



PHOSCRETE FORMULA 3 [MKP Series]

INSTALLATION GUIDE

Installation Overview

Using Phoscrete concrete repair materials is easy, but for best results, it is important to follow the directions provided in this installation guide.

Visit phoscrete.com¹ for the latest versions of this installation guide and all technical documents. Contact our installation support team for help anytime.

What is MPC and MKP?

PHOSCRETE concrete materials are MPC (**M**agnesium **P**hosphate **C**ement) concretes. Unlike conventional concrete, MPC is not produced with Portland cement. PHOSCRETE FORMULA 3 concretes are the MKP version of MPC [**M**agnesium **P**otassium (**K**) **P**hosphate] concretes. Phoscrete's MKP concrete materials mix with water. MKP products include:

Short Name	Full Product Name	Application
F3E-HC	PHOSCRETE FORMULA 3E- HC	Horizontal and Castable
F3E-VO	PHOSCRETE FORMULA 3E-VO	Vertical and Overhead
F3E-SG	PHOSCRETE FORMULA 3E-SG	Shotcrete/Gunite
F3E-HF	PHOSCRETE FORMULA 3E-HF	Hot Floor Refractory
F3E-PR	PHOSCRETE FORMULA 3E PR	Primer

What is PHOSCRETE[®] ENDURE[™]?

PHOSCRETE concrete formulas labeled "3E" are packaged with the PHOSCRETE ENDURE[™] admixture, a bio-based, liquid soy-methyl-ester polystyrene (SME-PS) concrete durability enhancer. When mixed with ENDURE, PHOSCRETE FORMULA 3E concretes become hydrophobic, with exceptional freeze-thaw and salt scaling resistance properties that protect concrete 10+ years.

Properties of PHOSCRETE F3 Concretes

PHOSCRETE MKP Series concrete materials are rapid hardening, with high early strength gain. Phoscrete bonds strong – both chemically and mechanically - to conventional concrete substrates with no cold joints. Phoscrete also bonds super strong to itself, wet or cured, so repairs can be completed in segments or lifts with no cold joints. Phoscrete stops rust on contact, prevents chloride penetration, does not shrink, and resists cracking even under severe stress and/or environmental conditions.

At temperatures above 70°F (21°C), PHOSCRETE MKP Series concretes are traffic-ready in less than three [3] hours. F3 concretes typically achieve two [2] hour strengths of: compressive 3,000 psi (17 MPa), and bond (by slant/shear) 1,500 psi (10 MPa). Phoscrete's ultimate strengths are: compressive 10,000 psi (70 MPa), tensile 600 psi (4 MPa), and bond 3,000 psi (20 MPa).

For detailed technical data and performance characteristics, visit phoscrete.com.



Important things to know when working with PHOSCRETE FORMULA 3 [MKP Series]

- ▶ **Always pre-measure the water to the correct ratio** when mixing (Phoscrete provides water measure pitchers). Wet to Dry (WTD) mix ratio is 13% for PHOSCRETE FORMULA 3E-HC, SG, and HF. WTD is 13.5% for FORMULA 3E-VO.
- ▶ **Always add water first into an empty pail** when mixing. Next add Phoscrete Admixtures, including ENDURE. Then blend in the F3 Dry Mix powder.
- ▶ **Do NOT extend Phoscrete F3 with aggregates or sand.** Phoscrete is pre-extended.
- ▶ Phoscrete products are usually mixed one kit at a time in standard 5-gallon (or larger) buckets on installations requiring 2 pallets of material or less (96 kits).
- ▶ Use a heavy-duty drill designed for mixing concrete materials. Phoscrete recommends the Bosch GBM9-16 mixing drill or the Collomix Paddle Mixer XO. Ensure your generator and extension cords can supply sufficient power to the mixing drills.
- ▶ PHOSCRETE Urethane Mixing Augers (Small and Large) are excellent tools for fast and easy mixing of Phoscrete in a bucket. A special version of the auger is available for Collomix.
- ▶ On larger volume repairs, multiple kits of PHOSCRETE F3 can be mixed at once using a rubber tipped, paddle-type mortar mixer. The Multiquip WM70PH8 Whiteman mortar mixer with a HDPE plastic drum is recommended.
- ▶ For bulk sacks mixing and placement of large volume applications, use a silo-style continuous mortar mixer with metered water delivery.
- ▶ On smaller repairs, it is recommended to use Phoscrete Small Pails that have 2-gallon capacity and are available for PHOSCRETE F3 Products. Small Pail coverage is [1] board foot (.0833 cf or 12" x 12" x 1").
- ▶ Do not over-mix Phoscrete. Mix approximately one minute, until material is fully wetted out (no dry material remains) and shows uniform consistency. Then, place and finish immediately.
- ▶ Typical working time is 15-25 minutes (temperature dependent).
- ▶ **In warm temperatures, cool water in ice and/or use PHOSCRETE Slow-Set Admix for longer working time.** Refer to [Phoscrete Best Practices - Warm Temperature Concrete Repair Guidelines.](#)ⁱⁱ
- ▶ **Use PHOSCRETE Fast-Set Admix in cold temperatures** to accelerate set time. Refer to [Phoscrete Best Practices - Cold Temperature Concrete Repair Guidelines.](#)ⁱⁱⁱ
- ▶ Phoscrete F3 concretes prefer a dry substrate for strongest bond. Phoscrete F3 concretes can be installed on SSD (Saturated Surface Dry) substrates with reduced bond strength. Primer is not generally required.
- ▶ **Use PHOSCRETE Primer** (scrub coat + thin layer) for challenging applications where maximum bond strength is required.
- ▶ **Use PHOSCRETE ENDURE Admix** to improve freeze/thaw and salt-scaling durability. ENDURE dissolves polystyrene (foam board) so when forming Phoscrete with foam board, apply painters' (masking) tape on areas in direct contact with Phoscrete F3E products. Refer to [Phoscrete Best Practices - Endure Admix Usage Chart.](#)^{iv}
- ▶ Place Phoscrete using standard concrete tools (magnesium or plastic float, margin trowel).
- ▶ Phoscrete does not bond to plastic, polystyrene (foam board), or petroleum products. Always clean wet/dry slurry from saw cut demolition prior to application of F3 concrete products.
- ▶ Dampen gloves and wipe down tools with water (and shake off) for ease of placement and best finish, but do not pour water directly on wet Phoscrete.
- ▶ Clean tools, buckets, clothing, and boots with water. Clean hands with soap and water.



Phoscrete Installation Support

Phoscrete technical support personnel are available to travel on-site for application training and start of work. Virtual interactive training is also available, and the most up-to-date documentation and installation videos are published at phoscrete.com. Contractors with recent experience working with Phoscrete may receive a letter of qualification upon request.

Phoscrete Packaging

Phoscrete is manufactured and delivered on pallets in Kits (Large Dry Mix bags plus Endure Admix jugs), in *Small Pails* (containing small Dry Mix bags and pre-measured water + Endure Admix jars), and in *Patch Kit Tubs* (Dry Mix baggies and pre-measured water + Endure Admix jars), LTP (Less than Pallet) orders are packaged in shippable boxes. Refer to the Technical Data Guides found at phoscrete.com for weights and yields of specific products.

Shelf Life, Lot Numbers, Disposal, Health, Safety, and Environmental

When components are properly stored, the **shelf life of Phoscrete F3 Dry Mix is two [2] years**. The **shelf life of Phoscrete Endure is 18 months**. Store Dry Mix indoors, in low humidity. Store Endure in temperatures above 41°F (5°C).

14 Digit Phoscrete Lot Numbers [PNX-YYMMDD-LBB] are printed on every bag of Dry Mix, every jug of Liquid Activator, and every jug of Endure so be sure to check the lot numbers before installing. Here is how to decode a Phoscrete product batch number:

Dry Mix Bags and Small Pails: [PNX-YYMMDD-LBB] First digit "P" is for Phoscrete. "N" is FORMULA (1 or 3) X=Formula Variation [1=HC, 2=VO, etc.) "YYMMDD" is the year, month, day. "L" is the production location. The last 2 digits BB are the batch number. For example: "P32-221012-CO7" means the Phoscrete Formula 3-VO Dry Mix was bagged on Oct. 12, 2022, in Chicago, Batch 07.

Endure Jugs, Drums, or Totes: [PEX-YYMMDD-LBB] "PE" indicates Phoscrete Endure. "X" is Supplier Identifier, "YYMMDD." BB indicates for the tank number. For example: "PE3-210626-IO2" the ENDURE from supplier 3 was batched on June 26, 2021, in Iowa, tank 02.

Refer to [Phoscrete Best Practices - Activator Safe Disposal](#)^v at phoscrete.com for more information

Phoscrete STRONGLY advises against installing expired material, material improperly stored, or material opened or damaged. If you cannot avoid installing a questionable material, first mix a full kit (or pail) in your shop and observe mixing properties, time of set, and maximum temperature to verify the material is consistent with fresh product.

Disposal: Hardened Phoscrete concrete and PHOSCRETE Dry Mix powder can be disposed in any dumpster or landfill. Contact your Phoscrete representative for any questions regarding disposal of improperly stored or expired material. Always follow local environmental regulations when disposing of Phoscrete.

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, emailing your request to 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.

Personal Protection Equipment

When mixing, placing, and finishing Phoscrete, wear a particle filtration mask, nitrile-coated gloves, and eye protection. Have water and an eye wash station handy. Wash your hands with soap and water after working with Phoscrete.

Surface Preparation

- ▶ Follow [ICRI Guidelines 310.1R.vi](#) for preparing the surface prior to placing Phoscrete.
- ▶ Remove all loose and damaged concrete from the repair area to reach sound concrete. Remove concrete contaminated by asphalt, oils, or other bond-inhibiting materials. Remove previously installed non-cementitious repair materials.
- ▶ Use appropriate mechanical means to obtain an exposed aggregate surface profile correspondent to a Concrete Surface Profile (CSP) rate between 7 and 9 according to [ICRI Guidelines 310.2R.vii](#)
- ▶ Remove exposed rust scale with a wire brush or use an angle grinder with a wheel brush. Because Phoscrete naturally stops rust on contact, sandblasting to completely remove rust from rebar is not necessary. Remove concrete beneath and around rebar whenever possible.
- ▶ For overlays, insure at least a ½-inch (1.25 cm) depth throughout the repair. Thicker is always better for lasting horizontal repairs. For deck patches, two-inch [2"] (5 cm) minimum thickness is recommended. For expansion joint headers/nosings, four inches [4"] (10 cm) minimum thickness is recommended. For vertical and overhead installations, Phoscrete F3 no minimum depth is required; may be feather-finished. Encapsulate the rebar with Phoscrete for best results.
- ▶ Use an angle grinder with wheel brush to remove slurry from the substrate after wet/dry saw cutting, especially over vertical edges. Blow out any remaining dust.
- ▶ Use a torch and lightly "kiss" the substrate surface to burn off residual oils (after thorough mechanical removal), to dry damp concrete. Be careful because extended heat on conventional concrete can cause concrete's thermal degradation.



Deck Spall
Ideal Site Preparation



Vertical Column
Site Preparation



Use Foam Board to Establish
Control and Expansion Joints

- ▶ Use bond breaking materials such as polystyrene foam board to prevent Phoscrete from bonding across expansion joints. Mark form with a chalk line or tape to establish the level for finishing to substrate. Soak wooden forms with and screeds with water, or paint with urethane paint or release agent to prevent bonding to the form and for slip-forming cast repairs. Note that release agents prevent the Phoscrete-to-Phoscrete bond.



Primer Treatment

PHOSCRETE PRIMER is not generally required for Phoscrete repair installations. The use of Phoscrete Primer is advised for challenging conditions to achieve a stronger bond. Phoscrete Primer improves bond strength as much as 50% by reducing voids at the bond line interface. All Phoscrete repair materials (F1, F3, Primer) bond to itself, effectively creating a monolithic pour (no cold joints).

When using Primer, prepare the concrete substrate service as noted in the previous section. Then, (1) aggressively scrub freshly mixed Phoscrete Primer on the prepared substrate surface to fill all voids; (2) apply a thin ¼" layer of Phoscrete Primer over the scrub coat; (3) wait at least 15 minutes for the thin layer to set up; (4) mix, place, and the finish Phoscrete F1 repair material.

Phoscrete's chemical and mechanical bond to Portland cement concrete is very good without primer treatment. Use PHOSCRETE PRIMER for best results in challenging conditions. Phoscrete F1 or F3 can be used as an alternative to Phoscrete Primer, following the primer treatment described above.

Small Pail Mixing Instructions

Phoscrete Small Pails are 2-gallon pails containing a paper bag of Dry Mix and a jar of pre-measured water plus Endure. PHOSCRETE F3E-HC, F3E-VO and F3E-HF are available in Small Pails for small concrete repairs, or for a final, finishing mix to save a full bag. Phoscrete Primer is also packaged in Small Pails and smaller tubs. Refer to Technical Data Guides for coverage details.

- ▶ Remove all items from the small pail and empty the entire content of the jar into an empty pail.
- ▶ Add scoop(s) of Fast-Set or Slow-Set admixtures per [Phoscrete's Best Practices for Cold Temperature](#) and [Warm Temperature Guidelines](#).
- ▶ Empty entire contents of the Dry Mix bag into the pail.
- ▶ Insert the PHOSCRETE Small Mixing Paddle or similar into the pail. Slowly power up the 3/8" drive, min. 18V portable mixing drill and run on the highest torque setting for approximately one [1] minute, or until the material is completely wetted out (no dry material remains) and shows a uniform consistency. F1-HC and F1-HF mix to a flowable consistency.

Large Bag Bucket Mixing Instructions

- ▶ PHOSCRETE Dry Mix bags and Liquid Activator jugs are typically mixed as kits in [5] gallon (or larger) buckets. Refer to the Technical Data Guides for coverage details.
- ▶ When mixing more than 5 cubic feet (10+ kits of Phoscrete) for a single placement, it is recommended that [2] persons mix from [2] buckets each, with a runner steadily delivering freshly mixed material to the finishers.
Watch installation videos at phoscrete.com for mixing examples.
- ▶ Pre-measure chilled water using the provided pitcher and pour into bucket first.
- ▶ Using the provided beaker, measure then pour 8 ounces (245 ml) of Endure Admix from the provided gallon Endure Jug into the bucket Note F3E-VO requires twice as much Endure (2%) as F3E-HC/HF/PR (1%). Therefore, the volume measure of Endure is the same for all F3 products.
- ▶ Add scoop(s) of Fast-Set or Slow-Set admixtures per [Phoscrete's Best Practices for Cold Temperature](#) and [Warm Temperature Guidelines](#).
- ▶ Empty entire content of the Dry Mix bag into the bucket.

Large Bag Bucket Mixing Instructions (continued)

- ▶ Use Phoscrete's Large Urethane Mixing Augers with a dual or variable speed drill mixer (minimum 7-amp drill, ½" chuck with side handle), and mix approximately 1 minute, or until the material is completely wetted out (no dry material remains) and shows a uniform consistency. Do not overmix.
- ▶ Empty the bucket into prepared site and finish immediately.
- ▶ Clean bucket and mixing paddle with water only after the final pour.



Phoscrete recommends:
Bosch GBM9-16
9 Amp 5/8" Drill Mixer
with Side and D-Handles

Mortar Mixer Instructions (Mix Multiple Kits at Once)

- ▶ Position mortar mixer close to prepared site. Turn on mortar mixer.
- ▶ Pre-measure, then pour water into a rubber-tipped, paddle-style mortar mixer. A polyethylene drum is recommended for easy cleanup.
- ▶ Measure and add 1% ENDURE by weight using the provided beaker.
- ▶ Add Fast-Set, or Slow-Set admixtures as appropriate into the drum. Refer to [Phoscrete's Best Practices for Cold Temperature](#) and [Warm Temperature Guidelines](#) for admix measure.
- ▶ Break the requisite number of PHOSCRETE Dry Mix Bags over the mortar mixer and run paddles until the material is completely wetted out (no dry material remains) and shows a uniform consistency. Mix for a maximum of 3 minutes. Do not overmix.
- ▶ Stop the mixer and empty the contents directly into the prepared site.
- ▶ Return mixer to upright position and add the next batch of water, allowing the mixer to spin continuously to prevent material remaining in the drum from hardening. Add Endure, other Admixtures and then Dry Mix when ready for the next placement.
- ▶ Clean mixer with water after final pour.



Phoscrete recommends:
Whiteman WM70PH8
Polyethylene-Drum Mortar Mixers
for mixing up to 6 kits at a time.

Volume Mixer (Bulk Sacks)

- ▶ For large volume installations using bulk sacks and metered water, use a pan mixer like the Blastcrete MX-10 Mixer/Pump to automatically mix Phoscrete F3 and F3E delivered from bulk sacks.
- ▶ Contact Phoscrete Installation Support to discuss your specific application requirements.



Placing and Finishing Phoscrete

Plan on between 15-25 minutes working time (ambient and activator temperature dependent) to place and finish each batch of Phoscrete.

After mixing, empty into prepared site immediately. If a delay causes Phoscrete to begin setting up in the bucket/pail/mixer, discard the mix. When mixing in a mortar mixer, whenever possible, empty the material directly into the prepared site.

On inclines, start at the bottom of the slope and work your way up. On steep inclines, allow the material placed first to set to control the slump from subsequent pours. Remember, Phoscrete bonds to itself wet or cured with no cold joints and may be installed in lifts.



Expansion Joint Header Installation



Bridge Deck Spall Repair



Vertical Column Repair

Finish using standard concrete tools: magnesium floats, steel margin trowels, and screeds. Push material toward (not away from) edges for maximum bond. Wipe trowels and rinse gloves with water to prevent Phoscrete from sticking to the trowel or gloves for the smoothest finish. Be sure to shake off excess water. **DO NOT** pour water directly onto wet Phoscrete.

Blend multiple pours: Before the material has set, use vibration, or wiggle your trowel in the Phoscrete F3 mix to blend each new pour with the previous pour at the point of contact to get a nice finish.

Install in lifts: When installing Phoscrete F3 concretes greater than 4" thick, install Phoscrete in lifts, and leave 2" for the final lift to achieve the best finish (less is okay for VO). Scarify the surface of each lift to improve the mechanical bond. For best finish, wait for the material to begin cooling down before placing the final lift.

Use a **concrete pencil vibrator** to increase material flow in tight spaces, to blend multiple batches, and to reduce expansion in horizontal applications. Vibration reduces voids at the substrate interface and increases density by allowing air bubbles to escape.

Once the Phoscrete surface begins to harden, stop finishing. Initial and final set are imminent.



Grinding Phoscrete

For horizontal patches subject to heavy traffic, and for headers of expansion joints, Phoscrete will last longer when finished level to the concrete approach. When finished too high, constant vehicular impact will ultimately damage Phoscrete, same as any concrete. In addition, smoother rideability enhances user satisfaction and reduces truck impact that can cause damage to the structure.

As soon as 15 minutes following the final set of the last finishing pour, Phoscrete can be milled using a walk-behind grinder or an angle grinder. Grind before Phoscrete achieves ultimate strength if possible.

When installing Phoscrete for expansion joint headers, grind the exposed corner to a 45° angle prior to installing the joint seal. Refer to [Phoscrete Best Practices for Expansion Joint Installation](#).^{viii}

Sealing Phoscrete

Film-forming sealers, such as epoxies can be applied as soon as 15 minutes following the final set of the last pour of Phoscrete since Phoscrete does not outgas after cure.

In many instances, sealers can be applied 15 minutes following the final set of Phoscrete even in cold temperatures, thanks to the heat given off on set. Wait until the temperature of the installed Phoscrete material drops below 100°F (38°C) before applying any type of sealers.

Expansion Joints

Phoscrete Formula 1 is an excellent material for installation and repair of expansion joint headers. Because Phoscrete mixes, places, and finishes fast, joint seals can be installed as soon as 15 minutes following initial set of the final pour, allowing an expansion joint installation to be completed in one lane closure. Refer to [Phoscrete Best Practices for Expansion Joint Installation](#).

Opening Phoscrete to Traffic

Phoscrete achieves set when a nail can no longer be pressed into the corner of a Phoscrete repair area. Phoscrete F3 typically achieves final set less than five [5] minutes after working time is ended, is ready for heavy traffic less than three [3] hours following set of the final pour.

When ENDURE Admix is used, the surface of the repair may be slippery. After allowing one hour for the ENDURE admixture to penetrate, brush concrete dust from the demolition, or broadcast sand or baking soda to absorb any admixture remaining on the surface, and ensure the road is safe for vehicular traffic.

Ensure the Phoscrete repair is level to the adjacent concrete. Grind as noted above.

Prior to installing any type of sealers, and prior to leaving the job site, hammer-test the Phoscrete repair and listen for any hollow spots. Common reasons Phoscrete may not adequately bond to the concrete substrate include:

- ▶ Placed Phoscrete that already began to set in the bucket/mixer.
- ▶ Contaminated substrate (oils, dirt, moisture)
- ▶ Excessive voids in the bond interface.
- ▶ Phoscrete placed against unsound concrete substrate.

If you detect delamination in your Phoscrete repair, quickly remove the delaminated areas, and correct the cause (mechanically remove contaminated substrate), use PHOSCRETE Primer if appropriate, then mix, place and finish with additional Phoscrete. The fresh Phoscrete will bond strong to the adjacent Phoscrete that remains in place with no cold joints.



Phoscrete Repairs Last!

When properly installed, Phoscrete is fast, easy to use, and it lasts. The more often you use Phoscrete, the better experienced you become, and the more you will turn to Phoscrete to fix damaged concrete once and for good.

Phoscrete Technical Support

Visit our website for the latest installation guides and technical data.

Contact Phoscrete installation support anytime for guidance for your concrete repair projects:

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URLs for Referenced Hyperlinks in this Document

This document is published at phoscrete.com where you can click on the referenced hyperlinks in the document. If you have a printed version, full URLs are end-noted below.

ⁱ Refer to the latest published Phoscrete Technical and Safety Data Guides Phoscrete Quick Start Guides, Full Installation Guides, Best Practices, and Videos: <https://www.phoscrete.com/technical/>

ⁱⁱ <https://www.phoscrete.com/phoscrete-best-practices-warm-temperature-concrete-repair-guidelines/>

ⁱⁱⁱ <https://www.phoscrete.com/phoscrete-best-practices-cold-temperature-concrete-repair-guidelines/>

^{iv} <https://www.phoscrete.com/phoscrete-best-practices-endure-admix-usage-chart/>

^v <https://www.phoscrete.com/phoscrete-activator-safe-disposal/>

^{vi} <https://icri.ce21.com/item/3101r2008-english-pdf-guideline-surface-preparation-repair-deteriorated-concrete-resulting-reinforcing-steel-corrosion-342512>

^{vii} <https://icri.ce21.com/item/3102r2013-english-pdf-selecting-concrete-surface-preparation-sealers-coatings-polymer-overlays-concrete-repair-342521>

^{viii} <https://www.phoscrete.com/phoscrete-bridge-expansion-joint-installation-guidelines-1/>