



# PHOSCRETE FORMULA 1-HC

## TECHNICAL DATA GUIDE

Very Rapid Hardening MALP (Magnesium Aluminum Liquid Phosphate) concrete for horizontal and castable installation and repairs. Provides long-term durability with structural integrity.

### DESCRIPTION

PHOSCRETE® FORMULA 1-HC™ (F1-HC) is a two-part cementitious MPC (Magnesium-Phosphate-Cement) concrete repair material composed of magnesium oxide, aluminosilicates, aggregates, and reinforcing fibers (Dry Mix), that must be mixed with pre-measured F1-HC Activator. F1-HC is very rapid hardening, and gains strength suitable to vehicular traffic in less than one hour at a wide range of ambient temperatures. F1-HC forms both a chemical and a mechanical bond to cured concrete and to itself. F1-HC meets ASTM C 928, Type R3.

### PROVEN APPLICATIONS

- ▶ Full depth and partial depth concrete repairs
- ▶ Horizontal and castable: above grade and below grade concrete structures
- ▶ Rehabilitation of concrete bridge structural elements such as bridge decks and expansion joints
- ▶ Rehabilitation of marine structures such as seawalls, navigation locks, guide walls, reservoirs, and dams
- ▶ Highway concrete spall and rutting repairs
- ▶ Airport runway and apron concrete repairs
- ▶ Dowel bar retrofit, pre-cast joint grouting, bearing locations
- ▶ Freezer floors, industrial floors, and loading dock repairs

### ADVANTAGES

- ▶ Labor and time saving material: fast setting, pre-extended mix, self-consolidating, no sandblasting of steel bars, easy clean up with water.
- ▶ Fast, easy, and accurate mixing in a bucket, mortar mixer, or pan mixer. Two pre-measured components: dry mix in a bag liquid activator in a jug.
- ▶ Rapid return to service [1] hour following placement at 68°F (20°C).
- ▶ Freeze-thaw and salt scaling resistant.
- ▶ Very low shrinkage.
- ▶ Fiber reinforced: high flexural strength and ductility.
- ▶ Strong bond to clean cured concrete and to itself with no cold joints.
- ▶ Stops rust and inhibits corrosion: converts iron oxide to metal phosphate.
- ▶ Does not out-gas after cure: accepts sealers and polymer coatings as soon as 15 minutes following initial set.
- ▶ Chemically stable: no added chlorides, resists chloride penetration.
- ▶ Not a vapor barrier; allows on grade applications.
- ▶ Environmentally friendly: no odor.
- ▶ All temperature use – sets in temperatures cold as -5°F (-20°C)  
*Cool F1-HC Activator and use Phoscrete Fast-Set/Slow-Set admixtures to manage setting/working time.*

### Packaging

**Large Bag Kit:** [1] bag + [1] jug  
Dry Mix: 50 lb. (22.5 kg)  
Polyethylene -lined paper bag  
F1-HC Activator: 107 fl. oz. (3.1 l)  
LDPE 1-gallon jug  
**Yield:** 5.4 bf, 0.45 ft<sup>3</sup>, 0.0127 m<sup>3</sup>  
52 bags and jugs per full pallet.

**Small Bag Kit:** [1] bag + [1] jug  
Dry Mix: 22 lb. (10 kg)  
Polyethylene -lined paper bag  
F1-HC Activator: 45 fl. oz. (1.3 l)  
LDPE 1-gallon jug  
**Yield:** 2.4 bf, 0.20 ft<sup>3</sup>, 0.0056 m<sup>3</sup>  
96 bags and jugs per full pallet.

### Mixing Ratio

*Pre-measured, pre-extended.  
Mix [1] jug into [1] bag.  
Use color-matched bags and jugs.  
Always add liquid first.  
Do not extend with sand or aggregate.*

### Storage

Store in clean, dry conditions in unopened, original packaging.

### Shelf Life

**Dry Mix:** 24 months  
**Activator:** 12 months  
(when properly stored)

### VOC Content

0 g/L: Less exempt solvents



LABORATORY TEST DATA

Fresh Properties					
Test	Specification	Description	Time	Typical Results	
Set Time	ASTM C191	Time of Setting by Vicat Needles	Initial   Final	12 min	13 min
	ASTM C403	Time of Setting by Penetration Resistance		8 min	9 min
Slump	ASTM C143	Slump of Hydraulic-Cement Concrete	5 min	10.25 in (26 cm)	
Density	ASTM C387	Density (Unit Weight) of Concrete		132.9 lb/ft <sup>3</sup>	2259 kg/m <sup>3</sup>
Air Content	ASTM C231	Air Content by Pressure Method		5.7%	
Strength Properties					
Test	Specification	Description	Time	Typical Results	
				psi	MPa
Compressive Strength	ASTM C109	Compressive Strength of Hydraulic Cement Mortars Using 2-in. Cube Specimens	1 hour	7500	51.7
			1 day	10000	68.9
			28 days	11000	75.8
Compressive Strength	ASTM C39	Compressive Strength of Hydraulic Cement Mortars Using 4x8-in. Cylinder Specimens	1 hour	5000	34.5
			1 day	7500	51.7
			28 days	8500	58.6
Flexural Strength	ASTM C78	Flexural Strength of Concrete Using Simple Beam with Third-Point Loading	1 day	575	3.4
			28 days	600	4.8
Bond Strength	ASTM C882	Bond Strength by Slant Shear: Phoscrete - Concrete	1 hour	1500	10.3
			1 day	2500	17.2
			28 days	3000	20.7
		Bond Strength by Slant Shear: Phoscrete - Phoscrete	1 hour	1750	12.1
			1 day	2500	17.2
			28 days	3000	20.7
Tensile Strength	ASTM C496	Splitting Tensile Strength of Cylindrical Concrete Specimens	1 day	810	6.9
Modulus of Elasticity	ASTM C469	Static Modulus of Elasticity and Poisson's Ratio of Concrete in Compression	28 days	3.1 E <sup>+06</sup>	21 E <sup>+04</sup>
				0.274	
Durability Properties					
Test	Specification	Description	Test	Typical Results	
Free Shrinkage	ASTM C157	Length Change of Hardened Concrete (Std)	28 Days Wet   Dry	0.00%	-0.03%
Freeze Thaw	ASTM C666-A	Resistance of Concrete to Rapid Freezing and Thawing in a Saturated Condition (300 cycles)	Durability Factor	94.5%	
Scaling	ASTM C672	Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals (50 cycles) Results = Visual   Material Loss lbs./ft <sup>2</sup>	NaCl	Visual = 0	0.0 lbs/ft <sup>2</sup>
Chlorides	ASTM C1202	Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration (Coulombs)	28 days	38 C (negligible)	
	AASHTO T260	Chloride Content (%)	28 days	.004%	.004%
Abrasion	California CT-550	Determining the Surface Abrasion Resistance of Concrete Specimens (mass loss)	24 hours	16 g	1.8%

Independent accredited laboratory test reports are available upon request.



## GENERAL INSTALLATION GUIDELINES

- ▶ Refer to [Phoscrete Formula 1 \[MALP Series\] Full Installation Guide](#), for the most complete documentation on best practices.
- ▶ Refer to [Warm Temperature Guidelines](#) and [Cold Temperature Guidelines](#), for information on how to mix Phoscrete materials in warm (>70°F/20°C) and cold climates (<50°F/10°C). The Guidelines contain information about the use of Phoscrete Fast- and Slow-Set Admixtures, and best practices for cooling or supercooling the Liquid Activator. Cooling the Liquid Activator can be achieved on ice at 40°F (4°C) or supercooling in a freezer at 10°F (-12°C). Liquid Activator's freezing point is -10°F (-23°C).

## SURFACE PREPARATION

- ▶ The concrete surface must be sound and fully cured.
- ▶ Remove loose, damaged, and concrete contaminated by oil, grease, and other bond-inhibiting materials.
- ▶ Concrete profile should reach minimum CSP of 6 per ICRI Guidelines. Water-blasting is not recommended.
- ▶ In the case of partial depth installations, the thickness of the repair should not be less than 1 inch (2.5 cm) deep. A minimum depth of 2-inch (5 cm) is recommended. For expansion joints, a 4-inch minimum depth is recommended. Saw-cut the edges of the repair area parallel and perpendicular to traffic to limit the number of load-bearing stress points.
- ▶ Surface must be frost-free, dry, and free of standing water. Gently apply heat (torch) to eliminate surface moisture.
- ▶ Remove loose scale (rust) from steel bars with a wire brush. Sandblasting is not required.
- ▶ When saw-cutting or shot-blasting, remove surface dust and slurry with air or water (allow to dry prior to application).
- ▶ Replace reinforcing bars according to instructions from the engineer. Generally, bars that lost 25% or more of their original diameter must be replaced.

## PRIMER COAT

Phoscrete Primer is recommended as a pre-treatment when installing Phoscrete Formula 1 (F1) for concrete repairs when the substrate contains reactive aggregates (notably limestone), and in high stress environments (including expansion joints), and when maximum bond strength is desired. Phoscrete Primer is ideal for preparing substrates for vertical, overhead, and horizontal concrete repairs, including expansion joints.

- ▶ Scrub in a thin layer of Primer into the area to be repaired using a gloved hand, being careful to fill all voids and cover all exposed aggregates.
- ▶ Apply Primer to maintain at least ¼" (½ cm) uniform thickness over the bond interface using gloved hands and concrete margin trowels.
- ▶ Wait at least 15 minutes, and until the material is no longer malleable (you can't press your finger and indent the primer surface), before proceeding with installation of Phoscrete F1.
- ▶ Phoscrete F1 bonds to Primer with no cold joints, when cured.

## MIXING

- ▶ Mix PHOSCRETE F1-HC at the placement site.
- ▶ Mix [1] jug of F1-HC Activator into [1] bag F1-HC Dry Mix. Match colored labels on bags and jugs to insure proper mixing ratio.
- ▶ DO NOT MIX USING PARTIAL BAGS OR JUGS.  
*Note: F1-HC Activator jugs contain liquids with different densities. Using a partial jug does not guarantee equal distribution of liquids.*
- ▶ Use a heavy-duty five [5] gallon bucket for mixing. Mix with a paddle (Phoscrete's urethane auger is highly recommended), using a dual or variable speed drill suitable for mixing (Bosch GBM-9-16 is highly recommended).
- ▶ When mixing up multiple kits at once, use a pan mixer or a paddle-style mortar mixer.
- ▶ Agitate then empty entire jug or jar into a clean bucket first. Next add other Phoscrete admixtures (Fast-Set, Slow-Set) as needed. Then add Dry Mix into the bucket while slowly running the mixer.
- ▶ Mix for a minimum of 45 seconds, and until the material is completely wetted out (no dry material remains) and shows a uniform consistency. Do not under-mix or over-mix.

## APPLICATION

- ▶ A batch of Phoscrete F1-HC must be placed and finished within 5 - 15 minutes depending on ambient temperature.
- ▶ Install immediately after mixing. Discard the batch if the material begins to set up in the pail or mixer.
- ▶ Phoscrete F1-HC is a thixotropic material: vibration and tapping with a trowel increases flow.
- ▶ Scrub in a thin layer of F1-HC into the bottom and sides of the area to be repaired, using a trowel, float, or a gloved hand, being careful to fill all voids.
- ▶ Fill the repair in lifts using concrete floats and margin trowels. Force the material against the edges of the repair. In-between lifts, scarify the surface by scratching crisscross lines in the layer with a trowel prior to set for best bond adhesion. When placing multiple pours across a long patch, blend the Phoscrete at the interface using a trowel for best looking finish. Phoscrete bonds to itself with no cold joints, whether wet or completely cured.



## APPLICATION *(continued from page 3)*

- ▶ Finish the repaired area using clean concrete floats and trowels. Plastic floats work best. Tap on surface with trowel to bring liquid to the surface for best finish. When installing in lifts, do not apply a final layer thinner than 1 inch (2.5 cm).
- ▶ Stop finishing once the surface of the placed material develops a "skin."
- ▶ If the material finishes higher than the adjacent surface, use a diamond grinder to level surface as soon as 15 minutes following final set. Scarify or groove as necessary to ensure adequate tire traction.
- ▶ If rain begins prior to final set, cover the surface with plastic sheeting for at least 15 minutes following initial set.
- ▶ On sloped surfaces, pour the material at the bottom of the slope and work your way up. Use a hand screed or float to move the material up the slope. When installing on steep inclines, use forms, or work in smaller increments (one kit at a time), and allow the material to set prior to the next pour.
- ▶ For expansion joint nosings, ensure that the hardened repair material is not higher than the approach slab. Use a grinding tool to cut a 45° bevel at the edge of the joint no sooner than 15 minutes after initial set. Compression or silicone seals can be applied immediately after grinding, or once the material temperature cools below 100°F (38°C). Refer to Phoscrete's [Expansion Joint Installation and Repair Guidelines](#).

## CLEANING

- ▶ In-between batches, clean tools with water and wipe off excess water prior to contact with Phoscrete.
- ▶ When the job is completed, clean tools with water. Clean hands with soap and water.

## LIMITATIONS

- ▶ Do not use any primer or admixtures other than those provided by Phoscrete.
- ▶ Do not extend PHOSCRETE F1-HC with aggregate. Do not add sand and/or any type of cement.
- ▶ Do not mix partial units.
- ▶ Minimum application thickness: 1-inch (2.5 cm), 2-inches (5 cm) recommended. Maximum application thickness: none
- ▶ Minimum ambient temperature: -5°F (-20°C)
- ▶ Do not use water when mixing, placing, or finishing PHOSCRETE F1-HC
- ▶ When wet, PHOSCRETE F1-HC cannot be placed in direct contact with galvanized steel (zinc).
- ▶ Proper application is the responsibility of the user. Field visits by Phoscrete personnel are for the purpose of making technical recommendations, not for supervising or providing quality control on the jobsite.

## LIMITED WARRANTY NOTICE

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