



## PHOSCRETE FORMULA 1-VO

### TECHNICAL DATA GUIDE

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

#### DESCRIPTION

PHOSCRETE® FORMULA 1-VO™ (F1-VO) is a two-part cementitious MPC (Magnesium-Phosphate-Cement) concrete repair material composed of magnesium oxide, aluminosilicates and aggregates (Dry Mix), that must be mixed with pre-measured F1-VO Activator. Phoscrete F1-VO is very rapid hardening with high-early strength gain. It is easy to apply by hand with a trowel and can be feather-finished. F1-VO stops corrosion of steel on contact and forms both a chemical and a mechanical bond to cured concrete and to itself. Phoscrete F1-VO allows fast completion of concrete repairs. F1-VO meets ASTM C 928, Type R3.

#### PROVEN APPLICATIONS

- ▶ Vertical and overhead: above grade and below grade concrete structures
- ▶ Rehabilitation of concrete bridge structural elements, including soffits, beams, caps, piers, and columns
- ▶ Rehabilitation of marine structures including seawalls, navigation locks, guide walls, reservoirs, dams, and discharge tunnels
- ▶ Rapid repair of new construction concrete's defects, notably pre-cast shapes
- ▶ Rapid repair of spalls on concrete pavements and floors
- ▶ Rapid repair of sidewalks, stairs, sills, and culverts
- ▶ Rapid repair of building facades, parking structures and tilt-up walls

#### ADVANTAGES

- ▶ Labor and time-saving - no sandblasting of steel bars, no anti-corrosion primer, no sacrificial anodes.
- ▶ Fast, easy, and accurate mixing in a bucket.  
Two pre-measured components: dry mix in a bag and liquid activator in a jug.
- ▶ Easy to apply: high-build, non-sag.
- ▶ Easy to finish using a trowel, screed, or sponge; can be feather-finished.
- ▶ High early and ultimate compressive, bond, flexural, and tensile strengths.
- ▶ Freeze-thaw 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.
- ▶ Does not out-gas after cure: accepts sealers and polymer coatings as soon as 30 minutes following initial set.
- ▶ Chemically stable: no added chlorides, resists chloride penetration.
- ▶ All temperature use –works fast even in sub-freezing temperatures. Cool F1-VO Activator in warm temperatures 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*  
F1-VO Activator: 96 fl. oz. (2.8 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-VO Activator: 42 fl. oz. (1.2 l)  
*LDPE ½-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.

**Small Pail Kit:** [1] bag + [1] jar  
Dry Mix: 11 lb. (5 kg) *paper bag*  
F1-VO Activator: 21 fl. oz. (0.6 l)  
*PET jar*  
**Yield:** 1.2 bf, 0.10 ft<sup>3</sup>, 0.0028 m<sup>3</sup>  
64 small 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 C403     | Time of Setting by Penetration Resistance  | Initial   Final   | 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            | 4500                     | 31.0                   |
|                       |               |  | 1 day             | 8500                     | 58.6                   |
|                       |               |  | 28 days           | 10000                    | 68.9                   |
| 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 | +0.03%                   | -0.03%                 |
| Freeze Thaw           | ASTM C666-A   | Resistance of Concrete to Rapid Freezing and Thawing in a Saturated Condition (300 cycles) | Durability Factor | 95.5%                    |                        |
| Chlorides             | ASTM C1202    | Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration (Coulombs)  | 28 days           | 83 C (negligible)        |                        |
|                       | AASHTO T260   | Chloride Content (%)   | 28 days           | .004%                    | .004%                  |

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.
- ▶ When saw-cutting or shot-blasting, remove surface dust and slurry with air or water (allow to dry prior to application).
- ▶ Surface must be frost-free, dry, and free of standing water. Gently apply heat (torch) to eliminate surface moisture.
- ▶ Concrete profile should reach minimum CSP (Concrete Surface Profile) of 6 per ICRI Guidelines.
- ▶ Remove loose scale (rust) from steel bars with a wire brush. Sandblasting is not required.
- ▶ Replace reinforcing bars according to instructions from the designer. Generally, bars that have 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, 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. Do not apply Primer to reinforcing steel.
- ▶ 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-VO at the placement site.
- ▶ Mix [1] jug of F1-VO Activator into [1] bag F1-VO Dry Mix. Match colored labels on bags and jugs to ensure proper mixing ratio. *Note: 22 lb. Kits of F1-VO have light purple labels and pair with ½-gallon jugs. 50 lb. Kits have purple labels and pair with 1-gallon jugs.*
- ▶ DO NOT MIX USING PARTIAL BAGS OR JUGS. *Note: F1-VO 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 Small Pail Kits, 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 a minimum of 45 seconds, and until the material is completely wetted out (no dry material remains) and begins to fold over on itself, showing a putty consistency. Do not under-mix or over-mix.

## HAND-PACK APPLICATION

- ▶ A batch of Phoscrete F1-VO must be placed and finished within 5 - 15 minutes after mixing, temperature dependent.
- ▶ Install immediately after mixing. Discard the remainder of the batch once the material begins to set up in the pail.
- ▶ Phoscrete F1-VO is a thixotropic material: vibration and tapping with a trowel increases flow.
- ▶ Scrub in a thin layer of F1-VO into the area to be repaired using 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 repair using margin trowels or a water-dampened stucco sponge. Phoscrete F1-VO can be feather-finished.
- ▶ Wipe F1-VO from trowels with a water-dampened cloth. Do not pour water on the repair.
- ▶ If rain begins prior to final set, protect the repair area with plastic sheeting for at least 30 minutes following initial set.



## CURING

- ▶ Once Phoscrete F1-VO 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.
- ▶ Phoscrete Endure absorbs quickly into Phoscrete F1-VO.

## 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 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-VO with aggregate. Do not add sand and/or any type of cement.
- ▶ Do not mix partial units.
- ▶ Minimum recommended thickness for partial depth repairs: ½ inch (1.27 cm). F1-VO can be feather finished. Note: no maximum thickness limitation with Phoscrete F1-VO
- ▶ Minimum ambient temperature: -5°F (-20°C)
- ▶ Do not use water when mixing, placing, or finishing PHOSCRETE F1-VO
- ▶ When wet, PHOSCRETE F1-VO cannot be placed in direct contact with galvanized steel (zinc). Apply Phoscrete Primer first.
- ▶ 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

Phoscrete Corporation (Phoscrete) warrants this product to be free from manufacturing defects and to meet the technical properties on the current Technical Data Guide, when used as directed within shelf life. Satisfactory results depend not only on quality products but also upon many factors beyond Phoscrete's control. PHOSCRETE MAKES NO OTHER WARRANTY OR GUARANTEE, EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO ITS PRODUCTS. The sole and exclusive remedy of Purchaser for any claim concerning this product, including but not limited to, claims alleging breach of warranty, negligence, strict liability or otherwise, is the replacement of product or refund of the purchase price, at the sole option of Phoscrete. Any claims concerning this product must be received in writing within one (1) year from the date of shipment and any claims not presented within that period are waived by Purchaser. PHOSCRETE WILL NOT BE RESPONSIBLE FOR ANY SPECIAL, INCIDENTAL, CONSEQUENTIAL (INCLUDING LOST PROFITS) OR PUNITIVE DAMAGES OF ANY KIND. Purchaser must determine the suitability of the products for the intended use and assumes all risks and liabilities in connection therewith. This information and all further technical advice are based on Phoscrete's present knowledge and experience. However, Phoscrete assumes no liability for providing such information and advice including the extent to which such information and advice may relate to existing third-party intellectual property rights, especially patent rights, nor shall any legal relationship be created by or arise from the provision of such information and advice. Phoscrete reserves the right to make changes according to technological progress or further developments. The Purchaser of the Product(s) must test the product(s) for suitability for the intended application and purpose before proceeding with a full application of the product(s). Performance of the product described herein should be verified by testing and carried out by qualified experts.

## HEALTH, SAFETY, AND ENVIRONMENTAL

Read, understand, and follow all Installation Instructions, Safety Data Sheets, and product label information for this product prior to use. The latest SDS can be obtained by visiting [phoscrete.com](http://phoscrete.com), emailing your request to [safety@phoscrete.com](mailto:safety@phoscrete.com), or calling +1 561-420-0595. Use only as directed. For Hazardous Materials [or Dangerous Goods] Incident Spill, Leak, Fire, Exposure, or Accident, Call CHEMTREC® 24 Hours 800-424-9300 / +1 703-527-3887. Contracted by Phoscrete, CCN 866520.