



PHOSCRETE® VO-ENDURE™ (Vertical/Overhead)

Very Rapid Hardening MALP (Magnesium Alumino Liquid Phosphate) mortar for hand-packed and trowel-applied concrete repairs. Provides long-term durability for cold weather applications.

DESCRIPTION

Phoscrete VO-ENDURE is a three-part cementitious concrete repair mortar composed of magnesium oxide, aluminosilicates, and reinforcing fibers (Dry Mix), a liquid phosphate activator (Liquid Activator), plus a liquid soy-methyl-ester polystyrene (ENDURE) admixture that is a concrete durability enhancer. Phoscrete VO-ENDURE is very rapid hardening with high early strength gain. It mixes to a putty consistency, is easy to apply by hand or trowel, and can be feather-finished. Phoscrete VO-ENDURE meets ASTM C 928, Type R3.

PROVEN APPLICATIONS

- ▶ Vertical and overhead: above grade and below grade concrete structures
- ▶ New construction concrete's defects, including pre-cast shapes
- ▶ Small spalls on concrete pavements and floors
- ▶ Bridge structural elements, such as beams, caps, piers, and columns
- ▶ Marine structures such as seawalls, navigation locks, guide walls, and discharge tunnels
- ▶ Sidewalks, stairs, sills, and culverts
- ▶ Building facades, parking garages and tilt-up walls

ADVANTAGES

- ▶ Labor and time-saving - no sandblasting of steel bars, no anti-corrosion primer, no sacrificial anodes, no curing.
- ▶ Easy and accurate mixing: three components, Dry Mix in a bag, Liquid Activator in a jug, and ENDURE in a pail. No water, pre-extended mix. self-consolidating, fast setting, easy clean up with water.
- ▶ Easy to apply: high-build, non-sag, easy clean-up with water.
- ▶ Easy to finish using a trowel or a stucco sponge: can be feather-finished.
- ▶ High compressive and bond strength for lasting repairs.
- ▶ Durable and hydrophobic: exceptional freeze-thaw and salt scaling resistance, even when exposed to MgCl₂ and CaCl₂.
- ▶ Fiber reinforced: high flexural strength and ductility
- ▶ Strong mechanical and chemical bond to clean cured concrete and to itself: no cold joints and no shrinkage cracking.
- ▶ 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.
- ▶ Environmentally friendly - no odor, no free silica.
- ▶ All temperature use – sets in temperatures cold as -5°F (-20°C)
-use Phoscrete Fast-Set/Slow-Set Admixture to manage setting/working time.

Packaging

Full Kit: [2] bags + [1] jug

Dry Mix bag: 30 lb. (13,6 kg) each polyethylene-lined paper bag

Liquid Activator jug:

10.4 lb (4,7 kg), by volume: 108 oz (3,2 l) HDPE plastic jug

Kit Yield: 0.5 ft³ (6 bf, 0,014 m³)

36 kits: per full pallet.

Small Pail: 13.5 lb. (6,1 kg)

HDPE pail contains Dry Mix paper bag and HDPE Liquid Activator jar.

Small Pail Yield: 1.0 bf

(144 in³, 0,0024 m³)

Endure Pail: 5 gallon (19 l)

Add 1.5% Endure by weight of dry mix. Use designated scoops (provided) per [Admixture Chart](#).

Mixing Ratio

Neat mix. Do not extend with sand or aggregate.

Wet-To-Dry Ratio: 17.33%

Mix Entire Small Pail: [1] jar + [1] bag + [3] scoops Endure

Mix Entire Full Kit: [2] jugs + [1] bag + [6] scoops Endure

Full Kit may be split: measure 54 oz (1.6 l) of Liquid Activator by volume for each 30 lb. bag. [3] scoops Endure.

Storage

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

Shelf Life

Dry Mix: 24 months

Liquid Activator: 12 months

Endure: 18 months

(when properly stored)

VOC Content

0 g/L: Less exempt solvents

Fresh Properties					
Test	Specification	Description	Time	Typical Results	
Set Time	ASTM C191	Time of Setting by Vicat Needles	lab temp supercooled [†]	Initial 5 min 9 min	Final 6 min 11 min
Density	ASTM C138	Density (Unit Weight) of Concrete		153 lb/ft ³	2450 kg/m ³
Air Content	ASTM C231	Air Content (Pressure Method)		8.3%	
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	7000	48
			1 day	9000	62
			28 days	11500	79
Flexural Strength	ASTM C78	Flexural Strength of Concrete Using Simple Beam with Third-Point Loading	1 day	600	4,1
			7 days	650	4,5
			28 days	750	5,2
Bond Strength	ASTM C882	Bond Strength by Slant Shear Phoscrete - Concrete	1 hour	2500	17
			7 days	3500	24
			28 days	4000	27,6
Tensile Strength	ASTM C496	Splitting Tensile Strength of Cylindrical Concrete Specimens	1 day	850	5,8
			28 days	900	6,2
Modulus of Elasticity	ASTM C469	Static Modulus of Elasticity [Chord Modulus] Poisson's Ratio of Concrete in Compression	28 days	4.24 E ⁺⁰⁶	2,92 E ⁺⁰⁴
				0.243	
Durability Properties					
Test	Specification	Description	Test	Typical Results	
Free Shrinkage	ASTM C157	Length of change of hardened Concrete	28 Days Wet Dry	0.006%	-0.085%
Freeze Thaw	ASTM C666-A	Resistance of Concrete to Rapid Freezing and Thawing in a Saturated Condition (300 cycles)	Durability Factor	106%	
Chlorides	ASTM C1202	Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration (Coulombs)	28 days	437 C (very low)	
	AASHTO T358	Cure Time Surface Resistivity Cl Penetrability Equivalent (kΩ-cm)	28 days: Air Cure	> 1000	Negligible
			28 days Wet Cure	123	Very Low

All results were obtained at Lab temp of 68°F (20°C) with both components, Dry Mix and Liquid Activator, stored at Lab temp.

† Supercooled Liquid Activator at 17°F (-8°C)

GENERAL INSTALLATION GUIDELINES

- › Refer to [Phoscrete MALP Full Installation Guide](#), for the most complete documentation on best installation practices.
- › Refer to [Phoscrete All 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), supercooling in a freezer at 10°F (-12°C). Liquid Activator's freezing point is -20°F (-29°C).
- › Refer to [Phoscrete Admixture Chart](#) for details on working with Phoscrete Admixtures (Endure, Fast-Set, Slow-Set)

SURFACE PREPARATION

- › Concrete must be sound and fully cured (28 days).
- › Remove loose, damaged, and contaminated concrete
- › Concrete profile should reach minimum CSP of 7-9 per ICRI Guidelines. Water-blasting is not recommended.
- › No saw-cutting of the edges of the repair is necessary. Phoscrete VO can be feather-finished.
- › Clean the surface of the area to be repaired from oil, grease, and other bond-inhibiting materials.
- › Surface must be frost-free, dry, and free of standing water. Use heat (torch) to eliminate surface moisture.
- › Remove loose scale (rust) from steel bars with a wire brush. Sandblasting is not required.

PRIMER COAT

For challenging applications, where maximum bond strength is required, use Phoscrete Primer. Using a cooled Liquid Activator, 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 HC full repair installation. If Phoscrete Primer is not available, Phoscrete VO can be used as an alternative, with cooled Liquid Activator.

MIXING

- › Mix Phoscrete VO-ENDURE at the placement site.
- › Full Kit mixing: [2] 30 lb. bags into [1] jug of Liquid Activator plus 12 ounces of Endure admixture (6 scoops).
- › Half Kit mixing: [1] bag into [½] jug - measure exactly 54 ounces of Liquid Activator plus 6 ounces of Endure admixture (3 scoops). The mix ratio is 17.33% Liquid Activator to Dry Mix. On-site Dry Mix measurement for partial unit mixing is NOT recommended. Inaccurate measurements will lead to poor material performance.
- › When mixing Full Kits, 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 (min. 7-amp, ½" chuck, side handle).
- › When mixing Small Pails, use a minimum 18v variable speed drill on the high torque setting. Phoscrete's small urethane auger is highly recommended.
- › When mixing Patch Kit tubs, use the provided stirrer and mix by hand until the material is completely wetted out.
- › Pour the Liquid Activator into a clean bucket or mortar mixer first. Next add the proper number of scoops of ENDURE Admix. Add Phoscrete Fast-or Slow-Set Admix, as needed. Then add Dry Mix into the bucket or mortar mixer, preferably 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 MALP must be mixed, placed, and finished within 5 - 15 minutes depending on ambient temperature.

APPLICATION

- › Install immediately after mixing. Discard material that begins to setup in the pail.
- › Using a trowel or with a gloved hand, scrub Phoscrete into the bottom and sides of the area to be repaired, being careful to fill all voids. Force the material against the edges of the repair.
- › Apply Phoscrete VO-ENDURE in lifts until the patch is completed. On overhead surfaces, the average thickness of a lift should not exceed 2 in. (5 cm). On vertical surfaces, lift thickness can be up to 3 in. (7.5 cm)
- › Phoscrete can be applied both fresh-on-fresh (or fresh-on-cured). Scarify the surface of the previous lift by scratching crisscross lines in the layer with a trowel prior to set for best adhesion bond. Wait at least one-minute in-between lifts, depending on ambient temperature and total depth of the repair.
- › To prevent Phoscrete from sticking to the trowel, wipe the trowel with a water-dampened glove or a cloth during application. Rinse nitrile-coated gloves in water and shake off excess when hand packing Phoscrete VO-ENDURE.

FINISHING

- › Use a margin trowel edge to saw away excess material until flush with surface.
- › Smooth finished surface with a clean trowel or a slightly dampened stucco sponge.
- › No curing is required. Phoscrete VO-ENDURE sets in approximately 15 minutes depending on ambient temperatures.
- › If the hardened material finishes higher than the adjacent surface, use a diamond grinder to level the repair surface within required tolerances as soon as 15 minutes after the final set.
- › If rain occurs prior to initial set, cover the surface with plastic sheeting for at least 15 minutes following initial set.

CLEANING

- › In-between batches, clean tools with water and wipe off excess water prior to contact with Phoscrete VO-ENDURE.
- › When the job is completed, clean tools and gloves with water. Wash hands with soap and water.

LIMITATIONS

- › Do not use any primer or admixtures other than those provided by Phoscrete.
- › Do not extend Phoscrete VO-ENDURE with aggregate. Do not add sand or any type of cement.
- › Do not mix partial units unless accurately pre-measured.
- › Minimum application thickness: none. Phoscrete VO-ENDURE can be feather-finished. However, for best results, 1 in. minimum thickness is recommended.
- › Maximum application thickness (per lift): 2 in. (5 cm) for overhead applications, 3 in. (7.5 cm) for vertical applications.
- › Minimum ambient temperature: -5°F (-20°C)
- › Do not use water when mixing, placing, or finishing Phoscrete VO-ENDURE
- › When wet, Phoscrete cannot be 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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