



Temperature-Resilient Concrete Repairs and Overlays

PRODUCT KNOWLEDGE

Introduction

Phoscrete's Magnesium Phosphate Cement (MPC) materials offer versatile solutions for concrete repairs and overlays across the entire temperature spectrum. From freezing conditions to extreme heat, Phoscrete provides durable, long-lasting performance without compromising on workability or strength development. This document explains how Phoscrete's formulations enable successful installations in standard conditions as well as challenging environments, maintaining strong bonds and durability against freeze-thaw damage, salt scaling, fire resistance, and corrosion.

Phoscrete MPC concrete repairs are engineered to meet the demands of modern infrastructure, delivering rapid return to service regardless of ambient temperature. Whether you're facing normal weather conditions, sub-freezing temperatures, extreme heat, or even specialized high-temperature applications like jet blast areas, Phoscrete provides reliable solutions that extend the service life of concrete structures across all temperature ranges.

Standard Temperature Performance (50°F to 80°F / 10°C to 27°C)

In moderate temperatures, Phoscrete delivers optimal performance with minimal adjustments needed:

- **Phoscrete Formula 1 [MALP-Series]** provides approximately 10 minutes of working time at 70°F (21°C).
- **Phoscrete Formula 3 [MKP-Series]** offers an extended 20 minutes of working time at 70°F (21°C).
- Both formulations achieve traffic-ready strength rapidly—F1 typically in less than one hour, F3 in less than three hours.
- Easy mixing and finishing with no special techniques required.
- Strong bond to properly prepared concrete substrates without primers.
- Excellent workability and self-consolidating properties.



For temperatures at the lower end of this range (<50-60°F), warming F1 or F3 Activator jugs in hot water improves mixing and speeds set times. At the higher end (70-80°F+), chilling F1 or F3 Activator jugs on ice provides additional working time.

Advantages in Standard Conditions:

- Predictable set times for efficient crew scheduling
- Rapid strength development for minimal traffic disruption
- Easy installation with conventional concrete tools
- Superior durability compared to traditional repair materials

Cold Temperature Performance (Below 50°F / 10°C)

Phoscrete Formula 1 [MALP-Series] extends the season for concrete repairs, allowing contractors and maintenance crews to perform concrete work when temperatures drop below 50°F (10°C). With a freezing point of -10°F (-23°C), Phoscrete's liquid activator component enables installations even in sub-freezing temperatures without requiring external heating or special handling.

Advantages of Cold Temperature Application:

- **Durable winter repairs**—Phoscrete provides long-lasting concrete repairs in cold temperatures, eliminating the need for temporary fixes like asphalt patches that often fail and require rework after the thaw.
- **Rapid strength development**—Phoscrete F1 achieves 2500 psi compressive strength in just one hour at 40°F (4°C), without an accelerant.
- **No risk of freezing**—With no water in the pre-measured activator jugs, Phoscrete F1 can be mixed in sub-freezing temperatures.
- **Adjustable set times**—Fast-Set Admix can be added to achieve desired performance in extremely low temperatures.
- **Ideal for freezer floor repairs**—Sets rapidly even in sub-freezing environments, minimizing downtime.



Warm Temperature Performance (Above 80°F / 27°C)

Phoscrete delivers consistent performance even in high temperatures, making it ideal for hot weather concrete repairs. While conventional materials often require icing down water to maintain a workable temperature, Phoscrete's liquid activator comes in pre-measured jugs that can be easily chilled in coolers on-site.

Advantages of Warm Temperature Application:

- **Reliable performance across a wide range of temperatures**—Maintains workability and ease of use in both moderate and extreme temperatures.
- **Managed working time options**—Slow-Set Admix and cooling techniques can be used individually or together to provide additional working time as needed.
- **Flexible application methods**—Can be bucket mixed, pumped, or sprayed, providing adaptability for various repair sizes.
- **Strong bonding without primers**—Bonds to itself and to concrete substrates without needing primers, allowing for placement in lifts or sections with no cold joints.

High-Heat Applications (Thermal Resistance)

Phoscrete Formula 1-HF [Hot Floor] is specially designed for applications requiring resistance to extreme temperatures. This refractory concrete withstands sustained temperatures of 500°F (260°C) and intermittent temperatures up to 1832°F (1000°C), making it ideal for industrial floors, foundries, and airport runways exposed to jet blast.

Advantages for High-Heat Applications:

- **Extreme temperature resistance**—Withstands direct jet engine blast with temperatures reaching 1825°F (996°C).
- **Fire resistance**—Maintains structural integrity during fire exposure.
- **Proven durability**—Successfully endured 500 hot jet blast cycles in testing with only surface discoloration.ⁱ
- **Superior structural integrity**—Maintains bond strength and structural properties even after thermal cycling
- **Rapid installation**—Same quick-setting properties as standard Phoscrete F1, allowing for minimal downtime.
- **Thermal shock resistance**—Withstands rapid temperature changes without cracking or spalling.



Key Advantages Across All Temperature Ranges

Regardless of application temperature, all Phoscrete MPC formulations provide:

- **Low coefficient of thermal expansion**—Phoscrete products have a low coefficient of thermal expansion, promoting dimensional stability during temperature changes.ⁱⁱ
- **Exceptional bond strength**—Forms both chemical and mechanical bonds to properly prepared concrete substrates.
- **Self-bonding properties**—Bonds to itself with no cold joints, whether wet or completely cured.
- **Corrosion inhibition**—Phoscrete F1 stops rust and prevents further corrosion of embedded steel.
- **Enhanced corrosion protection**—When using F3 products, MALP-Based Rebar Coat can be applied to reinforcement for superior corrosion resistance.
- **Chemical stability**—Contains no added chlorides and resists chloride penetration.
- **Rapid return to service**—Achieves traffic-ready strength in hours, not days.
- **Dimensional stability**—Very low shrinkage, reducing the risk of cracking.
- **Coating compatibility**—Does not outgas after cure, accepting sealers and coatings within minutes of final set.
- **Vapor permeability**—Not a vapor barrier, allowing on-grade applications.

Conclusion & Additional Resources

Phoscrete's temperature-resilient capabilities make it the ideal choice for infrastructure projects in both conventional and challenging environments. Whether dealing with standard conditions, sub-freezing installations, high-temperature applications, or extreme heat resistance requirements, Phoscrete provides durable, long-lasting solutions. Phoscrete MPC formulas bond strongly to concrete substrates and withstand the harsh effects of freeze-thaw cycles, salt scaling, and corrosion, ensuring that repairs remain intact and effective even in the most demanding environments.

For detailed installation guidance, refer to Phoscrete's [Best Practices for Cold Temperatures](#) and Phoscrete's [Best Practices for Warm Temperatures](#) at phoscrete.com.

Reach out to our knowledgeable Phoscrete sales engineers to find out if our materials are the right fit for your next concrete project.

ⁱ The jet blast resistance testing referenced was conducted in 2010 by the Air Force Research Laboratory (AFRL) on Phoscrete 602-L, which is chemically equivalent to the current Phoscrete F1-HF product.

ⁱⁱ Coefficient of thermal expansion measurements were conducted according to ASTM C531 and TXDOT TEX-428-A test methods.