



PHOSCRETE® HC-ENDURE™ (Horizontal/Castable)

Very Rapid Hardening MALP (Magnesium Alumino Liquid Phosphate) concrete for horizontal and castable installation and repairs. Provides long-term durability for cold weather applications.

DESCRIPTION

PHOSCRETE HC-ENDURE is a three-part cementitious concrete repair material composed of magnesium oxide, aluminosilicates, aggregates, and reinforcing fibers (Dry Mix), a liquid phosphate activator (Liquid Activator), plus a liquid soy-methyl-ester polystyrene (PHOSCRETE ENDURE) admixture that is a concrete durability enhancer. PHOSCRETE HC-ENDURE is very rapid hardening, and gains strength suitable to vehicular traffic in less than one hour at a wide range of ambient temperatures. PHOSCRETE HC-ENDURE forms both a chemical and a mechanical bond to cured concrete and to itself. PHOSCRETE HC-ENDURE meets ASTM C 928, Type R3.

PROVEN APPLICATIONS

- ▶ Full depth and partial depth concrete repairs
- ▶ Interior and exterior concrete installation and repairs
- ▶ Horizontal surfaces: poured/castable applications
- ▶ Vertical and overhead surfaces: form and pour applications
- ▶ Bridge deck and parking deck repairs of reinforced concrete
- ▶ 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
- ▶ Expansion joint nosing construction and repairs

ADVANTAGES

- ▶ Labor and time saving material: 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 (with a designated scoop). No water, pre-extended mix. self-consolidating, easy clean up with water.
- ▶ Rapid return to service: exceeds 4,000 psi (28 MPa) compressive strength and 1,500 psi (10 MPa) bond strength 1 hour after placement at 68°F (20°C).
- ▶ 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 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, 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: [1] bag + [1] jug + [1] bottle

Dry Mix bag: 55 lb. (25 kg)
polyethylene-lined paper bag

Liquid Activator jug:

10.4 lb. (4,7 kg) HDPE plastic jug

Kit Yield: 0.45 ft³ (0,0127 m³)

48 kits per full pallet.

ENDURE Jug: 1 gallon (3,8 l)

Add 1% ENDURE by weight of dry mix. Use designated measuring cup (provided) per

[Admixture Chart](#).

ENDURE Bottle: 10 oz. (300 ml)

Use 1 ENDURE bottle per 50 lb.

Large Pail of Dry Mix.

Small Pail: 12.8 lb. (5,8 kg)

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

Small Pail Yield: 1.0 bf

(144 in³, 0,0024 m³)

Mixing Ratio

Pre-extended mix. Do not extend with sand or aggregate.

Activator-To-Dry Ratio: 18.75%

Empty Liquid Activator into a clean plastic mixing bucket. Add 1% ENDURE Admix. Then add the entire pail of dry mix and mix thoroughly.

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 8 min 15 min	Final 10 min 19 min
Slump	ASTM C143	Slump of Hydraulic-Cement Concrete	0 5 15 min supercooled [†]	9.5 in (24cm)	8.7 in (22cm) 6.2 in (16cm)
Density	ASTM C387	Density (Unit Weight) of Concrete		141 lb/ft ³	2259 kg/m ³
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	5000	34,4
			1 day	9000	62.1
			28 days	11500	79,3
Flexural Strength	ASTM C78	Flexural Strength of Concrete Using Simple Beam with Third-Point Loading	1 day	500	3,4
			28 days	700	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	1000	6,9
			28 days	1200	8,3
Modulus of Elasticity	ASTM C469	Static Modulus of Elasticity and Poisson's Ratio of Concrete in Compression	28 days	3.1E ⁺⁰⁶	21E ⁺⁰⁶
				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%
Restrained Shrinkage	ASTM C1581	Age at Cracking and Induced Tensile Stress Characteristics under Restrained Shrinkage	180 Days Deformation	Did Not Crack	-60 µstrain
Freeze Thaw	ASTM C666-A	Resistance of Concrete to Rapid Freezing and Thawing in a Saturated Condition (300 cycles)	Durability Factor	103%	
Scaling	ASTM C672	Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals (50 cycles) Results = Visual Material Loss lbs./ft ²	CaCl ₂	50 cycles: Visual = 0	50 cycles: 0.005 lbs/ft ² (0.01%)
Chlorides	ASTM C1202	Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration (Coulombs)	28 days	122 C (very low)	
	ASTM C1543	Penetration of Chloride Ion into Concrete by Ponding	90 days	10-20 mm	0.135%
			180 days	55-65 mm	0.117%
				10-20 mm	0.195%
180 days	55-65 mm	0.145%			
	Abrasion	California CT-550	Determining the Surface Abrasion Resistance of Concrete Specimens (mass loss)	24 hours	16 g 1.8%

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.
- › Repair area must not be less than 1-inch (2,5 cm) deep. >2-inch (>5 cm) 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.
- › 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.
- › 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. 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-ENDURE full repair installation. If Phoscrete Primer is not available, Phoscrete VO or HC can be used as an alternative, with cooled Liquid Activator.

MIXING

- › Mix PHOSCRETE HC-ENDURE at the placement site.
- › The mix ratio is 18.75% Liquid Activator to Dry Mix. On-site 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 multiple Full Kits at once, use a paddle-style mortar mixer for placing large quantities (>2 cy) of Phoscrete.
- › 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.
- › 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 three [3] Endure Admix scoops. Add Phoscrete Fast-or Slow-Set Admixture. 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 the batch if the material begins to setup in the pail or mixer.
- › Using a trowel or float, 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.
- › Place Phoscrete level to the adjacent concrete surface. Screed off excess.
- › Finish Phoscrete using clean concrete floats and trowels. Magnesium floats work best. Tap on surface with trowel to bring liquid to the surface for best finish. Clean Phoscrete from trowels with a water-dampened cloth. Do not pour water on repair. 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.

APPLICATION *(continued from page 3)*

- ▶ When multiple layers are applied, scarify the surface by scratching crisscross lines in the layer with a trowel prior to set for best adhesion. Phoscrete bonds to itself with no cold joints, whether wet or completely cured. If installing in lifts, do not apply a final layer thinner than 1-inch (2,5 cm).
- ▶ 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 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. Standard compression or silicone seals can be applied immediately after grinding. Refer to Phoscrete's [Expansion Joint Installation and Repair](#).

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 HC-ENDURE with aggregate. Do not add sand and/or any type of cement.
- ▶ Do not mix partial units unless accurately pre-measured.
- ▶ 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 HC-ENDURE
- ▶ When wet, PHOSCRETE HC-ENDURE 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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HEALTH, SAFETY, AND ENVIRONMENTAL

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