



**Plibrico Company, LLC**

1935 Techny Road - Unit 16

Northbrook, IL 60062

(312) 337-9000

www.plibrico.com

# Plibrico Installation Guidelines

## Refractory Flooring

### Durafloor II

#### STORAGE

Refractory flooring materials are packaged in moisture resistant bags and super sacks. Even so, castable packages should be kept dry since moisture can reduce the castables ultimate strength and even cause hardening. Castable packages should be stored indoors in a dry, warm, location. If the material must be stored outdoors, it should be covered by tarpaulins and stored in a well drained location where standing water will not accumulate under the pallets. Do not store in direct sunlight, especially in hot climates.

#### PLACEMENT

- **Foot Traffic Only:** Refractory flooring can be installed from 4" thick to as little as 2". Note, thin cross sections are much more difficult to install and will generally require higher water additions. This can cause increased cracking and a reduction in strength.
- **Light to Moderate Traffic:** In general, these areas will require 4" to 6" thickness.
- **Heavy Traffic Conditions:** In highly trafficked areas or situations where mechanical abuse is a mechanism of failure, 6" to 8" of material will be required. It is not recommend to have any thicknesses greater than 8". If addressing a floor which requires greater than 8", it may be more cost effective to install a sub-floor, then install a refractory floor cap.

Internal anchoring or rebar is not typically necessary unless addressing a large surface area. Standard 6" x 6" wire mesh used in standard concrete installations will work well provided the mesh is supported off the foundation of the area to be cast.

The surface finish of the refractory flooring should be fairly rough with a minimum of trowel finishing. A thick bristle broom can give the surface a rough surface as well as provide for excellent traction. This type of surface finish will also help facilitate the removal of moisture. Excessive water used to 'finish' the floor may result in some surface "spider" cracking and is generally not a detriment to the overall properties of the floor.

Installment in large areas may require installation in sections. In these cases, the refractory material should be cast directly against itself, forming a cold joint. This will allow the installer to 'control' the cracks and will also facilitate a more manageable installation. In general, maximum section widths up to 8 feet with joints every 10 to 15 feet is recommended.

## PUMPING INSTALLATION

#### EQUIPMENT

1. **Mixer:** A high intensity, large capacity (1500+lbs) mixer such as paddle type or high torque turbine mixer is recommended to minimize castable mix times. For large volume pumping, rotary drum cement trucks may be used though mix times will increase and castable water contents may be higher than optimum. If lower capacity mixers (>1000lbs) are used, it may be necessary to use two (or more) mixers to adequately feed the pump.



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- 1. Pump:** A high pressure swing tube type piston pump with holding hopper with a mix agitator is preferred. Discharge cylinder/tube diameters up to 6 in. are acceptable though 3 to 4 inch cylinder/tube diameters are preferred to minimize line reduction. The pump should be positioned as close to the installation as possible to minimize the pumping distance and height and to maximize accessibility.
- 2. Pipe/Hose:** Refractory castable is usually pumped through 2-1/2 to 3 inch line. A combination of hard pipe (slickline) and rubber hose should be utilized with as much slickline used as feasible to reduce flow resistance and lower pump pressures. Some items to consider are:
  - Rubber hose should only be used for the final material distribution/placement sections. Rubber hose significantly increases flow resistance (twice the resistance of an equivalent diameter slickline).
  - Line diameter reduction should occur at the pump outlet with the reducer section being as long as possible to minimize flow resistance and the chance of a rock jam (blockage). Ideally, line reduction should be no greater than 1 inch diameter reduction over a 5 ft. length of reducer section.
  - Slickline is preferred for all vertical runs.
  - Since bends or elbows in the pipeline increase flow resistance and pump pressure, they should be as large as possible to minimize the resistance. Elbow pipe is available in various degrees of curvature (90°, 45°, 22-1/2°, and 11-1/2° are the common) and curvature line radii distances (C.L.R.). Larger C.L.R.'s (18+ in.) are preferred to reduce flow resistance and blockages.
  - Slickline and hose should be properly supported to reduce strain on the coupling joints.
  - The proper couplings, compatible with the slickline/hose ends, must be used to insure safety.
  - During assembly, care should be taken to keep the slickline sections reasonably in line to reduce pumping pressure and line wear.
  - Discharge hose handling is strenuous requires adequate personnel. A 10 ft section of 3 inch diameter hose filled with refractory castable weighs between 100 and 160 lbs.
- 3. Communication:** For job safety and installation quality and efficiency, it is strongly recommended that an audio system be used to allow direct communication between the pump operator, job supervisor, and placement crew.

### PUMPING

**Line Lubrication:** Prior to mixing and pumping the castable, the pipeline must be lubricated. This generally done by mixing a slurry of a bentonite clay or other plastic clay and pumping the slurry through the pipeline. This slurry and the first amount of castable behind it must be discarded.

**Mixing and Pumping:** The first batch of castable to be pumped is generally mixed slightly “wetter” than optimum to insure that it will pass through the pipeline with no leaks or restrictions. Once this is established, subsequent batches are mixed and pumped at the desired placement consistency and at normal pump pressures. Once castable pumping begins it is important that the pumping operation be as continuous as possible. Refractory castable, even those designed especially for pumping, can have a relatively short working time and hot ambient conditions and pipeline exposed to the sun, can cause accelerated stiffening or setting. If a significant work interruption occurs or the pumping pressure increases (indicating the castable is stiffening in the line), the pipeline and pump hopper should be purged and cleaned.



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## CASTING INSTALLATION

### PREPARATION

1. The site where the castable will be installed must be clean to minimize the chance of contaminating the castable.
2. Mixers, tools, vibrators, and conveying equipment must also be clean. NOTE: Contamination, particularly by portland cement, can effect setting, working time and final properties.
3. The back-up wall or insulation material against which the castables will be poured must be smooth and free from wide gaps or cracks. This surface, if not waterproof, must be coated with a curing compound or plastic film. If plastic film is used it must be securely attached or it may float or wrinkle during pouring.
4. All forms/molds used should be moisture resistant or made moisture resistant with the use of curing compound/moisture proofer. The forms should be coated with a parting compound /mold release agent.
5. Mechanical mixing equipment is recommended. Paddle, pan, and other high intensity mixers are preferred. Other types of mixing equipment (i.e. tumblers / cement trucks) may increase mixing time and water demand.

### MIXING

1. The ideal mixing and placement temperature (castable, water, & ambient conditions) for castables should be 60°F (16°C) to 90°F (32°C). If ambient conditions after placement are below 45°F (7°C), setting may be delayed. High ambient and material temperatures, >90°F (32°C), may cause reduced working/setting times or flash setting.
2. Mixing water should be clean and potable (i.e. drinking quality).
3. Start the mixer and empty the entire contents of one or more packages (bags or super sacks) into the mixer.
4. For the first batch add 90% of the mixing water as specified on the package or product data sheet.
5. Allow the batch to mix to “wet down” before adding additional water for the desired consistency.. Castables require mixing times of between 2 to 3 minutes. The final water amount required for the desired consistency can be used as the starting point for sub-sequent batches. Slight water adjustments may be needed from time to time during the casting process to maintain the desired consistency.

### CASTING

1. Castable placement should begin as soon as the mixing process is complete. The total time interval from the addition of water until the castable batch is in place should not exceed 20 minutes.
2. Do not over trowel or finish the cast surface to a very smooth or “slick” texture. This will inhibit moisture loss and setting. Use of a wood screed or broom is preferred for finishing the cast surface.
3. Once casting begins, it should continue uninterrupted until the form is complete. Do not allow castable to set more than 20 minutes between casting layers.

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