Low Cement Castables—Shotcretable, HL and GT (LCC-6)

Installation Guidelines

4/29/10

Safety and Health

Review the Material Safety Data Sheet (MSDS) before using this product. The MSDS 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 a temperature below 80°F.
- ANH packages its low cement 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 ANH sales and technical representative for alternate solutions.
- Always store low cement 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. Low cement castables have an average shelf life of 6 months. Refer to the product data sheet for specific shelf life recommendations. If product usability is questionable due to age, consult your ANH 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 ANH 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

The product can be installed as a castable with or without the use of a concrete type pump. It can also be installed as a shotcrete.

Mixer

- ANH recommends medium- to high-intensity paddle or pan mixers for best results.
- Ensure that the water delivery and measurement system is capable of supplying the required water within a 30-second timeframe.
- Mixing time will vary according to installation method and from mixer to mixer:
  - For non-pump casting, a mixing time of 5 to 7 minutes is typically recommended.
  - For pump casting, a mixing time of 3 to 5 minutes is typically recommended. (It is acceptable to reduce the mixing time in the mixer because the material will continue to be mixed at the pump.)
- Clean all mixing and handling equipment prior to and immediately following use. Residual material in the mixer may affect the set of the product.

Pump

- Commercially available swing tube piston pumps, from manufacturers such as Allentown, Blastcrete, and HPC, are acceptable for installing this product. Ideally, the pump should have a 3- to 4-in. piston.

Installation Guidelines

Piping and Hoses

- ANH recommends the use of hard (slick) pipe between the pump and the flexible hose. 2- or 3-in. pipe diameters are acceptable.
- To minimize pressure and friction, limit the length of flexible hose as much as possible. ANH recommends 50 ft or less of flexible hose between the hard pipe and the point of installation. Depending on the output required, use 1½- or 2-in. flexible hose.
- ANH recommends the use of elongated reducers to minimize clogging at the point of reduction.
- ANH recommends the use of long sweep elbows to minimize clogging and excessive pressure when making directional changes.

Compressed Air Requirements (For Shotcreting)

- A constant air pressure of 80 to 100 psi and a 500 cfm compressor are typically adequate.
- ANH recommends a 3/4-in. line for air delivery to the nozzle.

Activator Delivery System (For Shotcreting)

- The activator delivery system selected must be based on the type of activator being used:
  - For ACTIVATOR HL, ANH recommends a rotor stator system along with a mechanical or air-agitated activator tank.
  - For GT ACTIVATOR, ANH recommends using the A.P. Green GT tank, which is more rugged than conventional pump systems. The GT tank is a pressure vessel that injects the activator through a calibrated meter using an air-over-hydraulic principle. GT ACTIVATOR can also be used with the rotor stator or other mechanical pump system.
- ANH recommends 3/4- to 3/8-in. delivery lines for the activator.

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.

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

- Accurate water measurement is critical to achieve proper installation and optimum product properties. Refer to the product data sheet for water specifications.
- Water must be measured by weight or by volume.
- The water requirements for low cement 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 1% above or below the target value shown on the product data sheet is not recommended without consulting your ANH sales and technical representative.

Activator Selection (For Shotcreting)

ANH recommends the following activators for installation of its shotcretes. Activators should be selected based on the requirements of a specific installation and the equipment available. For more information on activators or activator selection, contact your ANH sales and technical representative.

Property	GT ACTIVATOR	ACTIVATOR HL
Equipment	A.P. Green GT tank or rotor stator pump	Rotor stator pump with agitated activator tank
Water-to-Activator Ratio	Ready to use	1 gal per 2.1 lb (weak) 1 gal per 4.2 lb (strong)
Activator-to-Product Ratio	1 to 1.5 gal per ton (10.9 to 16.4 lb of GT Activator per ton of product)	1 to 1.5 gal per ton (6.3 lb of dry activator per ton of product)
Trim Time	Fair	Poor
Set Time	2.5 to 4.5 hr	2.5 to 5 hr

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Installation Methods (For Casting and Pump Casting)

- The product is designed for hand casting, vibration casting, or pump 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.
- For pump installation:
  - Lubricate all lines with ANH BENTONITE HOSE LUBE before pumping. Other commercial products are available but most are designed to be used with concrete and may not be compatible with refractory cements. Mix ANH BENTONITE HOSE LUBE with water to a paint consistency. Note: HP-CAST products are sensitive to silica; do not use AHN BENTONITE HOSE LUBE or any silica-based lube. Only calcined alumina in water should be used.
  - Pump the material to clear all surplus hose lubricant from the hose. Discard this material.
- 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 Methods (For Shotcreting)

- Calibrate the activator pump to ensure that activator addition can be controlled to a rate between 1 and 1.5 gal per ton.
- Set the activator pump at the lowest setting possible to allow buildup without slumping. Over-activation of this product will lower properties and cause laminations.
- Lubricate all lines with ANH BENTONITE HOSE LUBE before pumping. Other commercial products are available but most are designed to be used with concrete and may not be compatible with refractory cements. Mix ANH BENTONITE HOSE LUBE with water to a paint consistency.
- Pump the material to clear all surplus hose lubricant from the hose. Discard this material.
- Reverse the pump two strokes to facilitate nozzle installation.
- Before beginning shotcreting, ensure that the activator line is full and the air pressure is at the nozzle.
- Always begin an installation at the bottom to avoid trapping rebound.
- Set the air pressure as high as possible to ensure a well-densified mix.
- During installation, hold the nozzle perpendicular to the target surface.
- Maintain a distance of 1½ to 3 ft from the target surface.
- Once installation begins, it should be continuous until the installation is complete. If a delay occurs during installation, score the installation surface while it is still wet to facilitate bonding of the layers.
- Installation should be done in small areas to ensure proper bonding of the layers.
- Remove excess material as soon as possible to facilitate easy trimming and to limit stresses on the installed material.

Installation Guidelines

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.
- 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.

Note: For shotcreting, cure time is related to activator selection. 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.

Dryout

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, hoppers, and pumps before beginning the mixing process.
- 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.
- The swing tube pump should be positioned as close to the installation as possible to reduce pump pressure, potential for clogging, and material waste.
- For applications where the target installation point is a significant vertical distance above the pump, many contractors have found that using a 2-in. line reduces the static pressure on the pump.
- For large installations where visual contact is not possible, headset communication between the nozzle operator and the pump operator is recommended.
- Properly maintained pumping equipment is critical to a quality installation. Always make sure that you follow the manufacturer's maintenance and lubrication schedule.
- 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 ANH sales and technical representative.