



INSTALLATION GUIDE

MIXING AND USING INSTRUCTIONS



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HOW TO USE THIS GUIDE***

This guide is divided into several sections. Depending upon how you intend to install these materials, only certain sections may apply to you. All the sections that are designated with a "****" at the beginning of the section are considered "Need To Read" sections and it is important that they be read by everyone regardless of your installation method.

Throughout this guide, we make several references to contacting Stellar Materials for help. As with any technical material, proper installation is the key to a successful application. If at any time or for any reason, you are not clear on any portion of this guide, please do not hesitate to contact us as follows:

Company Headquarters	European Headquarters
Stellar Materials Incorporated 7777 Glades Road Suite 200 Boca Raton FL 33434 USA	Stellar Materials International Nieuw Mathenesserstraat 39 - 41 Unit 1 B 3029 AV Rotterdam The Netherlands
Telephone: (561) 330-9300 Fax: (561) 330-9355	Telephone: +31 (10) 2460264 Fax: +31 847598123

Email: support@phoscrete.com

Website: www.phoscrete.com

Remember to *Phix it with PHOSCRETE!*TM

SPECIAL PHOSCRETE® FEATURES***

PHOSCRETE® CAN BE INSTALLED WITHOUT CURING

In many applications, Phoscrete's® unique technology allows for installation of the concrete with absolutely no cure-out. This can save significant time and money in downtime.

PHOSCRETE® SETS VERY QUICKLY

Phoscrete's® binder system initiates an exothermic reaction that causes the concrete to set very hard at ambient temperatures very quickly. It is excellent for casting shapes, since molds can be turned over several times per shift. Thus, the number of molds required can be greatly reduced, or the output per mold can be greatly increased. This feature also makes PHOSCRETE® ideal for fast installations and fast repairs. See the sections titled "WORKING TIMES" and "HOT AND COLD WEATHER PLACEMENT" for additional information.

PHOSCRETE® WILL BOND TO ITSELF AND OTHER CONCRETES

PHOSCRETE's® unique technology allows the concrete to bond to itself or other concretes with virtually no cold-joints. This is an important feature which makes PHOSCRETE® very easy to install, making its fast set-times a great advantage. PHOSCRETE® may be slip-formed into place, bonding one panel to the next, with the end result being an essentially monolithic lining. This feature makes it possible to make permanent repairs to existing concretes by simply placing PHOSCRETE® as a veneer. See the section titled "PREPARATION" for detailed procedures to assure a proper bond.

PHOSCRETE® RESISTS FREEZE-THAW

Phoscrete's® special binder system creates a bonded aggregate system that is very resistant to freeze-thaw conditions. Even when exposed to extreme thermal cycling, PHOSCRETE® exhibits far less cracking and deterioration than traditional concretes.

PRODUCT DESCRIPTION***

Phoscrete® Concretes are a two-part (dry formulation and Liquid Activator) concrete system. When added together, PHOSCRETE® products exhibit a fast exothermic set. PHOSCRETE® Concretes are available in many different formulations and may be applied using many techniques. There are different types of Phoscrete® products for different applications:

PHOSCRETE® CASTABLE

PHOSCRETE® Castable is the ideal concrete material for most flooring or Precast shape applications where forming and casting is possible

PHOSCRETE® GUNNABLE

PHOSCRETE® Gunnable is applied using slightly modified conventional gunning equipment, and should be used for high volume vertical or overhead applications.

PHOSCRETE® WINTER

PHOSCRETE® Winter is used in ambient temperatures below 40 deg. F. when a fast set time is desirable.

PHOSCRETE HOT FLOOR

PHOSCRETE Hot Floor is a castable concrete material for use in applications that will be exposed to intermittent heat, such as the outside perimeter of furnaces, or in high traffic areas exposed to molten metal spills or splashes.

PHOSCRETE V/O

PHOSCRETE V/O is a trowelable concrete material for use on vertical walls or overhead

PACKAGING

PHOSCRETE® products are supplied in pre-measured quantities called "Units," with each PHOSCRETE® Unit consisting of a pre-measured amount of dry formulation and a pre-measured amount of Liquid Activator. The dry component is supplied in plastic lined paper bags and the liquid component is supplied in either one-gallon jugs or 55-gallon drums. **SEE THE INDIVIDUAL TECHNICAL DATA SHEET FOR EACH PRODUCT TO DETERMINE ITS PROPER WET-TO-DRY RATIO AND FOR THE PROPER BAG-TO-JUG RATIO.**

ESTIMATING MATERIAL REQUIREMENTS

Each PHOSCRETE® product has a distinct density and therefore Unit volume. It is important to determine the amount of material required for the application, or equivalently the number of PHOSCRETE® Units required for the application. Refer to **Yield Per Unit** on the specific Technical Data Sheet to determine the number of Units required to fill a specific volume.

WORKING TIMES

In general, PHOSCRETE® products set very quickly and therefore must be mixed and placed quickly. The set is exothermic, and is affected by ambient conditions. Hotter temperatures will result in relatively shorter working times and colder temperatures will result in relatively longer working times. In addition, larger masses will set more quickly than smaller masses. For additional information, or for help in specifying the correct formulation for your application, please contact Stellar Materials Technical Support at 561.330.9300 or email support@phoscrete.com.

More specific information on working times may be found within each product section of this Installation Guide.

HOT AND COLD WEATHER PLACEMENT

The set time of PHOSCRETE® Concretes varies with the ambient temperature and the surface temperature of the area where the material is being placed. PHOSCRETE® Concretes set more quickly at hot temperatures and more slowly at cold temperatures. The optimum ambient installation range for PHOSCRETE® Castable Concretes is from 50°F to 80°F. (10°C to 25°C).

INSTALLATION AT AMBIENT TEMPERATURES BELOW OPTIMUM RANGE

PHOSCRETE® Castable Concretes may be placed at ambient temperatures as low as 20°F with no special precautions. The materials, however, will set much more slowly. The setting time can be decreased in applications below the recommended installation temperature "window" by keeping the pre-blended dry component and Liquid Activator in a heated area so that the materials are above 50°F (10°C) and by heating the area that the PHOSCRETE® Castable Concrete is to come in contact with to above 50°F (10°C).

INSTALLATION AT AMBIENT TEMPERATURES ABOVE OPTIMUM RANGE

Store all dry and liquid materials and all equipment in a cool place out of direct sunlight. PHOSCRETE Castable Concretes may be placed at ambient temperatures above the recommended installation temperature "window" by cooling the pre-blended dry component and Liquid Activator so that the materials are below 80°F. (25°C). The pre-blended dry component may be cooled by placing the bags of material in a refrigerated area, by packing dry ice around them, or storing them in an air-conditioned room. Another alternative is to locate a refrigerated truck on the job-site to store the material prior to use. This typically is affordable on larger jobs. If requested in advance, the material can usually be shipped directly to the job site in a refrigerated truck.

CLEAN-UP AFTER USE

For final cleaning of equipment, other tools, and areas exposed to the material after the completion of the application, use water before the material sets hard.

EQUIPMENT DESCRIPTION***

Within each product section of this guide, certain equipment is recommended for installing the material. Each section will list the particular equipment recommended and refer back to this section for the detailed description of each piece of equipment. The proper equipment can be critical for a quality installation. Please contact Stellar Materials Technical Support at 561.330.9300 or email support@phoscrete.com if you have any questions.

PERSONAL PROTECTION EQUIPMENT

Refer to the published MSDS at www.phoscrete.com for a complete listing of required PERSONAL PROTECTION EQUIPMENT when applying PHOSCRETE® products. If unable to access the guide, please contact Stellar Materials Technical Support at 561.330.9300.

PADDLE MIXER/PAN MIXER

A mixer is recommended for use when mixing 2 or more units for one job. Ideally the mixer should be positioned as close as possible to the pour site. The mixer should be clean and paddle scrapers should be in good condition and properly aligned to the drum. If using a Pan Mixer, the discharge doors MUST seal tightly to prevent leakage of the Liquid Activator, which is poured in first. If the seal is not tight enough to hold the liquid the following procedure will generally eliminate most leakage from the mixer:

1. Pour enough dry material into to the mixer to completely cover the discharge doors, but no more than half of dry material for any one batch to be mixed.
2. Pour all the liquid for the batch into the mixer and turn on the mixer.
3. Pour the remainder of the dry material into the mixer, mix for the appropriate amount of time, and discharge the mixer.
4. Repeat process until complete.

See "Mixing" section for mixer cleaning and neutralizing instructions. A mortar tray is recommended for keeping the area clean.

GUNNING MACHINE

ROTATING BOWL TYPE / ROTATING BARREL TYPE / FEED-WHEEL TYPE

The three different basic type of guns recommended are rotating bowl (Reed), rotating barrel (Piccola, Blastcrete, Allentown), and feed-wheel double chamber (Allentown). When applications necessitate a slower delivery of product from the nozzle we recommend a shallow pocket bowl with a minimum of 20 pockets or alternatively a barrel with minimum 12 pockets. For assistance in determining if your application will require a reduced delivery of product, please contact Stellar Materials technical support.

GUNNING NOZZLE ASSEMBLY

A pre-mixing nozzle assembly is highly recommended. For specifications, please contact Stellar Materials Technical Support at 561.330.9300 or email support@phoscrete.com.

AIR COMPRESSOR

The Air Compressor must meet or exceed the following specifications:

- A minimum of 600 CFM at 100 psi
- In-line water trap
- Independent dedicated air port for gunnite machine (not to be split with a manifold to run ANY other equipment).
- Independent dedicated air port for the Liquid Activator pump (not to be split with a manifold to run ANY other equipment).
- Dedicated air port for the additional air supply to the nozzle activator body.

If the compressor does not have two independent air ports, then the Liquid Activator pump must be run off of a completely separate compressor or plant air. Plant air is NOT to be used for supplying the gunnite machine.

LIQUID PUMP**ARO PUMP MODEL #66181A3-344C (MODIFIED WITH IN-LINE AIR GAUGE AND CUT-OFF VALVE BEHIND AIR GAUGE) OR EQUIVALENT**

Since Phoscrete® uses its own Liquid Activator and not water, a special pump system is required. The pump must be an air operated diaphragm pump capable of handling phosphoric acid with a concentration up to 77% and a specific gravity up to 1.6. All metal fittings in contact with the Liquid Activator must be high quality stainless steel or brass. The pump and hoses must be capable of operating at 125 psi with a minimum 3 to 1 safety factor. For longest lasting performance, VITON or TEFLON should be used for all O-rings, gaskets, diaphragms, and other non-metal fittings.

This pump may be purchased through Stellar Materials or directly from standard supply houses. Be sure to order two flange fittings for inlet and outlet with stainless steel or brass hardware and acid-resistant gaskets. These are not typically included from supply houses.

DRILL MOTOR AND BUCKET

When mixing individual units or partial units, a 1/2" drive drill motor operating at a minimum of 500 RPM and rated at 3/4 HP. or 7 amps with a Auger type mixer blade (available from Stellar Materials Inc.) or similar can be used with a 5-gallon clean plastic pail for a mixing container.

PLACING AND FINISHING TOOLS

Standard types of tools can be used to place and finish all Phoscrete® Castable Concretes. These tools would include power or non-powered screeds, trowels, floats, shovels, rakes, etc. A form vibrator is highly recommended for the best material placement and should be used whenever possible. If using a probe vibrator, a 2" diameter with a minimum of 12,000 VPM is recommended to efficiently move the material. As probe vibrators can generate substantial heat which can accelerate the hardening of Phoscrete® products, extra caution should be taken to avoid leaving "ratholes" in the material.

PARTIAL UNIT EQUIPMENT (IF NECESSARY)

Graduated measuring cylinder with capacity to one (1) gallon (3.785 L) and Scale with capacity to sixty (60) pounds (27.21 kg.)

PREPARATION***

Proper preparation of crews, equipment, forms and vessels is a key to successful Phoscrete® installations. Due to the relatively short working times, it is highly recommended that preparation procedures be followed explicitly. PHOSCRETE® Concretes bond to themselves when proper procedures are followed, so cold bonding or lamination is of little concern even if PHOSCRETE® has started to set. If the application is interrupted long enough that the material begins to harden, the surface to be bonded to should be scarified prior to applying PHOSCRETE® to it. If the installation is designed as multiple pours, all joints between pours should be keyed. All required equipment and materials should be staged as close to the casting site as possible before beginning the application.

Please review the published Material Safety Data Sheet for the specific product that you are using for a listing of necessary Personal Protection Equipment, as well as other precautions related to mixing and using PHOSCRETE® products.

FORM PREPARATION

It is necessary that any forming work or form preparation be performed prior to mixing PHOSCRETE® products. PHOSCRETE® materials will bond tenaciously to most non-plastic forming materials. Additionally, PHOSCRETE® will not shrink during setting. Coating steel forms with a paint primer and a light coat of vegetable oil works well for releasing the form when using PHOSCRETE® products. If painting the form is not practical, wrapping the form tightly with 4-mil polyethylene or contact paper and applying a light coat of oil or petroleum jelly will work well. Timber forms can be coated with vegetable oil or the appropriate PHOSCRETE Liquid Activator. Coating forms with greases with high sulfur content cannot be used as the sulfur reacts with the liquid activator.

NOTE: Be sure not to coat areas on forms that will be in contact with joint sections. Form release in these areas will not allow a proper bonding surface for the next subsequent pour.

PREPARATION OF EXISTING CONCRETE SURFACES

In order to assure a proper bond to an existing concrete surface, the following precautions must be taken:

- The surface being bonded to must be structurally sound and clean. When repairing existing concrete, make sure that the concrete is chipped back to solid, clean material. Remove all deteriorated concrete and dust including any concrete penetrated by foreign matter. If the concrete is not solid, it may then come apart from within, taking the PHOSCRETE® veneer with it. If the concrete is not clean and solid, the veneer may delaminate. Remember the bond is only as good as the surface it is bonding too.
- The surface being bonded to must not be wet. Due to the exothermic reaction of PHOSCRETE® products, form release products can become less viscous and runnier. When slip forming, make sure that no grease or form-release has accumulated on any surface that is to be bonded to. If it has, scarify it with a pneumatic or electric wire wheel brush prior to attempting to bond to it. If the surface is wet or oily, the joint will delaminate.

NOTE: We DO NOT recommend pre-dampening the existing CONCRETE surfaces with Liquid Activator prior to installation.

- The surface being bonded to must be rough. When slip-forming, make sure that the surface to be bonded to is not overly smooth. If it appears smooth, or "glassy," then scarify it with a pneumatic or electric wire wheel brush prior to attempting to bond to it. If the surface is too smooth, the strength of the chemical bond may be inhibited by a mechanical bond-plane or it may lack the necessary porosity for a good chemical bond, ultimately causing a lamination.

CASTABLE MATERIALS

RECOMMENDED EQUIPMENT

Each piece of equipment below is described in detail in the EQUIPMENT DESCRIPTION section near the beginning of this guide. The proper equipment can be critical for a quality installation. Please contact Stellar Materials Technical Support at 561.330.9300 or email support@phoscrete.com if you have any questions.

- PERSONAL PROTECTION EQUIPMENT
- PADDLE MIXER/pan mixer
- DRILL MOTOR AND BUCKET
- PLACING AND FINISHING TOOLS
- FORM VIBRATORS
- PROBE VIBRATORS
- PARTIAL UNIT EQUIPMENT (IF NECESSARY)

WORKING TIMES

PHOSCRETE® Castable Concretes must be mixed and placed quickly. Once an entire batch is added to the mixer, it takes less than thirty seconds for the material to wet completely. Based on an 80° Fahrenheit ambient temperature, most PHOSCRETE® Castable products will set within 30 minutes after mixing. Hotter temperatures will result in shorter working times and colder temperatures will result in longer working times. In addition, larger masses will set more quickly than smaller masses. Very thin layers may require external heat sources to set, especially in cooler ambient conditions.

MIXING

All mixing containers must be free of contaminants prior to using PHOSCRETE® products.

PHOSCRETE® Castable Concretes should be mixed in a paddle-type mixer. The paddle mixer should be clean and neutralized, and the paddle rubbers should be properly adjusted to the drum.

IMPORTANT: RENTAL MIXERS ARE MOST OFTEN USED FOR MIXING PORTLAND CEMENTS. EXTREME CARE MUST BE TAKEN WHEN USING A MIXER THAT WAS USED WITH PORTLAND-BASED PRODUCTS BECAUSE PHOSCRETE® PRODUCTS REACT ADVERSELY WITH PORTLAND-BASED PRODUCTS. THIS REACTION IS NOT A DANGEROUS REACTION, BUT WILL SERIOUSLY AFFECT THE PERFORMANCE OF THE PHOSCRETE®.

To clean mixer prior to use, pour one jug of PHOSCRETE Activator into the mixer and run the mixer for five to ten minutes until foaming stops. Empty mixer completely into a container and use the liquid for cleaning any other tools that will be used to handle and place PHOSCRETE®.

The following mixing instructions are simple, yet important. Please review them carefully noting the order of each step.

1. Turn on the mixer.
2. Pour enough pre-measured PHOSCRETE Activator into mixer or pail for the entire batch to be mixed.
3. Add the corresponding amount of pre-blended, pre-measured dry formulation into the mixer or pail.
4. After the last portion of dry formulation is added to the mixer, mix for approximately fifteen seconds, or until the PHOSCRETE® Concrete becomes completely wetted-out, then quickly discharge the mixer. **Mixing too long in the mixer will cause the material to begin to set, significantly decreasing the time available to properly place the material.**
5. Discharge the contents of the mixer and place the material (see Placing and Finishing instructions herein). When mixing multiple batches of PHOSCRETE® Castable Concretes, it is important to immediately load the mixer with the required amount of PHOSCRETE Liquid Activator for the next subsequent batch. This will prevent leftover material from the previous load from hardening in the mixer. If an application is temporarily delayed, let the mixer run with the PHOSCRETE Liquid Activator until the next load of dry mix is ready to be mixed.
6. Upon completion of the job, immediately pour a minimum of five gallons of water into the mixer to facilitate cleaning. **NEVER USE WATER IN THE MIX. WATER IN THE MIX CAN CAUSE CATASTROPHIC FAILURE, INCLUDING EXPLOSIVE SPALLING.**

DO NOT MIX LARGER BATCHES THAN CAN BE PLACED AND FINISHED WITHIN THE MATERIAL PLACEMENT TIME FOR THE PHOSCRETE® CONCRETE. FAILURE TO DO THIS CAN RESULT IN VOIDS OR AIR POCKETS CAUSING EARLY FAILURE. IF MIXING BATCHES LARGER THAN EIGHT (8) REGULAR UNITS, PLEASE CONTACT STELLAR MATERIALS TECHNICAL SUPPORT FOR SPECIAL INSTRUCTIONS AT 561.330.9300 or email support@phoscrete.com.

Individual units of Castable materials may be mixed one at a time in a five gallon pail utilizing a "JIFFLER" brand paddle mixer blade (Model 130) powered by a heavy duty drill motor (7 amp minimum). JIFFLER mixing blades may be ordered from Stellar or directly from Stiffler Handy Products at 317-898-5313.

PLACING AND FINISHING

When PHOSCRETE® Castable Concrete is completely wetted-out, immediately pour the material into the area to be cast. Vibration of the material is necessary to assure sound placement, free of voids and air pockets. A form vibrator is highly recommended for the best material placement and should be used whenever possible. If using a probe vibrator, a 2" diameter with a minimum of 12,000 VPM is recommended to efficiently move the material. As probe vibrators can generate substantial heat which can accelerate the hardening of PHOSCRETE® products, extra caution should be taken to avoid leaving "ratholes" in the material. When casting PHOSCRETE on Concrete surfaces as a repair, it is still recommended to ensure good contact between the surfaces by vibrating or tamping. Tools for mixing, placing, and finishing can be cleaned with Liquid Activator between batches.

TROWELABLE MATERIALS

RECOMMENDED EQUIPMENT

Each piece of equipment below is described in detail in the EQUIPMENT DESCRIPTION section near the beginning of this guide. The proper equipment can be critical for a quality installation. Please contact Stellar Materials Technical Support at 561.330.9300 or email support@phoscrete.com if you have any questions.

- PERSONAL PROTECTION EQUIPMENT
- PADDLE MIXER/PAN MIXER
- DRILL MOTOR AND BUCKET
- PLACING AND FINISHING TOOLS
- PARTIAL UNIT EQUIPMENT (IF NECESSARY)

WORKING TIMES

PHOSCRETE® Trowelable Concretes are formulated for longer working times than either the Castable or Gunnable products. Phoscrete® Trowelable products are typically mixed in single unit quantities.

MIXING, PLACING AND FINISHING

Certain PHOSCRETE® Concrete products may be troweled into place after mixing. Please follow the directions below carefully when troweling or hand packing any of these products.

1. When mixing partial units, dry mix the bag prior to weighing out the required amount of dry material.
2. When mixing partial units, agitate the entire jug prior to weighing out the liquid. Use the wet-to-dry ratios specified on the individual product data sheets. These percentages should be calculated as a percentage of the dry material. For instance, if the wet-to-dry ratio is 19%, then for every 10 lbs of dry mix, use 1.90 lbs of PHOSCRETE Liquid Activator.
3. Always mix the dry material into the Liquid Activator, never the reverse.
4. The material should be completely wetted-out within one minute after you begin mixing. If your mixer is not mixing the material at least this quickly, then use a Hobart-type mixer set on slow speed, or a heavy duty drill motor (at least 7 amps) with a Jiffly-type paddle blade.
5. If you need to mix the material to a wetter consistency for thinner sections, then use additional PHOSCRETE Liquid Activator. If you need to mix the material to a dryer consistency for thicker sections, then use less Liquid Activator. **NEVER USE WATER IN THE MIX. WATER IN THE MIX CAN CAUSE CATASTROPHIC FAILURE, INCLUDING EXPLOSIVE SPALLING.**
6. Do not mix more material at one time than can be placed within 15-20 minutes at 80°F. (If the ambient temperatures are higher, then the materials will have less working time.)
7. When troweling the materials, use a trowel with a large surface area for the best finish. When hand packing the materials, rubber gloves should be worn. To improve the appearance of the face of the material, wet the trowel or gloves slightly with the appropriate Liquid Activator when finishing the material. **NEVER USE WATER.**
8. When troweling or hand packing Phoscrete on horizontal surfaces as a repair to existing fired Concretes, it is recommended to ensure good contact between the surfaces by tamping.

GUNNABLE MATERIALS

RECOMMENDED EQUIPMENT

Each piece of equipment below is described in detail in the EQUIPMENT DESCRIPTION section near the beginning of this guide. The proper equipment can be critical for a quality installation. Please contact Stellar Materials Technical Support at 561.330.9300 or email support@phoscrete.com if you have any questions.

- PERSONAL PROTECTION EQUIPMENT
- GUNNING MACHINE
- GUNNING NOZZLE ASSEMBLY
- LIQUID PUMP
- AIR COMPRESSOR
- PADDLE MIXER
- PLACING AND FINISHING TOOLS
- SPARE PARTS
Replacement parts for nozzle.

WORKING TIMES

PHOSCRETE® Gunnable Concretes are formulated to set quickly on placement. Detailed instructions for gunning PHOSCRETE® products are detailed herein.

PLACING AND FINISHING

All mixing containers must be free of contaminants prior to using PHOSCRETE® products.

ON-SITE SERVICES

Prior to beginning the job, it should be confirmed that adequate services are available at the job-site for gunning PHOSCRETE® materials. These services include:

- Air Compressor (see Equipment Description Section)
- Adequate electrical supply
- A convenient area for equipment set-up and storage for dry material and liquid

COMMUNICATION

Walkie-talkies or headset telephones can provide direct contact between the nozzle man and the crew loading the gun. This can increase efficiency and quality significantly. Care should be taken in selecting communication equipment in that structural steel can cause interference.

EQUIPMENT START-UP AND TESTING

- Confirm that nozzle gate valve and air valve on the Liquid Activator pump are shut.
- Start air compressor and check air supply is minimum 100 psi.
- Place suction pipe/hose from the pump into the PHOSCRETE® Liquid Activator drum.
- Turn on air control lever to provide pressure to the liquid pump. Adjust pump pressure to 85 psi.
- Open air valve on pump to pressurize Activator feed line to nozzle.
- Open and set the additional air supply to approx. 40 psi to supply the Gunning nozzle body. This valve should be kept open throughout the gunning operation. This provides a better dispersion of the material and prevents the liquid activator from flowing back into the dry material hose.
- Open the Gunning Nozzle valve to ensure Liquid Activator is being supplied to the nozzle tip.
- Check all fittings and lines for leaks. This is important since the Liquid Activator can damage some finished surfaces. **DO NOT USE WATER IN THE MIX AS THIS CAN CAUSE EXPLOSIVE SPALLING ON HEAT UP RESULTING IN CATASTROPIC FAILURE OF THE MATERIAL.**

- Close the nozzle valve once the surge is started. The pump should stop. If it continues, then the nozzle gate valve was left open, there is a leak in the Liquid Activator line, or the pump is malfunctioning and needs to be replaced. The pump should be running at approximately 80-100 psi.
- Make sure that all functions of the Gunning machine are operating prior to placing any material in the hopper.
- If predampening, use PHOSCRETE Liquid Activator. Predampen in a paddle-type mortar mixer prior to introducing the material into the gunnite machine hopper. Liquid Activator should be sprinkled over the dry mix to reduce dusting. The amount of Liquid Activator required for predampening will vary depending on the ambient temperature and humidity. Normal predampening ratios are one (1) jug of the appropriate Liquid Activator to four (4) bags of the appropriate dry material. In higher ambient conditions, more Liquid Activator may be required for predampening to reduce dusting, but should not exceed one (1) jug of the appropriate Liquid Activator to three(3) bags of the appropriate dry material. Predampened material must be able to pass through a 3/8" mesh screen before entering the gunnite machine. If during predampening, excessive clumping is evident in the mix, then either too much Liquid Activator is being used and should be reduced until clumping disappears or the Liquid Activator is not being dispersed properly in the dry mix. It is recommended to order the correct number of Jugs of the appropriate Liquid Activator for predampening.
- Place dry (or predampened) material in hopper.
- Gunning may now begin.

GUNNING PROCEDURES

1. The nozzle man should be in position with personal protection items (as indicated in the Recommended Equipment section) and communications gear if necessary.
2. Open the additional air supply to the nozzle and ensure pressure is set @ approx. 40 psi.
3. Open the Valve on the gunning nozzle to supply activator to the nozzle tip.
4. Open the Gunning Machine Main Air valve that controls the air supply to the nozzle.
5. Turn on air to rotate the feedwheel or bowl that supplies material through hose.
6. Adjust liquid nozzle valve to obtain the proper wet-to-dry ratio. This valve is the nozzle man's adjustment. If the liquid level is too high, excessive slumping & liquid will be evident on the surface. If the liquid level is too low, excessive dust and high rebound will be evident. **DO NOT START THE INSTALLATION UNTIL PROPER CONSISTENCIES ARE ACHIEVED.**
7. Nozzle should be held approximately 3-4 feet from the substrate at all times. The position should be maintained whether gunning horizontally, vertically, or overhead. If this position is not maintained, rebound will increase, and yield will decrease.
8. The nozzle assembly should be moved in a circular motion until the desired thickness is achieved.
9. **WHEN STOPPING OR BREAKING FROM GUNNING, ALWAYS MAKE SURE THAT THE ENTIRE NOZZLE ASSEMBLY STAYS POINTED DOWNWARD FROM THE ACTIVATOR RING FORWARD TO PREVENT LIQUID ACTIVATOR FROM SEEPING BACK INTO DRY MATERIAL FEED HOSE.**
10. If gunning over existing Concretes, to confirm that a proper bond has been achieved, sound out the surface of PHOSCRETE® after gunning. Hollow sounds indicate an improper bond.

TROUBLESHOOTING

INSUFFICIENT ACTIVATOR AT NOZZLE.

- Air supply not connected
- Air hose is obstructed
- Pump has air lock
- Strainer not submerged in liquid
- Strainer is not clean
- Suction line has collapsed
- Liquid line is obstructed
- Liquid drum is empty
- Activator ring is not clean

If at any time, you experience any problems gunning PHOSCRETE® products, please contact Stellar Materials Technical Support at 561.330.9300 or email support@Phoscrete.com

INSUFFICIENT DRY (OR PREDAMPENED) MATERIAL AT NOZZLE.

- Air pressure is too low (material will clog in hose)
- A hose connection is split, loose, or leaking
- Air compressor output is less than 80 psi, or CFM output is too low

SHUT DOWN PROCEDURES

1. Turn off air to gunning machine feedwheel/bowl to stop dry material flow.
2. When dry material stops flowing, allow activator to run through the nozzle for approx 10 seconds to clean nozzle internals of any material debris then turn off nozzle valve to stop the Activator supply.
3. Crimp the hose on the special pre-dampening nozzle assembly and allow the air to build up in the line and carefully release quickly. Do this several times to purge the line of any DRY material. **EXTREME CAUTION SHOULD BE USED WHEN DOING THIS PROCEDURE TO AVOID ALLOWING THE HOSE TO KICK BACK AND INJURE THE OPERATOR.**
4. Turn off the Gunning machine Main air valve that controls the air supply to the nozzle. When laying down the nozzle assembly, **always make sure that the discharge end is pointing downward and is lower than the inlet.** The nozzle assembly should be placed in a location where it will not be damaged. It is advisable to place the nozzle into a drum of water.
5. The activator pump air valve should be turned off when shutting down. When stopping for the day, **purge out the pump and lines with water and clean nozzle assembly.**
6. When stopping the gunning operation for several hours, or at the end of the day, never leave dry material in the hopper. **Continue operating the machine until hopper is empty.** Leaving the hopper empty will allow the operator to visually inspect the machine for foreign objects prior to start-up. This will prevent unnecessary damage to the machine when resuming gunning operations.

FORM REMOVAL ***

Upon completion of placement, an exothermic reaction will begin and PHOSCRETE® will rapidly develop strength. Depending upon the particular product, the ambient temperature and the casting geometry, PHOSCRETE® will develop ample strength within approximately thirty minutes to one hour for the removal of the form.

Due to the exothermic reaction, the release agent on the form may thin and become less effective with time. Therefore, it is recommended that the forms be removed shortly after the material has developed sufficient strength. Otherwise, forms will be difficult to remove.

Typically, when the thinnest section of the application is hard enough so that it cannot be dented with trowel or similar tool, the material is hard enough to remove forms.

CURING ***

Once PHOSCRETE® is properly placed, an exothermic reaction will begin and typically take between one (1) and four (4) hours to complete, depending upon the volume of the Concrete installed. All PHOSCRETE products should be allowed to air dry for proper cure. Do not use any curing agents.

LARGE FLOOR OVERLAYS

Thoroughly mix PHOSCRETE prior to application in a 9 cu/ft paddle type mixer with a 12HP or larger motor. The paddle mixer must be clean and the paddles should be tight to the drum to insure proper disposal of the mix prior to subsequent batches.

Carefully follow the PREPARATION AND MIXING INSTRUCTIONS.

When placing the material (four (4) bags @ a time) the mixer should be placed as close to possible to the immediate work area. When the material is mixed and discharged from the mixer, it must be shoveled to a vibrating screed board so the material is constantly being moved. It is important to constantly "feed" material to the screed to insure the material will be properly placed before it is set. The following guidelines for placing the material should be followed:

1. When applying 1" of PHOSCRETE, mixing four (4) units at a time you will be able to screed approximately three (3) linear ft. using an 8ft. span.
2. When applying 2" of PHOSCRETE, mixing four (4) units at a time you will be able to screed approximately two (2) linear ft. using a 6ft. span.
3. When applying 3" of PHOSCRETE, mixing four (4) units at a time you will be able to screed approximately two (2) linear ft. using a 4ft. span

If you mix less than four (4) units at a time you should reduce your span proportionately.

HELPFUL HINTS

1. If you are going to pour on a sunny day over 80 degrees keep the dry and liquid in an area between 60 – 70F overnight. Do not allow material to sit in direct sunlight.
2. Pour early in the morning or evening hours out of the direct sun.
3. Make sure that your mixer is in good mechanical condition.

ADDITIONAL IMPORTANT INFORMATION***

MIXING PARTIAL UNITS

If mixing less than full units of any PHOSCRETE® Concrete, be sure to dry-mix the dry component and agitate the liquid before mixing any material, as the contents may have settled during shipping and some segregation may have occurred. The correct way to determine the amount of the pre-mixed dry formulation to that of the Liquid Activator is:

1. Determine the weight of the pre-mixed dry formulation required.
2. Refer to the appropriate Technical Data Sheet for the correct WET TO DRY RATIO.
3. Multiply the weight of the dry formulation by the WET TO DRY RATIO.
4. This number is the amount, by weight, of Liquid Activator required.

EXAMPLE: To combine 25 lbs of PHOSCRETE CASTABLE dry formulation with the correct amount of LIQUID ACTIVATOR, multiply the weight of the dry material by the WET TO DRY RATIO indicated for PHOSCRETE CASTABLE (18%): 25 lbs. x .18 = 4.5 lbs of Activator required.

MATERIAL STORAGE PRIOR TO USE

All PHOSCRETE® Castable Concretes are temperature sensitive materials. Always store the pre-blended dry component and the Liquid Activator in an area where direct heat from plant equipment or direct sunlight will not cause the material to become hot. Ideally, all PHOSCRETE® products should be stored in an area where the temperature is between 50°F and 80°F (10°C and 26.6°C).

MATERIAL STORAGE AND SHELF LIFE

Dry storage of the pre-blended dry component of Phoscrete® products is required. Store both the liquid and dry components in an area where the ambient temperature is between 32°F and 100°F (0°C and 37.7°C).

Stored properly, PHOSCRETE® products have a shelf life of one year:

HEALTH AND SAFETY PRECAUTIONS

Precautions should be taken when working with PHOSCRETE® Dry Mixes and Liquid Activators. Review the Material Safety Data Sheets for any product being used prior to application.

LIMITED WARRANTY

Stellar Materials Incorporated (“Stellar”) extends the following limited warranty for Phoscrete® Concretes only to its distributors, industrial commercial customers, and commercial customers who have had Stellar products installed by Stellar or installation agents approved by Stellar (each, a “User”).

1. LIMITED WARRANTY

Limited Warranty Period. All Phoscrete® Concretes (“products”) are manufactured to meet published physical properties within tolerances established by Stellar when the material is stored, mixed, placed, and cured according to Phoscrete® standards, and Stellar warrants all Phoscrete® Concretes to be free from defects for a period consistent with the shelf life of the material as described from time to time in this Installation Guide or until it is installed, whichever period shall expire first.

Limited Warranty Remedies. If, prior to expiration of the foregoing applicable limited warranty period, any of such products shall be proved to Stellar’s satisfaction to be defective or nonconforming, Stellar will repair or replace such defective product, F.O.B. Stellar’s plant or other destination designated by Stellar, or will refund or provide User with a credit in the amount of the purchase price paid therefor by User, at Stellar’s sole option. User’s exclusive remedy and Stellar’s sole obligation under this warranty shall be limited to such repair or replacement, F.O.B. Stellar’s plant or other destination designated by Stellar, or refund or credit by Stellar, and shall be conditioned upon Stellar’s receiving written notice of any defect within a reasonable period of time (but in no event more than sixty (60) days) after it was discovered or by reasonable care should have been discovered. **In no event shall Stellar’s liability for such defective or nonconforming products exceed the purchase price paid by User therefor.**

Exclusions. This warranty (i) does not cover shipping expenses to and from Stellar’s factory or other destination designated by Stellar for replacement of defective product or any tax, duty, custom, inspection or testing fee, or any other charge of any nature related thereto, nor does it cover the costs of removing defective product or reinstalling, or testing repaired or replaced product or finishing the reinstallation thereof; (ii) does not apply to, and shall be void with respect to, product not installed in accordance with installation instructions or requirements; product altered by a party other than Stellar or Stellar’s authorized service agents; product which has been rendered defective or nonconforming as a result of mixture with any defective or nonconforming materials of any party other than Stellar; product that was subjected to abuse, negligence, misuse, misapplication, accident, damages by circumstances beyond Stellar’s control, improper installation (if by others than Stellar), operation, maintenance or storage, or any use or service other than normal use or service; and (iii) does not apply to product not manufactured by or for Stellar. With respect to product not manufactured by Stellar, Stellar’s warranty obligations shall in all

respects conform and be limited to the warranty actually extended to Stellar by its suppliers, but in no event shall Stellar’s obligations be greater than those provided under Stellar’s limited warranty set forth herein.

THE FOREGOING LIMITED WARRANTIES ARE IN LIEU OF ALL OTHER EXPRESS AND IMPLIED WARRANTIES, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. NO EMPLOYEE, REPRESENTATIVE OR AGENT OF STELLAR (OTHER THAN AN OFFICER OF STELLAR) IS AUTHORIZED TO ALTER OR MODIFY ANY PROVISION OF THIS LIMITED WARRANTY OR TO MAKE ANY GUARANTEE, WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, ORALLY OR IN WRITING, WHICH IS CONTRARY TO THE FOREGOING. Any description of the product, whether in writing or made orally by Stellar or Stellar’s agents, or specifications, samples, models, bulletins, drawings, diagrams, engineering sheets or similar materials which may have been used in connection with any promotional materials or otherwise used in selling products to, or creating purchase orders for, User or for any agent acting on behalf of User (other than Stellar) are for the sole purpose of identifying the product and shall not be construed as an express warranty or to modify this limited warranty in any manner whatsoever. Any suggestions by Stellar or Stellar’s agents regarding use, application or suitability of the product shall not be construed as an express warranty or to modify this limited warranty in any manner unless confirmed in writing by an authorized officer of Stellar.

2. LIMITATIONS OF LIABILITY; CONSEQUENTIAL DAMAGES

Improper Use Disclaimer. Product sold by Stellar is not intended for use (i) in connection with any nuclear facility or activity, (ii) in connection with any material not specifically **Improper Use Disclaimer.** Product sold by Stellar is not intended for use (i) in connection with any nuclear facility or activity, (ii) in connection with any material not specifically approved in the Installation Guide, or (iii) in any manner or use otherwise contrary to the Installation Guide. If so used, Stellar disclaims all liability for any nuclear damage, other damage, injury or contamination, and User shall indemnify and hold Stellar, and its officers, agents, employees, successors, assigns and customers, harmless from and against any and all damages, liability, claims, losses or expenses of whatever form or nature (including attorneys’ fees, court costs, out-of-pocket expenses and other costs of defending any action) that they or any of them may sustain or incur, whether as a result of breach of contract, warranty, tort (including negligence) or otherwise, by reason of such use.

Consequential Damage Disclaimer. Stellar's liability with respect to product proved to its satisfaction to be defective or nonconforming within the limited warranty period, and for which no other exclusions or limitations set forth in this limited warranty are applicable, shall be limited to replacement or refund as provided in this limited warranty, and in no event shall Stellar's liability exceed the purchase price of the product involved. Stellar shall not be subject to any other obligations or liabilities, whether arising out of breach of contract, warranty, tort (including negligence) or other theories of law, with respect to product sold or services rendered by Stellar, or any undertakings, acts or omissions relating thereto. Without limiting the generality of the foregoing, Stellar specifically disclaims any liability for property or personal injury damages, penalties, special or punitive damages, damages for lost profits or revenues, loss of use of product, cost of capital, cost of substitute products, facilities or services, construction or other delays, downtime, shutdown, or slowdown costs, or for any other types of economic loss, and for claims of User's customers, agents, principals, partners, or other affiliated parties or affected third parties (all of the foregoing, "Affected Parties") for any such damages.

EVEN IF THE REPLACEMENT REMEDY SHALL BE DEEMED TO HAVE FAILED OF ITS ESSENTIAL PURPOSE UNDER SECTION 2-719 OF THE UNIFORM COMMERCIAL CODE, STELLAR SHALL HAVE NO LIABILITY TO USER FOR CONSEQUENTIAL DAMAGES, SUCH AS LOST PROFITS, LOST REVENUE, DAMAGE TO OTHER PRODUCT, OR LIABILITY OR INJURY TO USER, ANY AFFECTED PARTY, OR ANY OTHER THIRD PARTY. STELLAR SHALL NOT BE LIABLE FOR AND DISCLAIMS ALL CONSEQUENTIAL, INCIDENTAL AND CONTINGENT DAMAGES WHATSOEVER.

3. INDEMNIFICATION BY USER

By use of products manufactured by or for Stellar, User agrees to indemnify, hold harmless, and defend Stellar, and Stellar's officers, agents, employees, successors, assigns and customers, from and against any and all damages, liability, claims, losses and expenses of whatever form or nature (including attorneys' fees, court costs, out-of-pocket expenses and other costs of defending any action) arising out of or resulting in any way from claims by User, any Affected Party, or any other third parties against Stellar alleging a breach of contract or warranty by Stellar, to the extent that such damages, liability, claims, losses and expenses may be payable by Stellar to User pursuant to and as limited by Stellar's limited warranty obligations as contained in this limited warranty, so as to

effectively limit Stellar's obligations to Affected Parties or other third parties to those set forth in this limited warranty.

4. PATENT INDEMNIFICATION

Stellar will, at its own expense, defend or settle any suits that may be instituted against User for alleged infringement by the product of any United States patent, provided that (a) such alleged infringements consist of the use of the product for any of the purposes for which such product was sold, (b) User shall have made all payments for such product then due hereunder, (c) User shall give Stellar immediate notice in writing of any such suit and transmit to Stellar immediately upon receipt all processes and papers served upon User, and (d) User shall permit Stellar through its counsel, either in the name of User or in the name of Stellar, to defend such suit(s) and give all needed information, assistance and authority to enable Stellar to do so.

In case of a final award of damages in any such suit, Stellar will pay such award but will not be responsible for any compromise or settlement made without its written consent. In case the product itself is in such suit held to infringe any valid patent issued in the United States and its use enjoined, or in the event of a settlement or compromise approved by Stellar that shall preclude future use of the product sold to User by Stellar, Stellar shall, at its own expense and at its sole option, either (a) procure rights to continue using such product, (b) modify the product to render it non-infringing, (c) replace the product with non-infringing product, or (d) refund the purchase price paid by User for the product after return of the product to Stellar. Notwithstanding the foregoing, Stellar shall not be held responsible for infringements of combination or process patents covering the use of product in combination with other goods or materials not furnished by Stellar.

The foregoing states the entire liability of Stellar for patent infringement, and **in no event shall Stellar be liable for consequential or incidental damages attributable to an infringement**, nor shall Stellar be liable for infringement based on the use of the product for a purpose other than that for which sold by Stellar. As to any product furnished by Stellar to User manufactured in accordance with designs proposed or furnished by User or any claim of contributory infringement resulting from the use or resale by User of product sold hereunder, User shall indemnify Stellar for any award made against Stellar or settlement by Stellar for any patent, trademark or copyright infringements, including attorneys' fees, court costs, out-of-pocket expenses and other costs of defending any action.

TECHNICAL SUPPORT

PHOSCRETE's® technical support staff is available to provide technical assistance for pre-job planning at 561.330.9300 weekdays from 9am to 5pm Eastern Standard Time, or at support@phoscrete.com. Updated technical data and contact information is also available on the Internet at www.phoscrete.com.

INSTRUCTIONS FOR PREPARING PHOSCRETE FOR LABORATORY TESTING

INTRODUCTION

The PHOSCRETE binder system is very unique, and certain special procedures are necessary when mixing PHOSCRETE concretes. Most of these procedures differ only slightly from those used when mixing traditional concrete products.

Unless otherwise indicated, ASTM procedures are to be strictly followed. Where variations from ASTM procedures are indicated, they are considered necessary and appropriate for the unique characteristics of the PHOSCRETE binder system.

In order to fully understand these mixing and placing instructions, the Installation Guide should be read in its entirety. Some of the terminology herein is written with the assumption that the reader has done so. Be sure to read this entire procedure before beginning.

PHOSCRETE's® technical support staff is available to provide assistance for laboratory testing at 561.330.9300 weekdays from 9am to 5pm Eastern Standard Time, or at support@phoscrete.com.

MIXING PROPORTIONS

PHOSCRETE® products are packaged to be mixed in full "unit" quantities. See the products associated Technical Data Sheet for details.

Since most laboratory testing will require less than full unit quantities, it will likely be necessary to weigh out the appropriate amount of dry material and the corresponding amount of Liquid Activator.

The amount of dry material to be used should be enough to fill approximately 40% of the mixing bowl.

Before weighing out a portion of the dry material, it is necessary to dry mix the entire bag as packaged to compensate for any intra-bag settling or segregation which may have occurred in shipping.

In order to determine the necessary amount of liquid required for the dry material to be mixed, call Stellar Materials Incorporated at 561.330.9300 with the lot number stamped on the bottom of the bag and request the "wet-to-dry ratio" for that particular lot.

These percentages should be calculated as a percentage of the dry material. For instance, if the wet-to-dry ratio is 12%, then for every 10 lbs of dry mix, use 1.20 lbs of Liquid Activator.

NOTE: PHOSCRETE Liquid Activators are HEAVIER THAN WATER and must be measured by weight and NOT BY VOLUME.

Before weighing out a portion of the liquid material, it is necessary to agitate the entire jug thoroughly to compensate for any intra-jug settling.

FORMS AND MOLDS

Phoscret materials bond tenaciously to most inorganic substrates. Molds must be **PLASTIC** and completely clean and smooth to achieve proper results. **NO FORM RELEASE SHOULD BE USED.** If you have problems releasing the materials from the molds, the plastic molds should be replaced with new molds. If you need new molds, call Stellar at 561.330.9300.

MATERIAL MIXING

Once the dry and liquid components are properly proportioned, and the molds are properly prepared, the material may be mixed.

For all PHOSCRETE® materials, a Hobart-type lab mixer should be used on low speed, and the materials should be mixed at ambient conditions of 70-80 degrees Fahrenheit and 40-60% relative humidity.

The following steps should be followed exactly in the order indicated. Read the entire procedure before beginning.

1. Pour all the liquid to be mixed into the mixer bowl.
2. Pour all the dry material into the liquid in the mixer bowl.
3. Immediately mount the mixer bowl onto the mixer.
4. Immediately connect a **stainless steel** mixing blade to the mixer.
5. Immediately turn on the mixer at low speed. Let the mixer run until the material "folds."

When mixing PHOSCRETE® products, this folding should occur within sixty seconds.

MATERIAL PLACEMENT

Once the material is mixed properly, it should be immediately placed into the molds or forms per ASTM procedures. Do not cover the samples. Once completely placed in the molds, do not move the samples until they are ready to be removed.

REMOVAL FROM MOLDS

PHOSCRETE® materials should be allowed to set for a minimum of 24 hours prior to removal from molds.

SAMPLE PREPARATION

Test samples must **never** be wet-cut green but **must be fired** prior to wet cutting to obtain test samples. Sample pieces should then be dried to 230 F for five hours before testing.

FIRING THE MATERIAL

Follow ASTM firing procedures.



PHOSCRETE® INSTALLATION CHECKLIST

MIXER CONDITION

- Is the mixer located as close to the casting site as possible?
- Is a mortar box required on site?
- Has the mixer been cleaned properly and neutralized?
- Are the rubber paddles properly adjusted to the drum?
- Has the fuel/oil and/or power supply to the mixer been checked?
- Has the mixer been tested to make sure that it runs properly?

OTHER EQUIPMENT

See published MSDS at www.phoscrete.com for a complete listing of required personal protection when applying PHOSCRETE® products.

Have vibrators been checked for good working condition?

NOTE: If using a probe vibrator, a 2" diameter with a minimum of 12,000 VPM is recommended to efficiently move the material. As probe vibrators can generate substantial heat which can accelerate the hardening of PHOSCRETE® products, extra caution should be taken to avoid leaving "ratholes" in the material.

Is the vibrator(s) secured to the form and hooked up to the power/pneumatic supply?

Are all other required tools and equipment on site and operational?

- Dust Masks
- Safety Goggles
- Gloves
- Wheelbarrows / Troughs
- Clock with second hand
- Hammer
- Shovels
- Trowels
- Wrench (to remove vibrator)

