



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

Large Bag Kit: [1] bag + [1] jug
Dry Mix: 50 lb. (22.5 kg)
Polyethylene -lined paper bag
F3-HC Activator: 106 fl. oz. (3.1 l)
LDPE 1-gallon jug
Yield: 5.1 bf, 0.43 ft³, 0.0121 m³
52 bags and jugs per full pallet.

Small Bag Kit: [1] bag + [1] jug
Dry Mix: 22 lb. (10 kg)
Polyethylene -lined paper bag
F3-HC Activator: 47 fl. oz. (1.4 l)
LDPE 1-gallon jug
Yield: 2.2 bf, 0.19 ft³, 0.0053 m³
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.*

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	20 min	27 min
	ASTM C403	Time of Setting by Penetration Resistance		18 min	24 min
Flow	ASTM C1437	Consistency (Flow %)	5 min	102%	
Density	ASTM C387	Density (Unit Weight) of Concrete		133.67 lb/ft ³	2178 kg/m ³
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	5000	34.5
			1 day	6400	44.1
			28 days	9000	62.1
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:	1 day	2800	19.3
			7 days	3000	20.7
	ASTM C1583	Direct Bond Strength by Pull Off	28 days	292	2.0
Tensile Strength	ASTM C496	Splitting Tensile Strength of Cylindrical Concrete Specimens	28 days	605	4.2
Modulus of Elasticity	ASTM C469	Static Modulus of Elasticity	28 days	4.3 E ⁺⁰⁶	3.0 E ⁺⁰⁴
Durability Properties					
Test	Specification	Description	Test	Test Results	
Free Shrinkage	ASTM C157	Length Change of Hardened Concrete (Std)	28 Days Wet Dry	+0.07%	-0.01%
Freeze Thaw	ASTM C666-A	Resistance of Concrete to Rapid Freezing and Thawing in a Saturated Condition (300 cycles)	Durability Factor	98.5%	
Scaling	ASTM C672	Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals (100 cycles) Results = Visual Material Loss lbs./ft ² (%)	NaCl	Visual 0	0.0 lbs/ft ²
Resistivity	AASHTO T358	Surface Resistivity (kΩ-cm)	28 days	56.8 kΩ-cm	
Chlorides	ASTM C1202	Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration (Coulombs)	28 days	610 C	
	AASHTO T260	Chloride Content (%)	28 days Acid Water	0.007%	0.006%
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.
- ▶ Cool Activator on ice to 40°F and/or use Slow-Set Admix in temperatures above 77°F (25°C) for additional working time.
- ▶ Warm Activator in hot water and/or mix longer when working in cold temperatures for faster set.
- ▶ Refer to [Phoscrete's Best Practices for Cold Temperature](#) and [Warm Temperature Guidelines](#) for details on mixing times and working with Phoscrete Admixtures (Fast-Set, Slow-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 a minimum of 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. *Note: 22 lb. Kits of F3-HC have light green labels and pair with ½-gallon jugs. 50 lb. Kits have green labels and pair with 1-gallon jugs.*
- ▶ 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 five [5] gallon bucket or larger for mixing kit (Phoscrete's 8 gallon heavy-duty mixing bucket is highly recommended). 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).
- ▶ First, empty the entire jug into a clean bucket. Next, add other Phoscrete admixtures (Fast-Set, Slow-Set, Fibers) as needed. Then quickly add Dry Mix into the bucket while slowly running the mixer.
- ▶ Mix with the drill at full speed for at least two [2] minutes, and until the material is fully wetted out and shows a uniform consistency. DO NOT UNDER MIX. Using a mixing paddle other than Phoscrete's urethane auger will require additional mixing time. In colder temperatures, mix longer: ADD one [1] minute additional mixing time for every 5°F (~3°C) COLDER than 73°F (23°C). Refer to [Phoscrete's Best Practices for Cold Temperature](#) for a mixing temperature guideline chart.

APPLICATION

- ▶ A batch of Phoscrete F3-HC must be placed and finished within 15 - 25 minutes from mixing, temperature dependent.
- ▶ 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).
- ▶ 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)*

- ▶ 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.
- ▶ When mixing multiple kits at once for large volume installations, use a pan mixer or a paddle-style mortar mixer.
- ▶ 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 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.
- ▶ If rain begins prior to final set, cover the surface with plastic sheeting for at least 30 minutes following initial set.

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)
- ▶ 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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