



### Safety and Health

Review the Safety Data Sheet (SDS) before using this product. The SDS contains important information concerning potential health hazards and protective measures for these hazards. Contact your supervisor or safety director to obtain a copy.

### Storage Requirements

- For best performance, store the product in a dry location at temperatures between 60°F and 80°F.
- HWI packages its insulating castables in poly-lined paper bags or super sacks protected with plastic wrap to ensure dry product delivery. This packaging is not intended for outdoor storage. If no dry storage is available, contact your HWI sales and technical representative for alternate solutions.
- Always store insulating castables on a dry flooring surface to prevent ground moisture from condensing into the package.
- Avoid storage in direct sunlight to prevent the packaging from deteriorating over time.
- Ensure that your inventory is rotated on a regular basis. Insulating castables have an average shelf life of 6 to 12 months. Refer to the product data sheet for specific shelf life recommendations. If product usability is questionable due to age, consult your HWI sales and technical representative.
- Compaction during shipping and storage can cause soft lumps to form in the material. This is not detrimental to product performance if the lumps can easily be broken by hand.
- If the material becomes damp during shipping and storage, a partial reaction of the binders can occur causing hard lumps to form. If the lumps cannot easily be broken by hand, do not use the product without first consulting your HWI sales and technical representative.

### Form and Backup Requirements

- Ensure that all casting forms are stout and watertight.
- Waterproof all porous forms, such as wood, and all porous backup linings before casting. Porous surfaces can reduce product properties and flow, resulting in a substandard installation.
- If installing over existing refractory, remove all loose material, debris, or contaminants prior to installation.
- Remove wood forms prior to dryout and heatup. Allowing wood forms to catch on fire can cause localized overheating and possible spalling of the refractory.

### Installation Equipment Requirements (For Casting)

- The product can be mixed in a drum, paddle, or other concrete type mixer. HWI recommends high-intensity paddle mixers for best results. The use of low-intensity, poorly maintained mixing equipment or inadequate mixing times can result in a mix that appears too dry, prompting the operator to add an excessive amount of water.
- Mixing time will vary from mixer to mixer; a mixing time of 1 to 3 minutes is typically suggested. To ensure short mix times, add 70-80% of water prior to adding the dry mix to the mixer.
- Over-mixing can cause the aggregate in the product to break down, making the material finer than intended and reducing its insulating value. **Never mix for more than 3 minutes unless otherwise stated on Product Data Sheet.**
- Clean all mixing and handling equipment prior to use. Residual material in the mixer may affect the set of the product.

### Installation Equipment Requirements (For Gunning)

- HWI gunning castables are designed to be installed using most commercial gunning equipment.
- Always check with your equipment manufacturer or contact your HWI sales and technical representative to determine equipment suitability and proper setup for a specific product.
- Most products can be gunned with or without predampening. When applicable, predampening can lower rebound and improve material properties. Refer to the product data sheet or contact your HWI sales and technical representative for specific information on predampening.
- Clean all gunning and handling equipment prior to use. Residual material in the gunning and handling equipment may affect the set or properties of the product.

## Installation Guidelines

### Environmental Conditions

- For best results, ensure that the temperature of the product is between 60°F and 80°F prior to mixing. Temperature extremes affect working time, final set time, and final product quality.
- For hot weather installations, the mixing water may be cooled to extend working time. **In extreme hot weather conditions, add 70-80% water to the mixer prior to adding dry mix to allow for shorter mixing times.**

### Water Quality

For best results, use drinkable water with a pH of 6 to 7.5 and a temperature of 60°F to 80°F.

### Water Addition (For Casting)

- Accurate water measurement is critical to achieve proper installation and optimum product properties. Refer to the product data sheet for water specifications.
- Mixing time will vary from mixer to mixer; a mixing time of 1 to 3 minutes is typically suggested. To ensure short mix times, add 70-80% of water prior to adding the dry mix to the mixer.
- Water must be measured by weight or by volume.
- The water requirements for insulating castables vary. The information given on the product data sheet is a target value. Mix the first batch at the target value, then adjust the amount of water in subsequent batches based on the required flow for the installation.
- Varying the amount of water more than 3% above or below the target value shown on the product data sheet is not recommended without consulting your HWI sales and technical representative.

### Water Addition (For Gunning)

#### Predampening

- Refer to the product data sheet for product predampening suitability and proper water requirements.
- Predampening water must be measured by weight or by volume.
- Predampen the material for 30 to 90 seconds.
- Excessive predampening can cause the material to clog the gunning equipment.
- Load material promptly into the gunning equipment. Under normal environmental conditions, no aging is required.
- For extremely cold conditions, aging can be used. As a general rule, age between 10 and 30 minutes; never age beyond 45 minutes.

#### Installation

- Adjust the water at the nozzle so that the gunned surface has a sheen and the coarse aggregate craters the surface on contact.
- A sandy surface indicates that the material is too dry; a rippled surface indicates that the material is too wet.
- Water adjustments are critical. Installing too dry or too wet will adversely affect rebound and material properties.
- Adequate and consistent nozzle water pressure is critical. A booster pump is recommended to ensure both.

### Installation Methods (For Casting)

- The product is designed for hand casting or vibration casting installation.
- For hand casting, "rod" the wet material to help remove trapped air.
- For vibration casting, either form vibration or immersion (pencil) vibration can be used.
  - For form vibration, ensure that you can control the frequency and time of the vibration. Vibration should be sufficient to densify the product without causing the material to segregate. **Do not over-vibrate.**
  - For pencil vibration, insert the vibrator to the bottom of the casting. Move and extract the vibrator slowly to avoid creating an air pocket.
- Install the product promptly after mixing. Mixer and batch sizes should be as large as possible to minimize the number of batches.
- Never continue to install subsequent batches if the first batches start to set. If this occurs, use a cold joint casting design between the current casting and the subsequent casting.
- Do not trowel or slick the surface. This practice will prevent proper water removal during dryout.

## Installation Guidelines

### Installation Methods (For Gunning)

- Always begin an installation at the bottom to avoid trapping rebound.
- Installation should be done in small areas to ensure proper bonding of the layers.
- For large installations, a cold joint design is recommended.
- If a delay occurs during installation, score the installation surface while it is still wet to facilitate bonding of the layers.
- Remove excess material as soon as possible to facilitate easy trimming and to limit stresses on the installed material.

### Curing

- Ideal curing temperatures are between 70°F and 100°F.
- For installations above 60°F, cure the product for a minimum of 24 hours or until a hard set is reached.
- For installations below 60°F, longer times are required to reach a hard set. Apply heat (not exceeding 120°F) to accelerate curing in cold conditions.
- Dryout and heatup can begin after the recommended minimum cure time as long as a hard set has been achieved.
- A hard set can be determined by striking the surface of the casting with a metal bar. A distinctive ring indicates a hard set.
- During curing, keep the surface covered and damp to avoid drying and cracking. Avoid direct water spray on the surface during curing.
- Avoid allowing the material to freeze prior to reaching a hard set or preferably prior to dryout (complete water removal).
- During curing, avoid applying excessive weight, such as equipment, to the cast surface.

### Alkali Hydrolysis in Lightweight Products

- Alkali hydrolysis, also known as carbonation, is the formation of calcium carbonate caused by the reaction of lime in cement and carbon dioxide in the atmosphere. The hydrolysis reaction breaks down the cement bond, which creates a volume expansion that weakens the refractory lining surface. This weakened surface is friable and can peel off in ¼-in. to 1-in. layers depending on the severity.
- High porosity and alkali content make lightweight castables susceptible to alkali hydrolysis, which can occur in unprotected linings exposed to weather conditions, especially rain. This reaction does not occur in protected linings, such as insulating linings that are protected by a solid structure on the back and a dense refractory on the front.
- Three steps must be followed to minimize/prevent the alkali hydrolysis reaction:
  1. Cast and cure material at warmer temperatures to develop stable cement hydrates, which are more resistant to alkali hydrolysis (higher than 70°F is preferred).
  2. Dry the material out as soon as possible after the 24-hour cure time. Drying will remove excess water and convert cement hydrates to more stable phases. The dryout temperature should be in the 500°F to 750°F range on the hot face to allow heat to penetrate the material and the temperature to reach at least 230°F part way into the lining. The lining does not have to be completely dried.
  3. Keep the material dry by covering it with plastic. Do not use surface sealants because they will break down over time and trap water inside the lining. The trapped water can act as a catalyst to promote the hydrolysis reaction.

### Dryout

**IMPORTANT:** During dry out of a castable lining, only some water escapes via the hot face while most of the water is driven through to the cold face. If material is cast directly against a steel shell or other impermeable material without the use of weep holes, the water remaining in the lining will have no path to escape, and as the dry out schedule proceeds, internal steam pressure will rapidly increase resulting in probable lining damage and/or steam spalling. Dry out schedules issued by HWI assume that an unobstructed path exists through the cold face so that water can easily escape through the vessel/furnace shell. In most cases, weep holes are required to facilitate the removal of water/steam. Where weep holes are not allowed or a path to the weep holes is lengthy or not direct (such as a furnace hearth) some type of wicking should be used to create a path toward the weep holes or to the outside of the furnace.

Dryout and heatup can begin any time after a hard set has been achieved. Refer to the curing and dryout schedule specified on the product data sheet for more detailed information on the appropriate curing, dryout, and heatup procedures.

### Tips

- When using metallic anchor systems, such as V-anchors, a coating on the tips is suggested to allow for anchor expansion during heatup.
- Wet down mixers and hoppers before beginning the mixing process.

## Installation Guidelines

- Add most of the water to the mixer before adding the dry castable/gun mix.
- If your application requires weep holes, ensure that they are maintained before beginning installation.
- When using forms, apply a good mold release or grease before installation.
- Wash out all equipment as soon as installation is complete. A power washer is recommended.
- Always time the mixing process. **Don't guess.**
- For water, less is always best. Don't guess. **Measure.**
- Never use additives such as set extenders or accelerators without first consulting your HWI sales and technical representative.
- For large gunning installations where visual contact is not possible, headset communication between the nozzle operator and the gun operator is recommended.
- Air pressure and volume are critical to a quality installation. Air pressure should be between 20 and 30 psi for lightweight products. Always check datasheet for product specific recommendations. Adequate air volume is necessary to ensure consistent pressure.
- Gunning hose inside diameter can range from 1 to 2 in. depending on application requirements. Ensure that the gunning hose inside diameter is consistent from the gun to the nozzle.