

Recommended Firing Schedules for Cast Refractory Tiles

All Fives North American Combustion, Inc. products containing cast refractory such as tiles and lined burner bodies have been wet cured per the manufacturer's recommendation at temperatures between 60°F and 90°F. After wet curing, these pieces undergo a controlled drying process with a final hold temperature of 500°F unless the manufacturer recommends otherwise. Additional firing in a controlled manner is required to remove chemically bonded water and prepare refractory for service.

Temperatures in the schedules below represent refractory surface temperatures. Thermocouple wires or probes used for monitoring surface temperature should be suited for these elevated temperatures. Additional protection for the probe may consist of a fiber blanket wrap or other methods to insulate the thermocouple from the radiant heat of the burner. The observation port on the burner body may be used as a location for insertion of a probe. Special care should be employed in completely sealing the ports on a positive pressure system prior to any firing in order to prevent hot gases from escaping.

NOTES:

1. Prior to installation, refractory pieces should be stored in a cool, dry location, protected from external elements.
2. The schedules are designed to maximize service life of the refractories. Where time does not permit adherence to these procedures, greater stresses will be generated and may reduce the service life through increased crack formation with wider and deeper crevasses. It is normal for some cracking to occur during the drying process.
3. To maximize the service life of refractory parts, try to allow for sufficient warm-up and cool down periods. Generally, this is 300°F to 400°F per hour and 100°F per hour, respectively. **Special duty castables often have special warm-up cycles which may require much slower ramping. Contact a Fives North American Combustion Representative, if you are not sure of the material used.**
4. A multi-component lining often requires a slower heat-up rate, especially when insulating castable is behind a dense castable and the furnace shell is vapor tight. When in doubt, contact Fives North American Combustion, Inc.
5. If at any time during the firing process you witness steaming or condensation escaping, hold the refractory at a constant temperature until such time as moisture is no longer evident.
6. **This schedule does not consider any other refractory materials which may be part of the application hardware. If other materials require firing, use the more conservative of the schedules.**

Firing Schedule for 62% Alumina Dense Castables:

- 3 hour ramp from 60° F to 300° F
- 6 hour soak at 300° F
- 12 hour ramp from 300° F to 1200° F (75° F per hour)
- X¹ hour soak at 1200° F
- 8 hour ramp from 1200° F to 2000° F (100° F per hour)

12 hour (minimum) cooling period from maximum temperature to ambient at a maximum of 150° F per hour unless starting production

¹ Soak for ½ hour per inch of refractory thickness. This soak period is not required. It is recommended when the application will require cyclic operation or when the operating temperature will exceed 2000° F. In no case exceed 2800° F for Standard Dense Castable.

Firing Schedule for Low Cement Castables:

3 hour ramp from 60° F to 300° F
X¹ hour soak at 300° F
6 hour ramp from 300° F to 600° F (50° F per hour)
X¹ hour soak at 600° F
8 hour ramp from 600° F to 1200° F (75° F per hour)
X² hour ramp from 1200° F to operating temperature
(100° F per hour)

12 hour (minimum) cooling period from maximum temperature to ambient at a maximum of 150° F per hour unless starting production

¹ Soak for 1 hour per inch of refractory thickness.

² No soak period required at maximum temperature. In no case exceed 3000° F for High Temperature, Low Cement Castable as damage to both burner internal and refractories may result.

Firing Schedule for Insulating Castables:

11 hour ramp from 60° F to 600° F (50° F per hour)
X¹ hour soak at 600° F
12 hour ramp from 600° F to 1200° F (50° F per hour)
X¹ hour soak at 1200° F
3 hour ramp from 1200° F to 1500° F (100° F per hour)
6 hour soak² at 1500° F

12 hour (minimum) cooling period from maximum temperature to ambient at a maximum of 150° F per hour unless starting production

¹ Soak for 1 hour per inch of refractory thickness.

² No soak period required if the unit is going into production. For production, continue to increase the ramp at 100° F per hour until operating temperature is increased.

WARNING: Situations dangerous to personnel and property may exist with the operation and maintenance of any combustion equipment. The presence of fuels, oxidants, hot and cold combustion products, hot surfaces, electrical power in control and ignition circuits, etc., are inherent with any combustion application. Parts of this product may exceed 160F in operation and present a contact hazard. Fives North American Combustion, Inc. urges compliance with National Safety Standards and Insurance Underwriters' recommendations, and care in operation.



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