Installation of Dry Vibe Linings

SELEE® Advanced Ceramics™ Technical Service

"The key step to getting maximum performance from a dry vibe lining is proper installation."

Installation Steps:

1. Equipment List

- Bosch Vibrator – Model #18900 or #18902
- Vibrating foot, the foot should allow for ½" clearance between the coil and form.
- Slip Plane, it is recommended that a slip plane is used between the coil and the lining.
- Forking tool, used to level and de-air the refractory and scratch the refractory surface between layers.
- Forms, melt out or removable, depending upon the type of dry vibe used and the application.

2. Furnace Preparation

- Clean furnace back to the coil grout, the surface should be smooth and uniform.
- Inspect and repair the grout if necessary, allow grout to air dry for at least 8 hours.
- Inspect bottom of furnace to make sure it is structurally sound.
- Set ground wires in place as per the furnace manufacturers specifications.

3. Installation Preparation

- Clean and level furnace; dust off and inspect refractory.
- Hang the slip plane blanket form the top of the furnace to the bottom. The length should equal the height of the furnace plus 5" to allow for overlap onto the top of the furnace. Slit overlap cloth every 6" to allow it to contour to furnace properly.
- Note: Use proper safety precautions, including OSHA approved respirators and remove loose objects, (lighters, pens, etc.) from pockets while installing lining.

4. Bottom Installation

- Introduce each layer in 3" loose layers.
- Level and de-air each layer making a minimum of four passes over it with a fork using an up and down motion.
- Make 4 passes with a Bosch vibrator using a round or square foot. Begin in the center and move across the complete surface area. The initial pass should be completed lightly in a spiral direction by lifting the vibrator from area to area. Each point of contact should overlap the previously vibrated area. As the density of the refractory increases, additional force will be required to achieve optimum density. Vibration is complete after a minimum of four passes with the vibrator and the refractory is dense.
- After completing each layer, the surface must be scratched with a forking tool prior to introducing the next layer in order to promote knitting between layers and to eliminate laminations.
- It is recommended that the total bottom thickness be installed 1" greater than required. The additional 1" can be removed with the use of a straight edge, and the bottom leveled. This procedure is designed to provide optimum density at the hot face.
- Cut and install the ground wires per the furnace manufacturer's specifications.

5. Sidewall Installation

- Set the form in place, using spacer blocks to center and level it. Place a heavy weight or starter block to secure its position. Scratch the exposed refractory to avoid laminations at the bottom/sidewall interface.
- Follow the same procedure as for the bottom using 3" loose layers of material, de-air and vibrate. Vibration is complete after 4 passes using the appropriate foot and extension.
- If a top cap is being used, the refractory should be brought up 1" above the de-aired height and scraped back to assure a dense surface. If a melt out lining is being used the working lining requires a top cap refractory.
- Install spout using a refractory plastic. Prior to installing the spout cut the slip plane around the spout area.

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6. Sintering

- Place a heat lamp into the furnace to prevent moisture absorption before sintering.
- Sinter cycle will depend on the refractory being used and the type of form used (removable or consumable).
- Consumable forms are melted out with induction power
- Removable forms are heated to the initial set temperature of the refractory by torch or induction power.
- For both cases, thermocouples should be used to monitor temperatures at the refractory/form interface.
- Follow the appropriate sinter schedule on the attached page

7. Reasons for Reduced Lining Life

Spalling – occurs when layers of the sintered refractory pull away from the refractory lining due to improper installation or sintering practices and on rare occasions by extreme thermal cycling.

- Steam spalling occurs on newly installed grout or castable rings when all the moisture is not removed.
- Differential expansion spalling occurs when lining is saturated with metal or slag due to poor lining density.

Finning – results from thermal cycling cracks, which are usually due to installation problems.

- Horizontal finning results from laminations that occur during installation, usually from poor de-airing practice.
- Vertical finning results form thermal cycling and becomes readily apparent after cooling the lining.

Metal Saturation – occurs when the sintered zone is penetrated by metal or slag and usually is the result of poor installed density or exposure of the lining to both metal and slag before the sinter zone is formed.

Superheating – occurs because of a lack of temperature control mostly in the lower one third of the furnace when the lining is exposed to temperatures above 3100°F. The result is rapid erosion of the lining.

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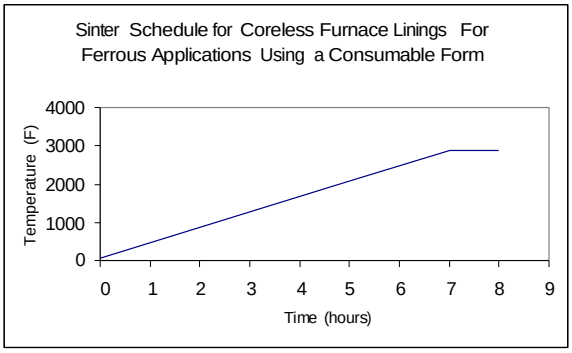
Consumable Form

A. Place thermocouples near top cap, mid sidewall and bottom sidewall.

B. Begin sinter not exceeding 400°F/220°C per hour to a final hold 100°F/38°C above tap temperature

C. Hold at this temperature for one hour.

D. Achieve normal tap temperature and place furnace into operation.



Removable Form (use only with materials designed for this technique)

A. Raise the temperature to 1000°F/540°C at a maximum rate of 400°F/222°C per hour.

B. Hold at this temperature for a minimum of four hours.

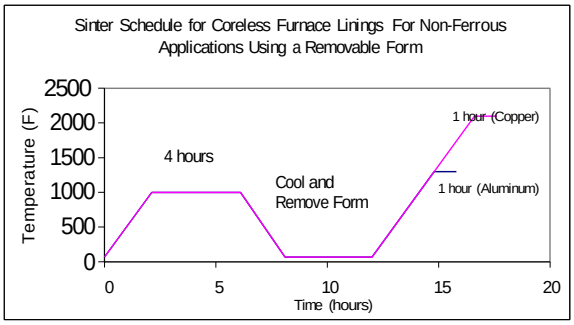
C. Cool form with forced air until safe removal is possible.

D. For cold metal charging, the use of round starter blocks, which are flat on the bottom and top, and are within 6" of the inside diameter of the metal form are preferred. If round starter blocks are not available, cold charge furnace by carefully hand placing the initial charge of clean and densely packed metal into the furnace taking care not to scar the side walls.

E. Raise the temperature to a maximum tap temperature at a maximum rate of 400°F/222°C per hour.

F. Hold at maximum tap temperature for one-hour minimum.

G. Allow to cool to normal operating temperature.



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