



# *Spirit*

CONCRETE CANOE ENGINEER'S NOTEBOOK 2014

NORTHERN ARIZONA UNIVERSITY

## Northern Arizona University – *Spirit*

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**Tab A – Compliance Certificate**

**Northern Arizona University— Spirit**

I, Hannah Williams, 2014 concrete canoe captain, certify the following statements:

- ❖ The construction and finishing process of the canoe has been performed in complete compliance with the rules and regulations of the National Competition
- ❖ The registered participants at the Conference/National Competition are qualified student members and National Student Members of ASCE, and meet the eligibility requirements as specified in the rules and regulations of the National Competition
- ❖ The canoe has been completely built within the current academic year of the competition
- ❖ The team acknowledges that all material safety data sheets (MSDS) have been read by the project management team
- ❖ The team acknowledges receipt of the *Request for Information (RFI) Summary*

Registered Participants:

Name	ASCE National Member ID	Name	ASCE National Member ID
Noël Cruz	9849681	Brent Allman	9680233
Alejandra Quesada	1023371	Todd Brewer	9860624
Ariel Suarez	9553798	Jeremy DeGeyter	9135577
Kristin Van Sciver	9121748	Brent Lipar	9857573
Hannah Williams	1023379	Shuo Zhang	9535251

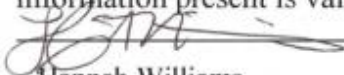
Canoe Parameters:

Parameter	Value (ft)	Value (in)
Maximum Length	19.00	228
Maximum Width	2.25	27
Maximum Depth	1.19	14.3
Average Thickness	0.04	0.5
Overall Estimated Weight	207 lbs	

Concrete Parameters:

Parameter	Value (English)	Value (SI)
Wet (Plastic) Unit Weight	98.1 lb/ft <sup>3</sup>	1571.4 kg/m <sup>3</sup>
Dry Unit Weight	81.1 lb/ft <sup>3</sup>	1297 kg/m <sup>3</sup>
Compressive Strength (28 day)	4536.0 psi	28.9 MPa
Tensile Strength (Estimated)	505.1 psi	3.48 MPa
Composite Flexural Strength (28 day)	N/A	N/A
Air Content	7%	

By signing below I certify that I have read and understand the aforementioned information and certify that all information present is valid.

  
 \_\_\_\_\_  
 Hannah Williams  
 Project Manager  
 Haw44@nau.edu  
 (915) 873-0042

02/28/2014  
 \_\_\_\_\_  
 Date

  
 \_\_\_\_\_  
 Robin Tuchscherer  
 Faculty Advisor  
 Robin.Tuchscherer@nau.edu  
 (928) 523-8080

2-28-2014  
 \_\_\_\_\_  
 Date

## Tab B – Construction Photographs

### Mold Construction

(All photos in this section were completed by Team *Night Fury*)



Photo 1: Cross Section Cut-



Photo 2: Attaching Cross Sections to





Photo 3: Attaching Wood Strips to Cross-



Photo 4: Attaching Wood Strips to Cross-





Photo 5: Patching Holes in Wood



Photo 6: Fiberglassing the Outside of the





Photo 7: Sanding the



Photo 8: Completed



**Canoe Construction**



Photo 1: Form Oil and First Layer of Concrete



Photo 2: Concrete







Photo 3: Concrete Distribution



Photo 4: First Layer of Concrete



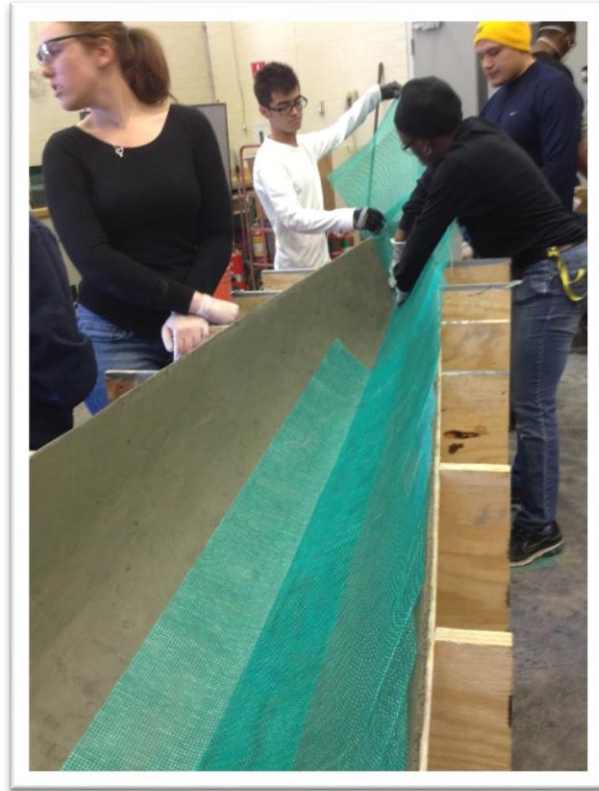


Photo 5: First Layer of Reinforcement



Photo 6: Rib





Photo 7: Installation of Foam



Photo 8: Final



**Finishing Techniques**



Photo 1: Patching Along Inside of

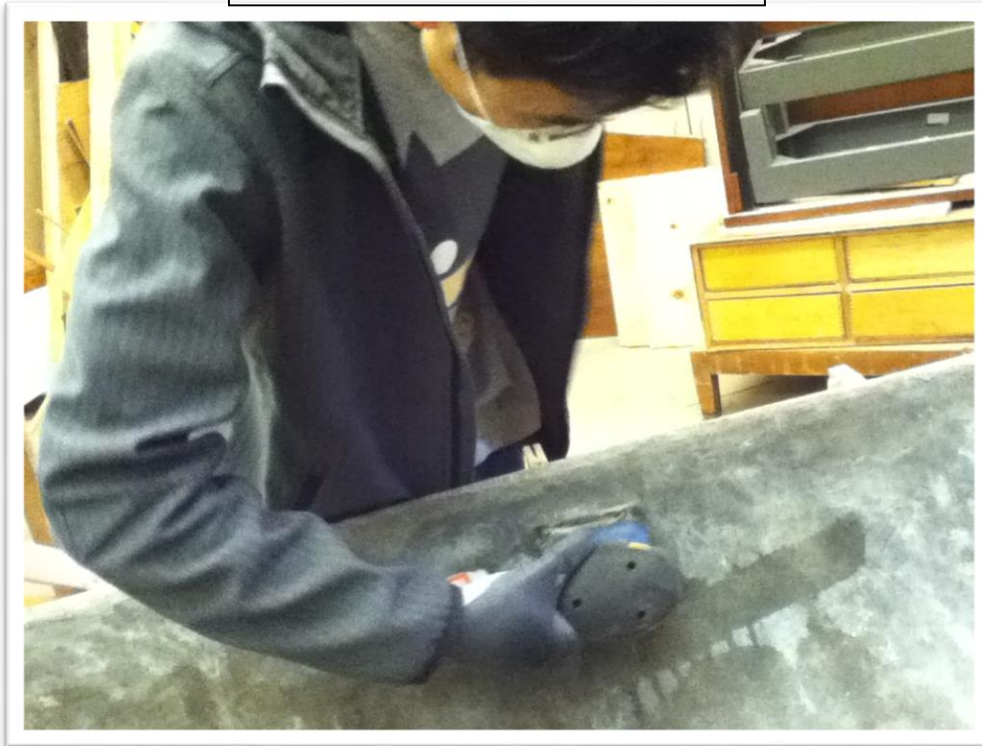


Photo 2: Sanding Uneven Surfaces within the Canoe





Photo 3: Preparing and Applying Stain to



Photo 4: Application of Concrete



## Tab C – Hull Thickness/Reinforcement and Percent Open Area Calculations

### Percent Open Area Calculations:

$$n_1 = 16$$

$$n_2 = 8$$

$$t_1 = 0.025 \text{ in}$$

$$t_2 = 0.06 \text{ in}$$

$$\text{aperture dimension} = 0.15 \text{ in}$$

$$d_1 = 0.15 + 2 \left( \frac{0.025}{2} \right) = 0.175 \text{ in}$$

$$d_2 = 0.0914 + 2 \left( \frac{0.06}{2} \right) = 0.21 \text{ in}$$

$$\text{Length}_{\text{sample}} = n_1 d_1 = 16(0.175) = 2.8 \text{ in}$$

$$\text{Width}_{\text{sample}} = n_2 d_2 = 8(0.21) = 1.68 \text{ in}$$

$$\Sigma \text{Area}_{\text{sample}} = n_1 n_2 \text{Area}_{\text{open1}} = 8(16)(0.15)^2 = 2.88 \text{ in}^2$$

$$\text{Area}_{\text{Total}} = \text{Length}_{\text{sample}} \text{Width}_{\text{sample}} = 2.8 * 1.68 = 4.704 \text{ in}^2$$

$$\text{POA} = \frac{\Sigma \text{Area}_{\text{open}}}{\text{Area}_{\text{Total}}} * 100 = \frac{2.88}{4.704} * 100 = \mathbf{61.2\%}$$

**61.2% > 40% min – Good!**

### Hull Thickness:

$t_{\text{Fiberglass}} = 0.0125 \text{ in}$  (Fiberglass mesh thickness determined through glass test as per 2014 ASCE NCCC Rules and Regulations)

#### Scenario 1 – Wall:

*Minimum hull thickness* = 0.5 in

*Reinforcement Thickness* = (2 layers mesh) = 2 \* 0.0125 in = 0.025 in

*Reinforcement Percentage* =  $\frac{0.025}{0.5} * 100 = 5\% < 50\%$  **OK**

#### Scenario 2 – Rib:

*Minimum hull thickness* = 1 in

*Reinforcement Thickness* = 2 layers mesh = 2 \* 0.0125 = 0.025 in

*Reinforcement Percentage* =  $\frac{0.025}{1} * 100 = 2.5\% < 50\%$  **OK**



Scenario 3 – Gunwales:

Minimum hull thickness = 0.75 in

Reinforcement Thickness = 1 layer mesh = 0.025 in

$$\text{Reinforcement Percentage} = \frac{0.025}{0.75} * 100 = 1.67\% < 50\% \text{ OK}$$

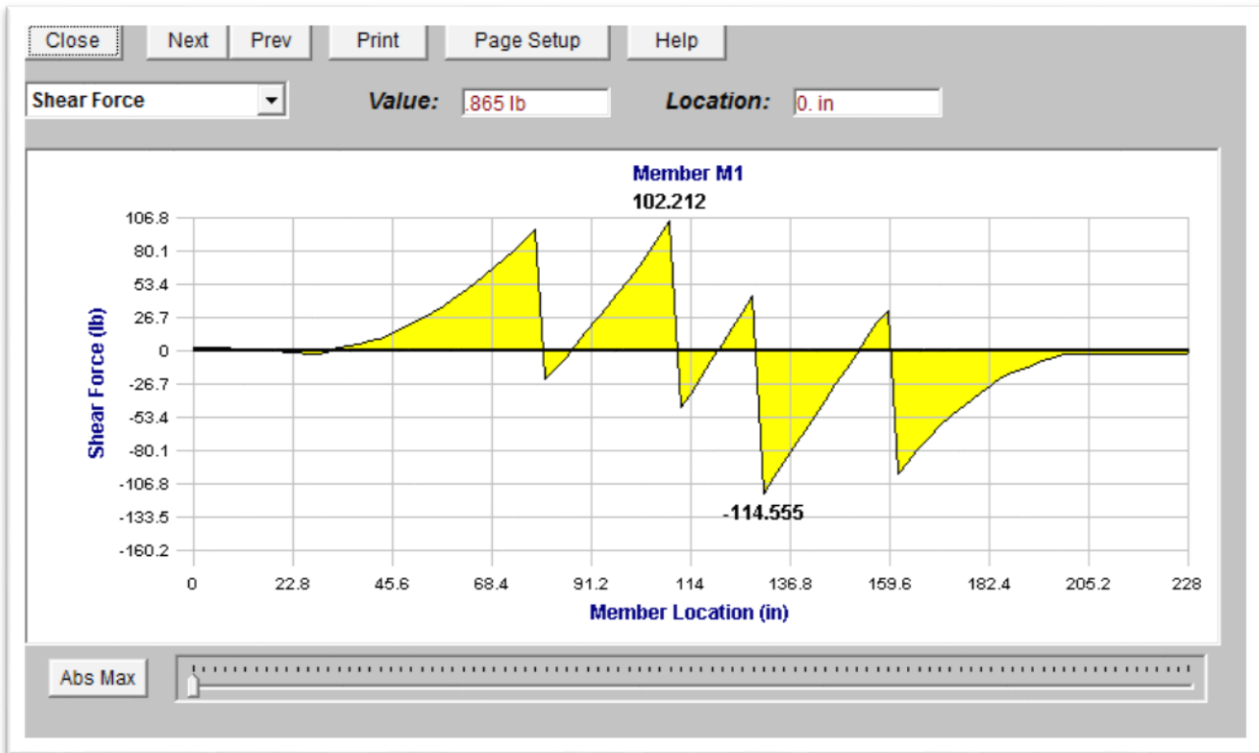
Scenario 4 – Bulkhead:

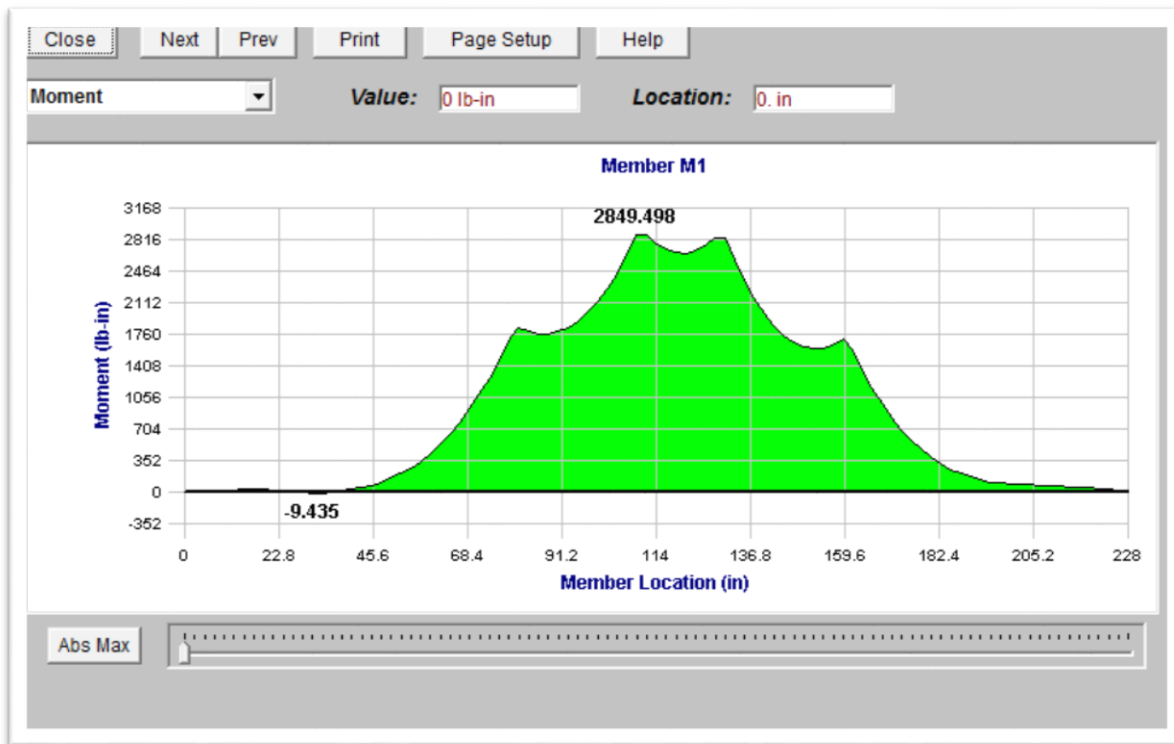
Minimum Hull Thickness = 0.25 in

Reinforcement Thickness = 1 layer mesh = 1 \* 0.0125 in

$$\text{Reinforcement Percentage} = \frac{0.0056}{0.25} * 100 = 0.56\% < 50\% \text{ OK}$$

Shear/Moment Diagrams for Critical Load Scenario:





**Reinforcement Decision Matrix:**

Reinforcement	Weight Factor	White/Green Stucco Fiberglass Mesh	HexForce Fiberglass Mesh	Chicken Wire	Geogrid
Flexibility, Workability, Molding w/ Shape of Canoe	0.30	0.60	0.90	0.30	0.00
Weight	0.10	0.30	0.30	0.30	0.30
POA	0.15	0.45	0.45	0.45	0.45
Bonding with Concrete	0.45	0.90	0.00	0.90	0.00
<b>TOTAL</b>	1.00	<b>2.25</b>	1.65	1.95	0.75





**Tab D – Material Technical Data Sheets (MTDS)**

*Present MTDS for each of the materials used in the construction of the canoe, including but not limited to binders, aggregate, chemical admixtures, paints, stains and sealers.*



# PORTLAND CEMENT

PRODUCT NO. 1124-31, -47, -94

## PRODUCT DESCRIPTION

QUIKRETE® Portland Cement is a high quality Portland cement meeting ASTM C 150 Type I.

## PRODUCT USE

QUIKRETE® Portland Cement is used for making high strength repair mortars, concrete and for any other applications requiring Type I Portland cement. In many locations the product also meets ASTM C 150 Type II. Consult your supplying plant to confirm compliance with ASTM C 150 Type II.

## SIZES

- QUIKRETE® Portland Cement
  - 31 lb (14 kg) bags
  - 47 lb (21.3 kg) bags
  - 94 lb (42.6 kg) bags
  - 40 kg (88 lb) bags
  - 42 kg (93 lb) bags

## YIELD

• Yield depends on application. For concrete mixes: Five to six 94 lb (42.6 kg) bags of QUIKRETE® Portland Cement is typically used with appropriate proportions of sand and gravel to produce 1 cu. yd. (0.8 m<sup>3</sup>) of concrete.

## TECHNICAL DATA

QUIKRETE® Portland Cement complies with ASTM C 150 Type I and in many locations also complies with ASTM C 150 Type II. The product is used in a variety of construction materials. Typical mix designs for some applications are listed below:

### Concrete Mix

- 1 Part QUIKRETE® Portland Cement
- 2 Parts QUIKRETE® All-Purpose Sand (ASTM C-33)
- 3 Parts QUIKRETE® All-Purpose Gravel (ASTM C-33)

### Mortar Mix (Type S, per ASTM C-270)

- 1 Part QUIKRETE® Portland Cement
- 1/2 Part QUIKRETE® Hydrated Lime -Type S
- 3-1/2 to 4-1/2 Parts QUIKRETE® Masonry Sand (ASTM C-144)

### Scratch and Brown Coat Stucco Mix (per ASTM C-926)

- 1 Part QUIKRETE® Portland Cement
- 1/2 Part QUIKRETE® Hydrated Lime (Type S)
- 4-1/2 to 6 Parts QUIKRETE® Washed Plaster Sand (ASTM C-897)

## DIVISION 3

Cement  
03 05 00



## INSTALLATION

Installation methods are specific for each type of product.

## PRECAUTIONS

The following points apply to all products made from Portland cement:

- Protect from freezing for at least 24-48 hr.
- Use the minimum amount of water necessary to achieve the desired consistency. Adding too much water will weaken the product.
- Keep the product damp for several days to obtain proper curing.

## WARRANTY

The QUIKRETE® Companies warrant this product to be of merchantable quality when used or applied in accordance with the instructions herein. The product is not warranted as suitable for any purpose or use other than the general purpose for which it is intended. Liability under this warranty is limited to the replacement of its product (as purchased) found to be defective, or at the shipping companies' option, to refund the purchase price. In the event of a claim under this warranty, notice must be given to The QUIKRETE® Companies in writing. This limited warranty is issued and accepted in lieu of all other express warranties and expressly excludes liability for consequential damages.

The QUIKRETE® Companies  
One Securities Centre  
3490 Piedmont Rd., NE, Suite 1300, Atlanta, GA 30305  
(404) 634-9100 • Fax: (404) 842-1425

\* Refer to [www.quikrete.com](http://www.quikrete.com) for the most current technical data, MSDS, and guide specifications

# Chemstar Type S Lime . . . it belongs in your mortar

When it comes to workability, boardlife, and sand carrying capacity, nothing is better than a cement-lime mortar with Chemstar Type S lime. And nothing enhances the quality and productivity of your masonry project like Chemstar Type S lime. By specifying Chemstar Type S lime, you are providing your customers with the best flexural bond strength and resistance to water penetration available. No wonder it is the market leader.

## Chemstar sets the standard

While cement-lime mortar is superior to other compositions, mortar made with Chemstar Type S lime is clearly a cut above the rest. Produced from the calcination of high quality dolomite and subsequent pressure hydration of the resulting quicklime, Chemstar Type S lime meets or exceeds all applicable standards, including:

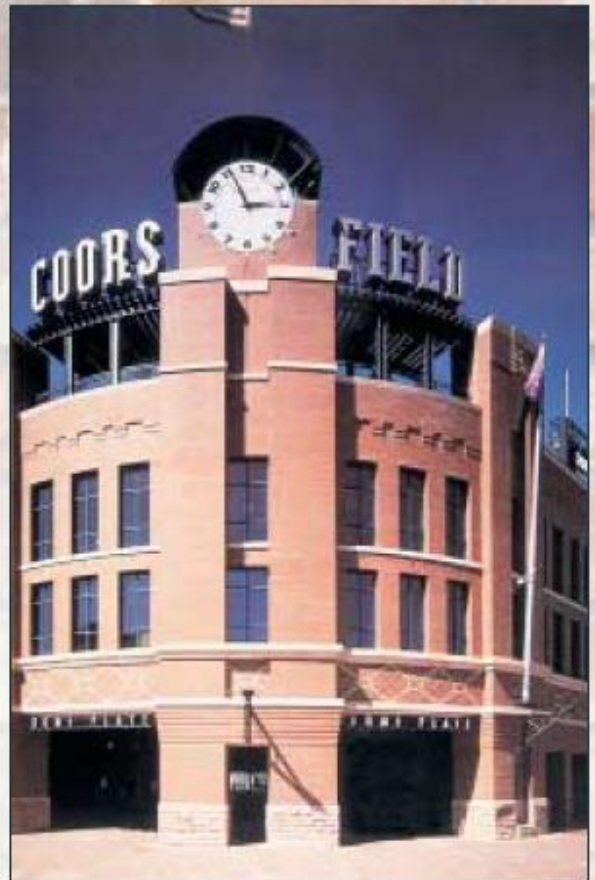
- ASTM C 207
- ASTM C 206 (Henderson and New Braunfels production)
- Uniform Building Code (UBC) standard 21-13
- International Building Code (IBC) 2000, 2103.7

As a result of their very small size (1/100th of a micron) the Chemstar Type S lime particles have very special properties which yield the following, significant benefits:

- Prolonged cement hydration for increased boardlife
- Excellent water retention
- Use of marginal mortar sand, as every grain is fully coated
- Maximum sand yield
- Superior workability
- Improved mortar consistency due to high dispersing properties.

## Chemstar meets the code

Building codes, including IBC and UBC standards, recognize the flexural bond strength of cement-lime mortars. Unreinforced masonry walls built using cement-lime mortars are allowed by code to accommodate a lateral load (i.e., seismic or wind driven) 67% greater than either masonry cement or mortar cement. In fact, masonry cement is not even allowed in seismic zones because of its deficiencies in bond strength. Chemstar Type S lime goes a step further by helping to knit the mortar to the masonry unit surface. This enhances the bond and promotes the early hydration of the cement, assuring full development of mortar strength during the first few critical days.



Call 800.365.6724  
Fax 817.732.8564  
Visit [www.chemicallime.com](http://www.chemicallime.com)  
Write PO Box 985004  
Fort Worth, Texas 76185.5004

# TECHNICAL DATA SHEET

According to ASTM C330, C331, C332

Poraver® expanded glass is available in five creamy white standard grain sizes from 0.1 - 4 mm. In addition, special grain sizes from 0.04 to 8 mm are produced. With this wide variety of grain sizes, Poraver® expanded glass granulate offers a suitable lightweight aggregate solution for many fields of application.

DESIGNATION	STANDARD	PORAVER® STANDARD GRAIN SIZES					PORAVER® SPECIAL GRAIN SIZES
Granular size [mm]		0.1-0.3	0.25-0.5	0.5-1	1-2	2-4	0.04-0.125
Granular size [Mesh #]	ASTM C136	140-50	60-35	35-18	18-10	10-5	400-120
Fineness modulus		0.66	1.92	2.72	3.81	4.7	on request
Dry loose bulk density [kg/m³]	ASTM C9/C29M	400 ± 60	340 ± 30	270 ± 30	230 ± 30	190 ± 20	530 ± 70
Apparent density [kg/m³]	ASTM C128	25 ± 3.8	21.2 ± 3.2	16.9 ± 3	14.4 ± 2.1	11.9 ± 1.8	33.1 ± 4.4
Compressive strength [MPa]	EN 13055-1:2002	850 ± 120	680 ± 50	430 ± 50	360 ± 50	320 ± 40	on request
Water absorption by mass <sup>1)</sup> [Mass. %]	ASTM C128	53.1 ± 8.4	42.5 ± 5.6	26.8 ± 4.4	22.5 ± 3.6	20 ± 3	on request
Water absorption by volume <sup>1)</sup> [Vol. %]	ASTM C128	2.8	2.6	2	1.6	1.4	on request
Organic impurities	ASTM C40	406	377	290	232	203	on request
Staining index (index number)	ASTM C641	35	28	20	20	23	on request
Loss on ignition [%]	ASTM C114	22	15	9	7	7	on request
Clay lumps and friable particles [%]	ASTM C142		no injurious compounds				no injurious compounds
Oversize	EN 13055-1:2002		0				0
Undersize			~1				~1
					< 2		< 2
			≤ 10% by mass				≤ 10% by mass
			≤ 15% by mass				≤ 15% by mass

The following data are valid for all grain sizes:  
<sup>1)</sup> % absorption determined after 5 minutes submerged in water

pH value		9-12	9-12
Moisture content on delivery		≤ 0.5 %	≤ 0.5 %
Softening point		approx. 700°C / 1300°F	approx. 700°C / 1300°F
Color		creamy white	creamy white
Thermal conductivity [W/m·K]			
			0.07 <sup>2)</sup>
			0.486 <sup>2)</sup>

The strength grades may vary within the tolerance range of bulk densities. The availability and delivery conditions for special grain sizes will be agreed on an individual basis.  
<sup>2)</sup> calculated values DIB according to approval Z-23.1-1.14



# MORTAR SAND

***ProMasonry Mortar Sand can be mixed with Portland cement to achieve a high performance mortar.***

**BELOW ARE TWO CHARTS FOR PROPORTIONING MIXES ACCORDING TO ASTM C270 STANDARDS.**

- The first chart specifies a Portland cement and hydrated lime based mix.
- The second chart specifies a Portland cement or masonry cement based mix.

## PORTLAND CEMENT-LIME

### PROPORTIONS BY VOLUME

TYPE	PORTLAND CEMENT	HYDRATED LIME	AGGREGATE RATIO
M	1	0.25	3.00 to 3.75
S	1	0.25 to 0.50	3.75 to 4.50
N	1	0.50 to 1.25	4.50 to 6.75
O	1	1.25 to 2.50	6.75 to 10.50
R	1	2.50 to 4.00	10.50 to 15.00

## MORTAR OR MASONRY CEMENT

### PROPORTIONS BY VOLUME

TYPE	PORTLAND CEMENT	MORTAR OR MASONRY CEMENT			AGGREGATE RATIO
		M	S	N	
M	1	-	-	1	4.50 to 6.00
M	-	1	-	-	2.25 to 3.00
S	0.50	-	-	1	3.50 to 4.50
S	-	-	1	-	2.25 to 3.00
N	-	-	-	1	2.25 to 3.00
O	-	-	-	1	2.25 to 3.00

## OTHER USES

- Paver base, Paver joints, General landscaping, Traction in snow and icy conditions.



A Division of  
Conproco Corporation

**PROMASONRY**<sup>®</sup>  
PROFESSIONAL QUALITY CEMENT PRODUCTS



# MORTAR SAND

## TECHNICAL DATA

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- ProMasonry Mortar Sand meets or exceeds ASTM C144 specification for masonry mortar aggregate.

## MORTAR TYPES AND STRENGTHS

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### *Type M*

- Very high strength mortar (2500+ psi or 17.2+ MPa) commonly used in exterior applications at or below grade.

### *Type S*

- High strength mortar (1800+ psi or 12.4+ MPa) commonly used in exterior load bearing applications above or below grade.

### *Type N*

- Moderate strength mortar (750+ psi or 5.2+ MPa) commonly used in interior or exterior non-load bearing applications at or above grade.

### *Type O*

- Low strength mortar (350+ psi or 2.4+ MPa) commonly used in tuck pointing and interior non-load bearing applications.

### *Type K*

- Very low strength mortar typically used when tuck pointing historic structures.

## YIELD

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- One 70 lb (31.8 kg) bag yields approximately 0.74 cu ft (21.0 L).

## HEALTH AND SAFETY

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- Do not ingest.
- Avoid breathing dust.
- Avoid contact with skin and eyes.
- Refer to Material Safety Data Sheet (MSDS) for additional information.
- Keep out of reach of children.

## FIRST AID

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- In case of skin contact, wash thoroughly with soap and water.
- For eye contact, flush immediately with a high volume of water for at least 15 minutes and contact a medical professional.
- For respiratory problems remove person to fresh air.

## DISPOSAL

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- Dispose of material in accordance with local, state or federal regulations.

### MANUFACTURER'S LIMITED WARRANTY

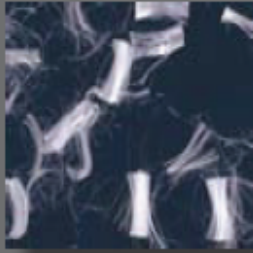
Conproco Corp. warrants this product for one year from date of installation to be free from manufacturing defects and to meet the technical properties on the current technical data sheet if used as directed within shelf life. User determines suitability of product for use and assumes all risks.

Buyer's sole remedy shall be limited to the purchase price or replacement of product exclusive of labor or cost of labor. July 2010

NO OTHER WARRANTIES EXPRESS OR IMPLIED SHALL APPLY INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. CONPROCO CORP. SHALL NOT BE LIABLE UNDER ANY LEGAL THEORY FOR SPECIAL OR CONSEQUENTIAL DAMAGES.

# PROMASONRY®

MANUFACTURED BY: **CONPROCO CORPORATION**  
PHONE 800.258.3500 FAX 603.743.5744 WEB PROMASONRY.NET



**SPECIFY FIBERMESH® 150 FIBERS:**

- Reduced plastic shrinkage cracking
- Improved impact, shatter and abrasion resistance
- Reduced water migration and damage from freeze/thaw
- Improved durability
- Areas requiring nonmetallic materials
- Concrete that needs an architectural finish

**FIBERMESH® 150 SYNTHETIC FIBER**

Fibermesh 150, formerly Stealth® e3®, micro-reinforcement system for concrete—100 percent virgin homopolymer polypropylene multifilament fibers containing no reprocessed olefin materials. Specifically engineered and manufactured in an ISO 9001:2000 certified facility for use as concrete reinforcement at an application rate of 1.0 to 1.5 lbs per cubic yard (.60 to .90 kg per cubic meter). UL Classified. Complies with National Building Codes and ASTM C III6/C III6M, Type III fiber reinforced concrete.

**ADVANTAGES**

Non-magnetic • Rustproof • Alkali proof • Requires no minimum amount of concrete cover • Is always positioned in compliance with codes • Safe and easy to use • Saves time and hassle.

**FEATURES & BENEFITS**

- Inhibits and controls the formation of intrinsic cracking in concrete
- Reinforces against impact forces
- Reinforces against abrasion
- Reinforces against the effect of shattering forces
- Reinforces against water migration
- Provides improved durability
- Reduces plastic shrinkage and settlement cracking
- Alternate system to traditional reinforcement when used for secondary (crack control) reinforcing in concrete.

**PRIMARY APPLICATIONS**

Applicable to all types of concrete which demonstrate a need for resistance to intrinsic cracking and improved water tightness and an aesthetic finish.

- Slabs-on-ground
- Stucco
- Slope paving
- Sidewalks
- Curbs
- Exposed aggregate
- Driveways
- Overlays & toppings

**CHEMICAL AND PHYSICAL PROPERTIES**

Absorption	Nil	Melt Point	324°F (162°C)
Specific Gravity	0.91	Ignition Point	1100°F (593°C)
Fiber Length*	Graded	Thermal Conductivity	Low
Electrical Conductivity	Low	Alkali Resistance	Alkali Proof
Acid & Salt Resistance	High		

\*Also available in single cut lengths

**PRODUCT USE**

**Mixing Designs And Procedures:** Fibermesh® 150 micro reinforcing is a mechanical, not chemical, process. The addition of Fibermesh 150 multifilament fibers do not require any additional water or other mix design changes at normal rates. Fibermesh 150 fibers are added to the mixer before, during or after batching the other concrete materials. Mixing time and speed are specified in ASTM C 94.

**FINISHING:** Fibermesh 150 micro-reinforced concrete can be finished by any finishing technique. Exposed aggregate, broomed and tined surfaces are no problem.

**APPLICATION RATE:** The application rate for Fibermesh 150 fibers is 1.0 to 1.5 lbs per cubic yard (.60 to .90 kg per cubic meter). Note: .75 lbs per cubic yard (.44 kg per cubic meter) may be acceptable based on local building codes.



### GUIDELINES

Fibermesh 150 fibers should not be used to replace structural, load-bearing reinforcement. Fibermesh 150 fibers should not be used as a means of using thinner concrete sections than original design. Fibermesh 150 fibers should not be used to increase joint spacing past those dimensions suggested by PCA and ACI industry standard guidelines.

### COMPATIBILITY

Fibermesh 150 fibers are compatible with all concrete admixtures and performance enhancing chemicals, but require no admixtures to work.

### PACKAGING

Fibermesh 150 fibers are available in a variety of packaging options. The 1.0 lb bag (1 bag per cubic yard, 0.6 kg/m<sup>3</sup>) is standard. Special packaging is available for full truckload addition. Bags are packed into cartons, shrink-wrapped and palletized for protection during shipping.

### TECHNICAL SERVICES

Trained Propex Concrete Systems specialists are available worldwide to assist and advise in specifications and field service. Propex Concrete Systems 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

- ASTM C 94/C 94M Standard Specification for Ready-Mixed Concrete.
- ASTM C III6/C III6M Standard Specification for Fiber-Reinforced Concrete.
- ASTM C 1399 Standard Test Method for Obtaining Average Residual-Strength of Fiber-Reinforced Concrete.
- 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). Replaces ASTM C 1018.
- ACI 304 Guide for Measuring, Mixing, Transporting and Placing Concrete.

- ACI 506 Guide for Shotcrete.
- International Code Council (ICC) NER-414 Evaluation Report.



UL® Classified: Type Fibermesh 150. For use as an alternate or in addition to the welded wire fabric used in Floor-Ceiling D700, D800, D900 Series Designs. Fibers may also be used in Floor-Ceiling Design Nos. G229, G243, G256, G514. Fiber added to concrete mix at a rate of 1.0 lb of fiber for each cubic yard of concrete.

### SPECIFICATION CLAUSE

Use Fibermesh 150 only 100 percent virgin polypropylene multifilament fibers containing no reprocessed olefin materials and specifically engineered and manufactured in an ISO 9001:2000 certified facility for use as concrete secondary reinforcement. Application per cubic yard shall equal a minimum of 1.0 lb/yd<sup>3</sup> (.60 kg/ m<sup>3</sup>). Fibers are for the control of cracking due to plastic shrinkage, plastic settlement and thermal expansion/contraction, lowered permeability, increased impact, abrasion and shatter resistance. Fiber manufacturer shall document evidence of ten year satisfactory performance history, ISO 9001:2000 certification of manufacturing facility, compliance with applicable building codes and ASTM C 1116/C 1116M, Type III fiber reinforced concrete. Fibrous concrete reinforcement shall be manufactured Propex Operating Company, LLC, 1110 Market Street, Suite 300, Chattanooga, TN 37402, USA, tel: 423 892 8080, fax: 423 892 0157, web site: propexglobal.com.



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# Armourwall 100 Specifications

(formerly one-coat stucco)

## CSI SECTION 09 24 00

### CSI SECTION 09 24 00 – PORTLAND CEMENT PLASTER

(Parex® Fiber Reinforced Stucco with Optional Krak-Shield)

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

- A. Supply and Installation of Parex® Armourwall 100™ Stucco Assemblies

##### 1.2 RELATED SECTIONS

- A. Section 03 30 00 - Cast-in-Place Concrete
- B. Section 04 20 00 - Unit Masonry
- C. Section 06 16 00 - Sheathing
- D. Section 07 25 00 - Weather Barriers
- E. Section 07 62 00 - Sheet Metal Flashing and Trim
- F. Section 07 90 00 - Joint Protection
- G. Section 08 50 00 - Windows
- H. Section 09 21 16 - Gypsum Board Assemblies

##### 1.3 REFERENCES

- A. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar
- B. ASTM C578 - Specification for Preformed, Cellular Polystyrene Thermal Insulation
- C. ASTM C847 - Standard Specification for Metal Lath
- D. ASTM C897 - Standard Specification for Aggregate for Job-Mixed Portland Cement-Based Plaster
- E. ASTM C926 - Standard Specification for Application of Portland Cement-Based Plaster
- F. ASTM C933 - Standard Specification for Welded Wire Lath
- G. ASTM C1032 - Standard Specification for Woven Wire Plaster Base
- H. ASTM C1063 - Standard Specification for Installation of Lathing and Furring for Portland Cement Based Plaster
- I. ASTM C1177 - Specification for Glass Mat Gypsum for Use as Sheathing
- J. ASTM C1278 - Specification for Fiber-Reinforced Gypsum Panel
- K. ASTM C1396 - Standard Specification for Gypsum Board
- L. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials
- M. ASTM E119 - Method for Fire Tests of Building Construction and Materials
- N. ASTM E330 - Test Method for Structural Performance of Windows, Curtain Walls, and Doors by Uniform Static air Pressure Difference
- O. ASTM G153 - Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
- P. ICC Acceptance Criteria 219 - Acceptance Criteria for Exterior Insulation And Finish Systems



111.08  
H&C®

# CONCRETE STAIN SOLID COLOR WATER BASED

FORMERLY SHIELD PLUS ULTRA CONCRETE STAIN

PRODUCT DESCRIPTION	CHARACTERISTICS	SURFACE PREPARATION														
<p><b>H&amp;C® Concrete Stain Water Based</b> provides superior protection and beauty for both exterior and interior concrete. Fortified with silicone it is ideal for pool decks, patios, walkways, block and stucco walls, basements and laundry rooms. It may be applied to bare concrete or previously painted surfaces. <b>H&amp;C® Concrete Stain Water Based</b> is highly resistant to pool chemicals. For best results on garage floors use <b>H&amp;C® Shield-Crete Garage Floor Epoxy</b>.</p>	<p><b>Color:</b> 8 ready mixed colors, 3 tintable bases for a variety of custom colors and clear for added durability.</p> <p><b>Coverage</b> <span style="float:right">sq ft/gal</span></p> <table border="0"> <tr><td>Concrete floors</td><td style="text-align:right">200-300</td></tr> <tr><td>Porous concrete</td><td style="text-align:right">150-250</td></tr> <tr><td>Asphalt</td><td style="text-align:right">200-250</td></tr> <tr><td>Concrete block</td><td style="text-align:right">100-150</td></tr> <tr><td>Split faced block</td><td style="text-align:right">75-125</td></tr> <tr><td>Fluted block</td><td style="text-align:right">50-100</td></tr> <tr><td>Brick (clay)</td><td style="text-align:right">100-150</td></tr> </table> <p><b>Drying Time, @ 77°F, 50% RH:</b> temperature and humidity dependent</p> <p>To touch: <span style="float:right">30 minutes</span></p> <p>Light traffic and recoat: <span style="float:right">2 hours</span></p> <p>Heavy traffic: <span style="float:right">72-96 hours</span></p> <p>Full Cure should be reached in 7-14 days</p> <p>*NOTE: High humidity and /or low temperatures will affect drying time.</p> <p><b>Flash Point:</b> <span style="float:right">N/A</span></p> <p><b>Vehicle Type:</b> <span style="float:right">100% Acrylic</span> <b>White 20.00121-</b></p> <p><b>VOC (less exempt solvents):</b> <span style="float:right">224 g/L; 1.87 lb/gal*</span></p> <p><b>Pigmented Sheen:</b> <span style="float:right">Low Luster &lt; 35</span></p> <p><b>Volume Solids:</b> <span style="float:right">30 ± 2%*</span></p> <p><b>Weight Solids:</b> <span style="float:right">43 ± 2%*</span></p> <p><b>Weight per Gallon:</b> <span style="float:right">10.0 lb*</span></p> <p>*May vary by color</p> <p><b>Clear 20.00120-</b></p> <p><b>VOC (less exempt solvents):</b> <span style="float:right">246g/l; 2.05lb/gal</span></p> <p><b>Clear Sheen:</b> <span style="float:right">Low Luster &lt; 35</span></p> <p><b>Volume Solids</b> <span style="float:right">19%</span></p> <p><b>Weight Solids</b> <span style="float:right">22%</span></p> <p><b>Static Coefficient of Friction:</b> <span style="float:right">.9</span></p> <p><b>Water Vapor Transmition</b></p> <p>ASTM D1653 <span style="float:right">5.21 ± 0.12 grains/(hr ft²)</span></p> <p><b>Perm Rating</b></p> <p>ASTM D1653 <span style="float:right">11.2 ± .3 grains/(hr ft² in Hg)</span></p>	Concrete floors	200-300	Porous concrete	150-250	Asphalt	200-250	Concrete block	100-150	Split faced block	75-125	Fluted block	50-100	Brick (clay)	100-150	<p><b>WARNING!</b> Removal of old paint by sanding, scraping or other means may generate dust or fumes that contain lead. Exposure to lead dust or fumes may cause brain damage or other adverse health effects, especially in children or pregnant women. Controlling exposure to lead or other hazardous substances requires the use of proper protective equipment, such as a properly fitted respirator (NIOSH approved) and proper containment and cleanup. For more information, call the National Lead Information Center at 1-800-424-LEAD (in US) or contact your local health authority.</p> <p><b>Bare Concrete:</b> Newly poured concrete must be at least 28 days old. All concrete must be porous, clean, dry and free of grease, oil &amp; any other contaminants. To spot clean, use <b>H&amp;C® Cleaner Degreaser</b> following label directions. If mold, mildew or fungus is present, kill and remove with a solution of one-cup household bleach to one gallon of water. All horizontal concrete surfaces <b>MUST</b> be etched with <b>H&amp;C® Etching Solution</b> or muriatic acid, following label directions. After proper etching the surface should have the feel of 120-grit sandpaper, if not then a second etching is required. Vertical concrete surfaces should absorb water. Test various sections by spraying water directly onto the surface to be stained. If the water does not absorb rapidly, then the surface should be acid etched using the <b>H&amp;C® Etching Solution</b> following label instructions or mechanically abraded. Do not apply the stain until all surfaces are porous. Allow all surfaces to dry 24 hours before staining. Prepared concrete must have a pH level between 6 and 10.</p>
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<p><b>Features:</b></p> <ul style="list-style-type: none"> <li>• Protects and beautifies interior and exterior surfaces</li> <li>• Use on concrete, masonry, and asphalt</li> <li>• Will not peel, flake, or fade</li> <li>• Resists oil, gasoline, water, and UV rays</li> <li>• Makes the surface easier to clean</li> <li>• Soap &amp; water clean up</li> <li>• Ideal for high pH surfaces</li> </ul>																
<p><b>Recommended Uses:</b></p> <ul style="list-style-type: none"> <li>• Pool Decks</li> <li>• Stadium Supports</li> <li>• Bridges and Bridge Structures</li> <li>• Parking Garages</li> <li>• Athletic Courts</li> <li>• Asphalt Driveways</li> <li>• Block &amp; Stucco Walls</li> <li>• Patios and Walkways</li> <li>• Basement Floors</li> <li>• CMU, Split Face, and Fluted Block</li> <li>• Precast, Poured-in-place, and Tilt-up Concrete.</li> </ul>																
<p>For a complete color/seal system on porous substrates, apply 2 coats of <b>H&amp;C® Concrete Stain Water Based</b> and a flood coat of <b>H&amp;C Super V™ Water Repellant</b>.</p>																



111.92

H&C®

# CONCRETE SEALER WET LOOK WATER-BASED

<u>PRODUCT DESCRIPTION</u>	<u>CHARACTERISTICS</u>	<u>SURFACE PREPARATION</u>																						
<p>H&amp;C® Wet Look Sealer is a premium quality 100% clear acrylic sealer that will enhance and protect previously coated, bare concrete and other masonry surfaces. This single component, solvent free sealer can be applied for both interior and exterior applications. H&amp;C® Wet Look Sealer will apply milky white to ensure complete coverage, but dries to a clear transparent finish.</p> <p><b>Where to use:</b></p> <ul style="list-style-type: none"> <li>• Topcoat for stained or painted surfaces</li> <li>• Patios</li> <li>• Lanais</li> <li>• Driveways</li> <li>• Walkways</li> <li>• Pool Decks</li> <li>• Brick and stucco surfaces</li> </ul> <p><b>Acceptable Standards:</b> Meets MPI (Master Painters Institute) #99 Sealer, Water Based for Concrete Floors.</p> <p>LEED 09 NC</p>	<p><b>Color:</b> Applies Milky White Dries Clear</p> <p><b>Coverage</b> sq ft/gal</p> <table> <tr> <td>Previously coated concrete</td> <td>200-300</td> </tr> <tr> <td>Porous Concrete</td> <td>100-200</td> </tr> <tr> <td>Concrete Block</td> <td>100-150</td> </tr> <tr> <td>Porous Decorative Block</td> <td>75-100</td> </tr> <tr> <td>Brick (clay)</td> <td>100-150</td> </tr> </table> <p><b>Drying Time, @ 77°F, 50% RH:</b> *temperature and humidity dependent</p> <table> <tr> <td>To Touch:</td> <td>1 hour</td> </tr> <tr> <td>Recoat:</td> <td>2 hours</td> </tr> <tr> <td>Light traffic:</td> <td>24 hours</td> </tr> <tr> <td>Heavy traffic:</td> <td>72 hours</td> </tr> </table> <p>*NOTE: High humidity and /or low temperatures will affect drying time.</p> <p><b>Finish:</b> Gloss</p> <p><b>Vehicle Type:</b> Acrylic</p> <p><b>VOC (less exempt solvents):</b> 98 g/L</p> <p><b>Volume Solids:</b> 27% +/-1%</p> <p><b>Coefficient of Friction</b></p> <table> <tr> <td>Without H&amp;C® SharkGrip:</td> <td>.7</td> </tr> <tr> <td>With H&amp;C® SharkGrip:</td> <td>.85</td> </tr> </table> <p><b>Taber Abrasion:</b> Good after 1 week cure time</p> <p><b>Chemical Resistance:</b> Good</p>	Previously coated concrete	200-300	Porous Concrete	100-200	Concrete Block	100-150	Porous Decorative Block	75-100	Brick (clay)	100-150	To Touch:	1 hour	Recoat:	2 hours	Light traffic:	24 hours	Heavy traffic:	72 hours	Without H&C® SharkGrip:	.7	With H&C® SharkGrip:	.85	<p><b>WARNING!</b> Removal of old paint by sanding, scraping or other means may generate dust or fumes that contain lead. Exposure to lead dust or fumes may cause brain damage or other adverse health effects, especially in children or pregnant women. Controlling exposure to lead or other hazardous substances requires the use of proper protective equipment, such as a properly fitted respirator (NIOSH approved) and proper containment and cleanup. For more information, call the National Lead Information Center at 1-800-424-LEAD (in US) or contact your local health authority.</p> <p><b>Bare Concrete:</b> Freshly placed concrete must be a minimum of 28 days old. All concrete should be clean and free of laitance, oil, grease and mildew. If mold, mildew or fungus is present, kill and remove with a solution of one-cup household bleach to one gallon of water. Wear protective eyewear, water-proof gloves, and protective clothing. Quickly wash off any of the mixture that comes into contact with your skin. <b>DO NOT ADD DETERGENTS OR AMMONIA TO THE BLEACH/WATER SOLUTION.</b> Concrete MUST be etched, with H&amp;C® Concrete Etcher or muriatic acid, following label directions. The surface should have the feel of 120-grit sandpaper, if not then a second etching is required. Allow 24 hours before staining. Cured concrete should have a pH level between 6 and 10.</p> <p><b>Previously Stained or Painted:</b> Make sure all previously painted or stained surfaces are in sound condition. Scrape and sand all loose material prior to the application of the H&amp;C® Wet Look Sealer. To ensure adequate adhesion of sealer, scuff sand all remaining stain or paint. Reapplication of the old coating should be done to create an even uniform appearance. H&amp;C® Cleaner Degreaser mixed to a 50/50 ratio with water will remove light soil from the surface. H&amp;C® Cleaner Degreaser should be used full strength on heavy oil and grease stains.</p>
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