



# PHOSCRETE FORMULA 1-HC (Formerly Phoscrete HC / Phoscrete HC-Endure)

## 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, no primer, 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: 55 lb. (25 kg)  
*Polyethylene -lined paper bag*  
F1-HC Activator: 119 fl. oz. (3.5 l)  
*LDPE 1-gallon jug*  
**Yield:** 4.8 bf, 0.45 ft<sup>3</sup>, 0.127 m<sup>3</sup>  
48 bags and jugs per full pallet.

**Small Pail Kit:** 11 lb. (5 kg)  
Dry Mix bag in HDPE pail  
F1-HC Activator in HDPE jar  
**Yield:** 1.0 bf, 144 in<sup>3</sup>, 0.0024 m<sup>3</sup>  
64 pails 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   |                   | 141 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 C39          | Compressive Strength of Hydraulic Cement Mortars Using 4x8-in. Cylinder Specimens   | 1 hour            | 5000                   | 34.5                    |
|                       |                   |   | 1 day             | 7500                   | 62.1                    |
|                       |                   |   | 28 days           | 8500                   | 79.3                    |
| 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>+06</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)<br>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 installation practices.
- Refer to [Phoscrete Warm Temperature Guidelines](#) and [Phoscrete 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 -20°F (-29°C).

## SURFACE PREPARATION

- 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 designer. Generally, bars that lost 25% or more of their original diameter must be replaced.

## PRIMER COAT

For challenging applications, where maximum bond strength is required, use Phoscrete Primer. Apply a scrub coat of Phoscrete Primer to the prepared concrete substrate. Be sure to fill all voids. Complete the primer coat by placing a ¼ in. (1.5 cm) thin layer of Phoscrete Primer over the scrub coat, either wet or dry. Wait at least 15 minutes for Phoscrete Primer to set and bond prior to proceeding with PHOSCRETE F1-HC full repair installation.

If Phoscrete Primer is not available, Phoscrete Formula 3-VO or Phoscrete Formula 3-HC can be used as an alternative.

## 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.
- When mixing Small Pails, use a minimum 18v variable speed drill on the high torque setting. For professional use, Phoscrete's small urethane auger is highly recommended.
- 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 about 1 minute, until the material is fully wetted out and shows a uniform consistency. Do not over-mix.
- A batch of Phoscrete F1-HC must be mixed, placed, and finished within 5 - 15 minutes depending on ambient temperature.

## APPLICATION

- 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.
- 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).



## APPLICATION *(continued from page 3)*

- › 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](#).
- › Contact Phoscrete installation support to discuss your specific application and requirements.

## 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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