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Plibrico Installation Guidelines

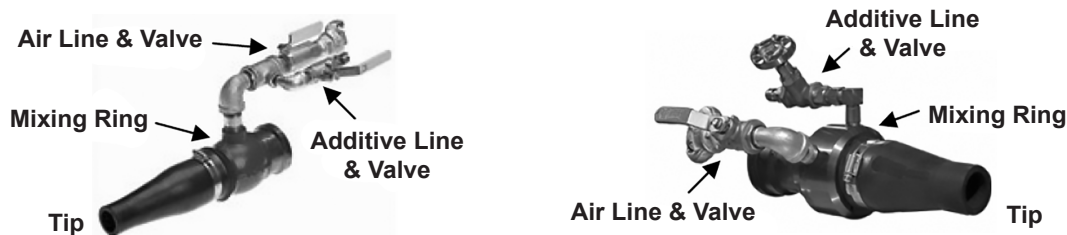
Pli-Shot Castables

This is a basic guide applicable for the application technique of various grades of Pli-Shot castables. Pli-Shot castables are versions of Plicast castables modified for shotcrete application. Please refer to the installation guide for the equivalent Plicast castable type for storage, preparation and general mixing information and to the Plibrico Pump Installation (TB-IG11-PI) guide for information on pumping castable refractories.

EQUIPMENT

Mixer-Pump-Pipe/Hose: See Plibrico Pump installation guide (TB-IG11-PI) for specific information on the pumping process and equipment set up.

Shotcrete Nozzle Assembly - 2" shotcrete nozzle assembly is preferred though in some instances 1 1/2" nozzle assembly can be used. The nozzle assembly consists of a rubber tip, mixing ring, hose connector, air line with valve and a additive dosing line and valve. Two acceptable type nozzles are shown below.



Air Compressor - Shotcrete installation requires sufficient compressed air pressure and volume at the nozzle to mix the accelerant into the pumped castable and propel the mixture on the surface being installed. Typically a 375 cfm compressor operating supplying air at 65-80 psi is sufficient but some installations may require larger volume compressors. Compressed air is supplied to the nozzle by means of a 1/2" air hose rated for the air pressure.

Additive Dosing Pump - Accelerant is introduced to the mixing ring or air line by means of a high pressure (100 psi min.), low volume, metering dosing pump. This pump may be either electric or air powered and is typically capable of metering additive at a rate between 0 to ~30 gal/hr. The additive type and amount may vary with the specific Pli-Shot castable being used, the volume per hour being installed and the installation configuration.

ACCELERANT

An accelerator causes the Pli-Shot castable to stiffen or gel within seconds of installation. This stiffening action allows the castable to build up without slumping and support itself. Various compounds can be used to accomplish this. Plibrico recommends that the following additives be used to accelerate Pli-Shot castables. There may be instances where a different type of accelerator may be required, need to be substituted or preferred. Please contact the Plibrico Technical Department to determine accelerant suitability or compatibility.

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Recommended Accelerators for Pli-Shot Castables

Accelerator	Dilution	Amount required
Sodium Silicate - "K" Type*	Water to Silicate - 1:2 to 1:3 by volume	1-2 gal/Ton
Sodium Silicate - "E" Type	Water to Silicate - Undiluted 1:3 by volume	1-2 gal/Ton
Hydrated Lime - "S" or "N" type**	~12 to 15 gal water: 50# lime	1-15 gal/Ton

PDEHRUGHUHGWKURKWKH3OLEULFR&RPSD
PWEHNHSWDLWDWHGRUWVLUUHGWRNHSLMWSHMLRIRUMHZLWKORZEHPHWVWHPVROOZPZNSO6KLHOG

Proper dilution allows for dispersion or atomization of the additive in the air stream at the nozzle. Improper dispersion of the additive in the air stream may result in the need for an excess amount of accelerant to be used. This may affect placement characteristics and the final physical properties of the shotcrete.

Note: For proper pumping, and dispersion, it is recommended that the temperature of the liquid sodium silicate be no lower than 45°F (7°C). Liquid sodium silicate solutions must be stored above freezing. Subjecting sodium silicate to freezing temperatures will cause separation resulting in a "thin" liquid on top of an over saturated "thick" liquid/gel. When thawed it may be possible to reconstitute the silicate to it's original consistency by vigorous stirring.

INSTALLATION PROCEDURE

When ambient, vessel, and mixed castable temperatures are below <40°F (4°C), the effectiveness of various accelerators diminishes (increased stiffening time) and may cause shotcreted castables to slump or run off the surface being installed. Increasing accelerator dosing amount or changing accelerators may not totally remedy this and also affect the final physical characteristics of the installation. It is recommended that for an optimum Pli-Shot installation that a minimum temperature of 40°F (4°C) be maintained in the vessel or installation site.

- Before pumping castable, open additive valve at the nozzle. Turn on dosing pump and establish additive flow to the nozzle. Based on past experience set the dosing pump flow rate. If unfamiliar with the required dosing rate for the Pli-Shot castable being installed, initially set the dosing rate at approx 30% of full output. Stop additive by shutting off valve at the nozzle.
- Open air valve at the nozzle approx. 1/8 to 1/4 turn.
- Begin pumping castable.
- Once castable reaches nozzle, open air valve ~ 3/4 of full open.
- Open additive valve.
- Adjust air by means of the nozzle valve to achieve a fine spray, similar to conventional gunnite. Excessive air will cause the castable to be blown off the installed surface before stiffening begins. Insufficient air will not propel the castable or provide adequate dispersion of the accelerant additive into the castable mix. If the accelerant is not dispersed properly, the shotcrete will not stiffen or gel



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7. Adjust the accelerant amount at the dosing pump. The proper amount of accelerant will begin to reduce or stop castable flow on the installed surface within 2-3 seconds. Note that accelerants may lose some setting effectiveness if the pumped castable is below 40°F (5°C).
8. Once the air and additive dosing have been adjusted, the following shotcrete installation techniques are recommended:
 - Distance from nozzle to working surface - 2-4ft.
 - The nozzle should be kept moving continuously in a curricular motion – 1-2 ft dia.
 - Build vertical refractory surfaces from the bottom up at a 45° angle.
 - Gun working area¹ (panel) to full thickness before continuing on.
 - Build up lining thickness, coating gradually over the working area¹ (panel).
 - Do not gun on a surface that has “set” more than 5 min.
 - Trim castable surface immediately if necessary.
 - If castable flow is interrupted, immediately close the additive valve. Do not spray accelerant on installed castable surface or disperse into the work space atmosphere!
9. On installation shut down:
 - Stop castable flow.
 - Immediately close the additive valve.
 - Wait 5 seconds and shut the air valve.

¹ A working area will vary between specific applications and refractory lining thicknesses but will be a surface that can be gunned full thickness within 5 minutes.

TECHNICAL REFERENCES

Castable Installation Guidelines:

- Plicast: TB-1G11-PC
- Plicast HyMOR, Super HyMOR & HyREZIST: TB-1G11HY
- Plicast Al-Tuff & Al-Shield: TB-1G11AT/AS
- PliFlow: TB-1G11-PF
- Plicast Si-Bond: TB-1G11-SB

For all technical questions please contact the Plibrico Technical Department at 312 337-9000.