



# PHOSCRETE FORMULA 3-HC

## TECHNICAL DATA GUIDE

Rapid Hardening MKP (Magnesium Potassium Phosphate) concrete for horizontal applications - including thin overlays. Can be placed by cast, pour, or pump methods. Provides long-term durability with structural integrity.

### DESCRIPTION

PHOSCRETE® FORMULA 3-HC™ (F3-HC) is a two-part cementitious MPC (Magnesium-Phosphate-Cement) concrete composed of magnesium oxide, potassium phosphate, and aggregates (Dry Mix) that must be mixed with pre-measured F3-HC Activator. F3-HC is rapid hardening, and gains strength suitable to vehicular traffic in two hours at moderate ambient temperatures. F3-HC forms both a chemical and a mechanical bond to cured concrete and to itself. PHOSCRETE F3-HC meets ASTM C 928, Type R3.

### PROVEN APPLICATIONS

- ▶ Full and partial depth concrete repairs
- ▶ Horizontal above grade and below grade concrete structures
- ▶ Vertical and overhead repairs by: form and pour or pump
- ▶ Repair of concrete bridge structural elements including expansion joints and bridge decks
- ▶ Rehabilitation of marine structures including seawalls, navigation locks, guide walls, reservoirs, and dams
- ▶ Thin cementitious overlays for bridge decks and concrete roadways.
- ▶ Highway concrete spall and rutting repairs
- ▶ Airport runway and apron concrete repairs
- ▶ Rapid concrete repair of parking structures, sidewalks, and stairs

### ADVANTAGES

- ▶ Labor and time saving material: fast setting, no need for aggregate extension, self-consolidating, no sandblasting of rebar, no anti-corrosion primer, no sacrificial anodes, 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.
- ▶ Easy to apply: cast, pour or pump.
- ▶ Easy to finish using screeds, floats, and trowels.
- ▶ Rapid return to service two [2] hours following placement at 68°F (20°C).
- ▶ High early and ultimate compressive, bond, flexural, and tensile strengths.
- ▶ Freeze-thaw and salt scaling resistant.
- ▶ Very low shrinkage.
- ▶ Strong bond to clean cured concrete and to itself. with no cold joints.
- ▶ Stops rust and inhibits corrosion: converts iron oxide to metal phosphate.
- ▶ Chemically stable: no added chlorides, resists chloride penetration.
- ▶ Not a vapor barrier; allows on grade applications.
- ▶ All temperature use: heat/cool F3-HC Activator and use Phoscrete Fast-Set/Slow-Set admixtures to manage setting/working time.
- ▶ Environmentally friendly: no VOCs, no odor.

### Packaging

**Bulk Sack Kit:** [1] bag + [40] jugs

Dry Mix: 2200 lb. (1000 kg)

**Yield:** 18 ft<sup>3</sup>, 0.66 yd<sup>3</sup>, 0.509 m<sup>3</sup>

**Large Bag Kit:** [1] bag + [1] jug

Dry Mix: 55 lb. (25 kg)

Polyethylene -lined paper bag

F3-HC Activator: 118 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

F3-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.*

### Curing

Phoscrete Endure 1-gallon (3.8l)

PET jugs Upon set, apply to

Phoscrete MPC to reduce

evaporation and shrinkage.

### Storage

Store in clean, dry conditions in

unopened, original packaging.

### Shelf Life (when properly stored)

**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                 | Test Results           |                         |
| Set Time              | ASTM C191             | Time of Setting by Vicat Needles   | Initial   Final      | 18 min                 | 22 min                  |
|                       | ASTM C403             | Time of Setting by Penetration Resistance  |                      | 20 min                 | 25 min                  |
| Slump                 | ASTM C143             | Slump of Hydraulic-Cement Concrete   | 5 min                | 7.0 in (17.8 cm)       |                         |
| Density               | ASTM C387             | Density (Unit Weight) of Concrete  |                      | 136 lb/ft <sup>3</sup> | 2178 kg/m <sup>3</sup>  |
| Air Content           | ASTM C231             | Air Content by Pressure Method   |                      | 4.8%                   |                         |
| Strength Properties   |                       |  |                      |                        |                         |
| Test                  | Specification         | Description  | Time                 | Test Results           |                         |
|                       |                       |  |                      | psi                    | MPa                     |
| Compressive Strength  | ASTM C109             | Compressive Strength of Hydraulic Cement Mortars Using 2-in. Cube Specimens  | 2 hours              | 4000                   | 27.6                    |
|                       |                       |  | 3 hours              | 4500                   | 31.0                    |
|                       |                       |  | 1 day                | 5000                   | 34.5                    |
|                       |                       |  | 28 days              | 7000                   | 48.2                    |
| Flexural Strength     | ASTM C78              | Flexural Strength of Concrete Using Simple Beam with Third-Point Loading   | 1 day                | 500                    | 3.4                     |
|                       |                       |  | 28 days              | 600                    | 4.1                     |
| Bond Strength         | ASTM C882             | Bond Strength by Slant Shear: Phoscrete - Concrete   | 2 hours              | 2000                   | 13.8                    |
|                       |                       |  | 1 day                | 2400                   | 16.5                    |
|                       |                       |  | 28 days              | 3000                   | 20.7                    |
|                       |                       | Bond Strength by Slant Shear: Phoscrete - Phoscrete  | 2 hours              | 2400                   | 16.5                    |
|                       |                       |  | 1 day                | 3000                   | 20.5                    |
|                       |                       |  | 28 days              | 3500                   | 24.1                    |
| Tensile               | ASTM C496             | Splitting Tensile Strength of Cylindrical Concrete   | 28 days              | 640                    | 4.4                     |
| Modulus of Elasticity | ASTM C469             | Static Modulus of Elasticity   | 28 days              | 4.3 E <sup>+06</sup>   | 3.0 E <sup>+04</sup>    |
| Durability Properties |                       |  |                      |                        |                         |
| Test                  | Specification         | Description  | Test                 | Test Results           |                         |
| Free Shrinkage        | ASTM C157             | Length Change of Hardened Concrete (Std)   | 28 Days Wet   Dry    | +0.03%                 | -0.03%                  |
| Freeze Thaw           | ASTM C666-A           | Resistance of Concrete to Rapid Freezing and Thawing in a Saturated Condition (300 cycles)   | Durability Factor    | 95%                    |                         |
| Scaling               | ASTM C672             | Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals (100 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              | 500 C                  |                         |
|                       | AASHTO T260           | Chloride Content (%)   | 28 days Acid   Water | 0.007%                 | 0.002%                  |
| Abrasion              | ASTM C779 Procedure B | Abrasion Resistance of Horizontal Concrete Surfaces  | 28 days              | 30 minutes             | 0.043 in                |
|                       |                       |  |                      | 60 minutes             | 0.060 in                |

Independent accredited laboratory test reports are available upon request.



## GENERAL INSTALLATION GUIDELINES

- ▶ Refer to [Phoscrete Formula 3 \[MKP Series\] Full Installation Guide](#), for the most complete documentation on best installation practices, including recommended tools and mixing equipment.
- ▶ Refer to [Phoscrete's Best Practices for Cold Temperature](#) and [Warm Temperature Guidelines](#) for details on working with Phoscrete Admixtures (Fast-Set, Slow-Set).
- ▶ Cool Activator on ice to 40°F for additional working time during placement and finishing.
- ▶ Warm Activator in hot water when working in cold temperatures for faster set.

## SURFACE PREPARATION

- ▶ The concrete surface must be sound and fully cured.
- ▶ Remove loose, damaged, and contaminated concrete, such as oil, grease, and other bond-inhibiting materials.
- ▶ Surface must be dry, frost-free, with no standing water. Gently apply heat (torch) to eliminate surface moisture.
- ▶ Concrete profile should reach minimum CSP (Concrete Surface Profile) of 6 per ICRI Guidelines.
- ▶ In the case of partial depth installations, the thickness of the repair should not be less than 0.5 in (1.25 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.
- ▶ 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.

## MIXING

- ▶ Mix PHOSCRETE F3-HC at the placement site.
- ▶ Mix [1] jug of F3-HC Activator into [1] bag F3-HC Dry Mix. Match colored labels on bags and jugs to insure proper mixing ratio.
- ▶ DO NOT MIX USING PARTIAL BAGS OR JUGS.  
*Note: F3-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 or larger for mixing bags. Mix with a paddle (Phoscrete's urethane auger is highly recommended), and 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, Fibers) as needed. Then add Dry Mix into the bucket while slowly running the mixer.
- ▶ Mix for about 2 minutes, or until the material is fully wetted out and shows a uniform consistency. Do not over-mix.
- ▶ A batch of Phoscrete F3-HC must be mixed, placed, and finished within 15 - 25 minutes from mixing, temperature dependent.

## APPLICATION

- ▶ Phoscrete F3-HC is a thixotropic material: vibration and tapping with a trowel increases flow.
- ▶ For concrete overlays:
  - Pour, place, and screed the material quickly to increase finishing time.
  - Finish F3-HC with a trowel, float, vibrating screed, or broom.
- ▶ For poured applications:
  - Scrub in a thin layer of F3-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. 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 ½ inch (1.27 cm).
- ▶ If the material finishes higher than the adjacent surface, use a diamond grinder to level surface as soon as 30 minutes following final set. Scarify or groove as necessary to insure adequate tire traction.
- ▶ If rain begins prior to final set, cover the surface with plastic sheeting for at least 30 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.



## APPLICATION *(continued from page 3)*

- For expansion joint nosings, ensure that the hardened repair material is not higher than the approach slab. Use a grinding tool to level the surface and to cut a 45° bevel at the edge of the joint no sooner than 30 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.

## CURING

- Once Phoscrete F3-HC achieves initial set (you can't press a nail into the center of the material), paint or spray-apply a thin coat of Phoscrete Endure™ to the exposed surface. This prevents evaporation during while the material cures, reducing drying shrinkage.
- When ENDURE is used, the surface of the repair may be slippery. broadcast sand, concrete dust, or baking soda to absorb any Endure remaining on the surface, sweep off, and ensure the road is safe for vehicular traffic.

## CLEANING

- In-between batches, clean tools with a water dampened towel, and wipe off excess water prior to contact with Phoscrete.
- When the job is completed, clean the 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 F3-HC with aggregate. Do not add sand and/or any type of cement.
- Do not mix partial units.
- Minimum application thickness: 0.5-inch (1.25 cm), 2-inches (5 cm) recommended (no maximum thickness limitation)
- Minimum ambient temperature: 35°F (2°C)
- When wet, PHOSCRETE F3-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.

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