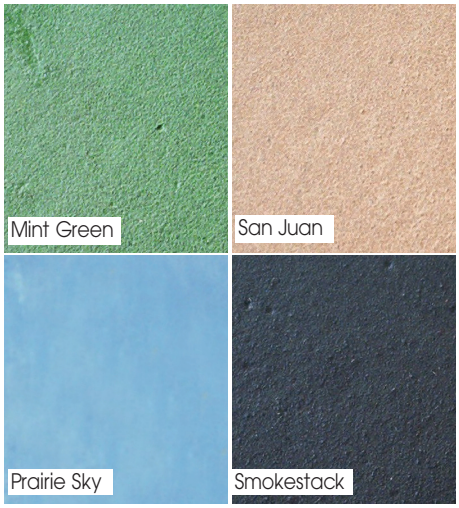
Close-up of stamped concrete walkway as shown above (Photo Courtesy of Decocrete)

- Efflorescence, a naturally occurring deposit found on the surface of concrete, is more noticeable on dark colors because of its whitish appearance. Although it will eventually cease, there is no known method to achieve 100% prevention. Efflorescence can quickly be removed by acid washing, but over time, natural weathering will achieve the same effect. See "Reducing Efflorescence" under "Installation" below for techniques to help reduce the occurrence of efflorescence

Direct Colors, Inc.

TABLE 1 INTEGRAL COLOR CHART, GRAY CEMENT BASE, TO ASTM C979					
Color mixture	Brick Red	Sun Dried Tomato	Merlot	Evening Shadow	Terra Cotta
Pigment type	1835	1835	126	126	560
Pound rating	4 lb	1 lb	3 lb	1 lb	5 lb
Color mixture	Majestic Sunrise	Dawn	Earthen Red	Desert Rouge	Desert Vista
Pigment type	1830	1830	1115	1115	560
Pound rating	4 lb	1 lb	3 lb	1 lb	3 lb
Color mixture	Navajo	Uplands	Caramel	San Juan	Frontier Buff
Pigment type	543	543	543	543	533
Pound rating	5 lb	3 lb	2 lb	1 lb	1 lb
Color mixture	Burnished Copper	Sandstone	Canyon Brown	Santa Fe Tan	Smokestack
Pigment type	553	553	553	533	230
Pound rating	4 lb	1 lb	5 lb	3 lb	5 lb
Color mixture	Weathered Tin	Deep Bronze	Milk Chocolate	Rattan	Golden Buff
Pigment type	230	680	680	609	609
Pound rating	1 lb	3 lb	1 lb	4 lb	2 lb
Color mixture	Cocoa Brown	Walnut	Petrified Wood	Mint Green	Briar Buff
Pigment type	653	649	649	5376	500
Pound rating	3 lb	4 lb	2 lb	3 lb	3 lb
Color mixture	Taupe	Pecan	Maple	Rocky Crag	Wildwood Buff
Pigment type	653	627	627	623	500
Pound rating	1 lb	3 lb	1 lb	3 lb	2 lb
Color mixture	Wheat Buff	Winterfield Buff	Mocha	Tarnished Brass	Sunray
Pigment type	500	1198	623	1311	1311
Pound rating	1 lb	1 lb	1 lb	3 lb	1 lb
Color mixture	Venetian Red	Umber	Slate Blue	Prussian Blue	Sapphire
Pigment type	1880	1880	5151	5151	15.3
Pound rating	5 lb	3 lb	1 lb	3 lb	5 lb
Color mixture	Midnight Blue	Mint Green	Forest Green		
Pigment type	15.3	5376	5376		
Pound rating	5 lb	3 lb	5 lb		

TABLE 2 INTEGRAL COLOR CHART, WHITE CEMENT BASE, TO ASTM C979					
Color mixture	Cayenne	Blush	Sequoia	Plum	Fire Rose
Pigment type	1830	1830	126	126	1115
Pound rating	3 lb	1 lb	3 lb	1 lb	3 lb
Color mixture	Morning Mist	Dusty Rose	Wildflower	Terran	Peach
Pigment type	1115	1835	1835	553	553
Pound rating	1 lb	3 lb	1 lb	3 lb	1 lb
Color mixture	Autumn	Leaf Fall	Pumpkin	Sun Dust	October Bronze
Pigment type	560	560	543	543	533
Pound rating	3 lb	1 lb	3 lb	1 lb	3 lb
Color mixture	Sunwashed Clay	New Bark	Everland Buff	Cake Buff	Beachfront Buff
Pigment type	533	623	623	609	609
Pound rating	1 lb	3 lb	1 lb	3 lb	1 lb
Color mixture	Canyon Wall	Cinnamon	Espresso	Pebble	Camel
Pigment type	627	627	653	653	500
Pound rating	3 lb	1 lb	3 lb	1 lb	3 lb
Color mixture	Sunset Tan	Tawny	Cream Beige	Café	Cottage Brown
Pigment type	500	1198	1198	649	649
Pound rating	1 lb	3 lb	1 lb	3 lb	1 lb
Color mixture	Malayan Bluff	Lotus Pond	Crème Mint	Hunter Green	Vineyard
Pigment type	1311	5376	5376	5376	1880
Pound rating	1 lb	3 lb	1 lb	5 lb	5 lb
Color mixture	Vineyard	Mauve	Tea Rose	Prairie Blue	Skye Blue
Pigment type	1880	1880	1880	5151	5151
Pound rating	5 lb	3 lb	1 lb	1 lb	3 lb
Color mixture	Electric Blue	Ultramarine			
Pigment type	15.3	15.3			
Pound rating	3 lb	5 lb			



Colors cast in Gray Cement

4. Technical Data

APPLICABLE STANDARDS

ASTM International (ASTM) - ASTM C979 Standard Specification for Pigments for Integrally Colored Concrete

APPROVALS

Occupational Safety and Health Administration (OSHA) Hazard Communication Standard, 29 CFR 1910.1200

PHYSICAL/CHEMICAL PROPERTIES

- Lightfast
- Alkali and weather resistant
- UV stable
- Non-hazardous
- Color consistent

Colors cast in White Cement

- Chemically inert
- Insoluble in water
- Inorganic
- Synthetic
- Specific gravity - Heavier than water
- Evaporation rate - None
- Reddish-brown appearance
- Odorless

FIRE PERFORMANCE

Direct Colors Concrete Pigments are nonflammable, noncombustible and nonexplosive.

5. Installation

PREPARATORY WORK

Store materials in an area protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

Verify that site conditions are acceptable for installation. Do not proceed with installation until unacceptable conditions are corrected.

METHODS

Mixing

Color charts and codes are based on pounds of pigment per 94 lb (43 kg) of cement material, including Portland cement, silica fume, fly ash and lime. Sand and aggregates are not used in this ratio. The maximum level of pigment to cement is 10% by weight. Using less than 1% pigment can result in a washed-out appearance. Blue pigments should be mixed dry with any cement-based material to ensure even color distribution.

Stamped walkway colored with Direct Colors Pigment (Photo Courtesy of Mark Douglass)

Swim-up pool bar countertop colored with 1311 Concrete Pigment, English Red Acid Stain and English Red Deco Gel (Photo Courtesy of Susan Turfle)

When an exact color match is required, complete a test pour, mixing the exact ingredients and ratios that will be used onsite. When custom blends are made for countertops, ready mixes, overlays, curbing, mortar, grouts and other concrete based products, the colors hold true within an acceptable range to most users, especially when the mixture has been adjusted to meet the specific needs of the mix and the project application.

Truck Pours

For a standard mix, the simplest method to convert the values on the color chart to a specific pour is to multiply the poundage on the chart by 5 to determine how much pigment per yard is needed. Consistency with the pigment per yard ratio is critical in achieving matching pours. The water level and mix ratios in each load are critical as well. It is essential to know how much concrete is in the truck, not just how much will be poured.

Dispense the pigment in the back of the truck, using the hose to clean the fins and ensuring that no loose pigment remains to cause streaking. Spinning the mix for 10 - 15 minutes is generally sufficient to properly disperse the pigment. Place and work the concrete as normal.

As the concrete sets, the color will appear to fade. This is caused by the concrete dispensing powder on the surface and will be resolved by sealing this in the same way as a decorative concrete would be sealed. Once sealed, the color should be stable and considerably darker than at first appearance pre-seal.

Color Calculator

Color calculators and measurement examples are available at www.directcolors.com to measure required pigment per yard and per custom batch of concrete.

PRECAUTIONS

Safety

- To avoid inhaling dust and contact with face and eyes, wear full face mask, eye protection and rubber gloves
- Avoid contact with inorganic acids
- Wash with soap and water after exposure. Chronic overexposure can cause slight skin irritation

Performance

- For optimal results, use the same brand of cement, aggregates and sand, as well as the same cement to pigment ratio, until project completion
- In order to avoid undesired discoloration, do not use calcium chloride as a set accelerator
- Difference in slump may produce a noticeable difference in color between batches
- Use local exhaust or baghouse for ventilation
- If material is released or spilled, scoop or vacuum the floor and wash with water
- To avoid color variation, be consistent in all stages of the batching, mixing, forming/placing and hardening of concrete

Stairs colored with Direct Colors Black Pigment

Reducing Efflorescence

- Ensure that the aggregate-cement ratio is sufficient to enable the cement paste to completely fill the voids between the aggregate particles after compaction
- To minimize air voids that remain after complete cement hydration, add to the concrete mix only the minimum amount of water needed to achieve required workability
- Select sands and aggregates for the mix design carefully, as appropriate particle size and shape can help to improve mechanical compaction, effectively squeezing air voids and allowing them to be replaced with the cement paste
- There is some evidence that certain cement additives and chemical admixtures can help to inhibit efflorescence. Consult Direct Colors, Inc., for more information
- Ensure concrete cures sufficiently to achieve not only strength, durability and reduced cracking, but surfaces that are as dense as possible to limit the concrete's ability to absorb water
- A variety of concrete coatings, including water and solvent based concrete sealers offered by Direct Colors, are available for application to the surface, blocking pores and forming an impermeable barrier at the concrete's exposed surface. This prevents the movement of water to the surface, restricting the migration of efflorescence forming compounds. Consult Direct Colors, Inc., for more information

BUILDING CODES

Installation and waste disposal must comply with the requirements of all applicable local, state and federal code jurisdictions.

6. Availability & Cost

AVAILABILITY

Products can be purchased at www.directcolors.com, or by calling (877) 255-2656. Products are also available from certified distributors. Contact the manufacturer or check online at www.directcolors.com for local availability information.

COST

Current pricing is available online at www.directcolors.com.

7. Warranty

The conditions of use and application of concrete pigment products are beyond the control of Direct Colors, Inc. Direct Colors makes no warranty regarding workmanship and other variables that do not involve the performance of pigments. Buyer's sole remedy shall be the purchase price paid by the user or buyer for the quantity of the Direct Colors product involved. For details, consult Direct Colors, Inc.

8. Maintenance

None required.

9. Technical Services

Technical assistance, including more detailed information, product literature, test results, project lists, assistance in preparing project specifications and arrangements for application supervision, is available by contacting Direct Colors, Inc. For questions or custom solutions, call (877)-255-2656 or email info@directcolors.com.

10. Filing Systems

- MANU-SPEC®
- Additional product information is available from the manufacturer upon request.

BASF
The Chemical Company

3 4

03 30 00
03 40 00
03 70 00
04 05 16

Product Data
Cast-in-Place Concrete
Precast Concrete
Mass Concrete
Masonry Grouting

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/yd^3 of Type I cement (360 kg/m^3); 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	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)

Master Builders

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
United States 23700 Chagrin Boulevard, Cleveland, Ohio 44122-5544 ● Tel: 800 628-9990 ● Fax: 216 839-8821
Canada 1800 Clark Boulevard, Brampton, Ontario L6T 4M7 ● Tel: 800 387-5862 ● Fax: 905 792-0651

NSF Certified to NSF/ANSI 61

Master Builders

CLEAR-SEAL

CONCRETE PROTECTIVE SEALER

PRODUCT DATA SHEET

DESCRIPTION: Clear protective finish for painted, stained or bare concrete & masonry surfaces; premium water-based urethane-fortified acrylic. Available in Satin & Gloss sheens.

Typical Uses:

✓ Pool Decks ✓ Patios & Porches ✓ Brick & Stone
✓ Driveways & Garages ✓ Exposed Aggregate ✓ Slate & Saltillo
✓ Pavers & Stamped Concrete

Important: *Read all directions thoroughly. Recommended: Wear gloves and safety glasses.*

SURFACE PREP*: Note: *The surface should be clean and dry. You may need an oil stain remover such as SEAL-KRETE® Oil Stain Remover to lift stubborn oil stains. Pressure-washing is recommended.*

Bare Concrete: Concrete must have cured for a minimum of 30 days. Etch smooth-finished concrete (such as basement or garage floors) with a concrete etching solution like SEAL-KRETE Clean-N-Etch. ***Note:*** *If etching with muriatic acid the area must be neutralized before proceeding. For more information visit www.seal-krete.com.*

Painted Surfaces: For use over one-part water-based coatings only; not recommended over acid-based stains or oil-based coatings. Freshly painted surfaces must have cured for a minimum of 72 hours. Paint must be sound (not blistering or peeling). Existing painted surfaces should be cleaned with a solution of Trisodium Phosphate (TSP) and water. Rinse well and allow to dry.

APPLICATION: Read "LIMITATIONS" section before use. This product is ready to use; do not dilute. Stir gently; do not shake. Apply in light, even coats. One coat is recommended; however, over porous surfaces (like saltillo tile) or when a higher sheen is desired, apply a second coat. ***Note:*** *Sealer goes on milky white but dries clear.*

Roller: Dampen roller, remove excess water, then saturate roller with product. Keep a wet edge while rolling. Do not allow to puddle, foam or run. (Use a 1/4" nap for smooth surfaces, 3/8" nap for rough or porous surfaces.)

Pump Sprayer: Set at a fine spray and apply using a circular motion. To eliminate puddling or to achieve a more uniform finish, backroll immediately after spraying.

COVERAGE: 150–300 sq.ft. per gallon, depending on surface porosity.

DRY TIME: Dry to touch in 1 hour at 77°F (25°C) 50% RH. Recoat in 2 hours. Dry to foot traffic in 24 hours. Will accept vehicular traffic in 72 hours. Dry times should be extended in colder climates.

CLEAN-UP & STORAGE: Clean tools with soap and water immediately after use. Store in a dry area. KEEP FROM FREEZING.

MAINTENANCE: Clean with a mild soap and water solution. Do not use solvent-based cleaners.

LIMITATIONS: Temperatures should be 50° to 90°F (10° to 32°C) and should not fall below 50°F (10°C) within 24 hours of application. Do not apply if rain is expected within 12 hours. Do not use over acid-based stains, 2-part epoxies or oil-based paints. Do not use on glazed tile. Do not use in areas subject to hydrostatic pressure. Smooth-finished concrete may be slippery when wet; consider using an anti-skid additive like SEAL-KRETE Clear Grip on high foot traffic areas.

**Sanding or removing paint containing lead may be hazardous. For information contact the National Lead Information Center at 1-800-424-LEAD or www.epa.gov/lead.*

CAUTION: EYE IRRITANT. Contains Dipropylene Glycol N-Propyl Ether. Avoid contact with eyes and prolonged contact with skin. Do not ingest.

FIRST AID: In case of eye contact, flush with water for 15 minutes. If irritation persists, get medical attention. In case of skin contact, wash thoroughly with soap and water. If swallowed, drink 1-2 glasses of water and immediately contact medical services regarding any instructions to induce vomiting. **KEEP OUT OF REACH OF CHILDREN – DO NOT TAKE INTERNALLY.**

Also Available in a Low VOC Formula

Product	No.	Unit	UPC Code	Carton Bar Code	Carton Size (W x D x H)	Cube / Wt. (cubic ft / lbs)	Carton Qty	Pallet Qty
Clear-Seal Satin Protective Sealer	604001	1 gal	0 15944 60401 6	1 00 15944 60401 3	14.38 x 14.38 x 8.5	1.02 / 36.68	4	45 cs
Clear-Seal Satin Protective Sealer	604005	5 gal	0 15944 60405 4	—	—	1.35 / 45.17	1	36 ea
Clear-Seal Gloss Protective Sealer	606001	1 gal	0 15944 60601 0	1 00 15944 60601 7	14.38 x 14.38 x 8.5	1.02 / 38.13	4	45 cs
Clear-Seal Gloss Protective Sealer	606005	5 gal	0 15944 60605 8	—	—	1.35 / 45.17	1	36 ea
Clear-Seal Gloss Protective Sealer Low VOC	607001	1 gal	0 15944 60701 7	1 00 15944 60701 4	14.38 x 14.38 x 8.5	1.02 / 37.79	4	45 cs

CLEAR-SEAL

CONCRETE PROTECTIVE SEALER

- EXCELLENT DURABILITY
- INTERIOR/EXTERIOR USE
- FOR COATED & UNCOATED HORIZONTAL SURFACES

TECHNICAL INFORMATION

- Clean-up: soap and water
- Shelf life: 2 years min. (closed container)
- Visual appearance: milky white (wet); dries clear
- Gloss: 25 (1 coat)
- Gloss retention: excellent
- Tire marking: resistant to most tires
- Propietary urethane-acrylic blend
- ASTM G-53 ultraviolet resistance: excellent
- ASTM D-1640: dry-to-touch 15 min; dry to recoat 2 hours; dry to light foot traffic 24 hours; dry to vehicular traffic 72 hours
- ASTM D-3359B intercoat adhesion: excellent

	Satin	Gloss	Gloss Low Voc
• ASTM D-3363 Konig hardness:	70	64	60
• VOC – EPA Method 24 – Waterproofing Sealer Category	< 100 g/L	< 250 g/L	< 100 g/L

CHEMICAL/SOLVENT RESISTANCE - ASTM D-1308

(One hour spot test)

- Gasoline: resistant
- Oil: resistant
- Water: resistant
- Salt: resistant
- Chlorine: resistant

FEATURES

- Seals and protects painted, stained or bare concrete
- Seals in color
- Reduces pockmarking and cracking
- Clear finish, will not yellow
- Premium, urethane-fortified acrylic formula

LIQUID PROPERTIES

- Water-Based
- Odor: Low

LIMITED WARRANTY: Manufacturer/Seller makes no warranty of any kind except that this product is free from defect and is of merchantable quality. Buyer remedy for breach of warranty is limited to replacement of SEAL-KRETE product or refund of purchase price. Convenience Products will not be responsible for labor or the cost of labor for removal or application of any product.

TECHNICAL SUPPORT: For more information on surface prep or application guidelines, or to obtain a Material Safety Data Sheet, call 1-800-323-7357, M–F (8:00 am–5:00 pm EST) or visit our website at www.seal-krete.com.

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PREMIUM PROTECTIVE SEALER

Vinyl Tape

471 • 4712 (Linered)

Technical Data **February, 2011**

Product Description

3M™ Vinyl Tape 471 and 4712 are a conformable colored (9 colors plus transparent) tapes made from vinyl backing with rubber adhesive. They are ideal for many lane and safety markings, color coding, abrasion protection, masking, sealing, splicing and other general purpose applications.

3M vinyl tape 4712 is a linered version of 3M vinyl tape 471 that may be used for die cutting or large area applications.

Product Construction

Product	Adhesive	Color	Standard Roll Length
3M™ Vinyl Tape 471	Rubber	Yellow, white, red, black, brown, green, orange, purple, blue and transparent	36 yds. (33 m)
3M™ Vinyl Tape 4712	Rubber	Yellow, white, red, black, brown, green, orange, purple, blue and transparent	36 yds. (33 m)

Typical Physical Properties

Note: The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

		ASTM Test Method
Properties for all colors except transparent:		
Adhesion to Steel:	23 oz./in. width (25 N/100 mm)	D-3330
Tensile Strength at Break:	14 lbs./in. width (270 N/100 mm)	D-3759
Elongation at Break:	130%	D-3759
Backing Thickness:	4.1 mils (0.10 mm)	D-3652
Total Tape Thickness:	5.2 mils (0.14 mm)	D-3652
Liner Thickness: (3M™ Vinyl Tape 4712)	2.5 mils (0.6 mils)	D-3652
Temperature Use Range:	40° to 170°F (4° to 77°C)	
Low Leachable Halogen and Sulfur:	Passes	MIL-STD-2041D(SH)
Properties for transparent:		
Adhesion to Steel:	26 oz./in. width (28 N/100 mm)	D-3330
Tensile Strength at Break:	14 lbs./in. width (270 N/100 mm)	D-3759
Elongation at Break:	150%	D-3759
Backing Thickness:	4.1 mils (0.10 mm)	D-3652
Total Tape Thickness:	5.2 mils (0.14 mm)	D-3652
Liner Thickness: (3M™ Vinyl Tape 4712)	2.5 mils (0.6 mils)	D-3652
Temperature Use Range:	40° to 170°F (4° to 77°C)	

3M™ Vinyl Tape

471 • 4712 (Linered)

Features

- Pigmented backings maintain their vivid colors even when exposed to heavy abrasion.
- Can be sold to Commercial Item Description A-A-1689 Type I & II
- Conformability and dead stretch properties are ideal for taping, wrapping or sealing many curved, convex, or irregular surfaces.
- Rubber adhesive provides good adhesion to many surfaces for easier application and excellent holding strength.
- Sharp colors for color coding or marking systems, draw attention and help enhance plant safety.
- Clean removal from many surfaces which helps reduce clean-up and labor costs.
- Abrasion resistant and longer potential application life.
- Good solvent resistance for application protection and longer product life.
- 3M™ Vinyl Tape 4712 can be printed using the thermal printing process.

Application Ideas

- Excellent for many lane and safety marking applications. When used with an applicator like the M-77 dispenser, 3M™ Vinyl Tape 471 can be quickly applied to define storage and safety areas. The fact that 3M tape 471 tape is quickly and cleanly removed in most cases makes it a faster, more versatile and less costly option than painting. Using tape for lane marking instead of painting also eliminates the need to ventilate paint solvents from an open area.
- Because they have low leachable halogens and sulfur, 3M™ Vinyl Tapes 471 and 4712 can be used in corrosion sensitive applications like the nuclear and stainless steel industries.
- 3M tape 4712 is great for die cuts and large area masking.
- Printed 3M tape 4712 can extend the range of 3M tape 471 for color coding by allowing multiple colors or identification on one tape.
- 3M tapes 471 and 4712 stretch to seal canisters and other storage containers that require a tight seal.
- Vivid colors of the tapes make them ideal for color, coding and decorating.

Application Techniques

- Best results are attained when applied to a clean, dry surface at temperatures between 60° to 85°F (16° to 27°C).

Note: While 3M tapes 471 and 4712 resist many common solvents, they should not be exposed to ketones, chlorinated hydrocarbons and esters found in lacquer thinner, degreasers, paint strippers, etc., which may cause the backing to swell or curl.

3M™ Vinyl Tape

471 • 4712 (Linered)

Storage

Store under normal conditions of 60° to 80°F (16° to 27°C) and 40 to 60% R.H. in the original carton.

Shelf Life

To obtain best performance, use this product within 18 months from date of manufacture.

Technical Information

The technical information, recommendations and other statements contained in this document are based upon tests or experience that 3M believes are reliable, but the accuracy or completeness of such information is not guaranteed.

Product Use

Many factors beyond 3M's control and uniquely within user's knowledge and control can affect the use and performance of a 3M product in a particular application. Given the variety of factors that can affect the use and performance of a 3M product, user is solely responsible for evaluating the 3M product and determining whether it is fit for a particular purpose and suitable for user's method of application.

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ISO 9001:2008

This Industrial Adhesives and Tapes Division product was manufactured under a 3M quality system registered to ISO 9001:2008 standards.

3M

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