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Making and Using Cone Packs

Which Cones to Include

Standard practice is a minimum of three cones in the cone pack. The warning cone is one cone below target cone, the firing cone is the target cone, and the guard cone is one cone above the firing cone. For a cone-08 bisque-firing, include cones-09, 08, and 07, and for a cone-6 electric glaze-firing, cones 5, 6, and 7.

Cone packs in fuel kilns often include a body reduction cone to indicate when to initiate a reduction atmosphere to bring out speckles in stoneware clays or to encourage certain glaze effects. Standard body reduction cone is 08, and for carbon-trap shinos or copper reds, cone-012. For a cone-10 reduction firing containing carbon-trap shinos and/or copper reds, the cone pack would be cone-012, 9, 10, and 11. In some situations it is helpful to include additional cones in the pack, especially when getting to know a kiln. If cone packs for midrange or highfire include multiple low-temperature cones, pinch-form a small tray to contain the whole cone pack in order to catch all melted cones.

Making the Cone Pack

Use care in making good cone packs. Poorly-made cone packs will cause inconvenience at best and a firing disaster at worst. If you experience the latter, you will never again make a sloppy cone pack.

- Form your cone pack on a piece of paper towel or newspaper so that the clay won't stick.
- Roll a coil of clay ½" to 5/8" diameter (no larger) and flatten to about 3/8" thick (no thinner!).
- If there is a body reduction cone form a basin at end of cone pack to catch melting cone.
- If there are additional low-temperature cones in a pack for midrange or high-fire, place the whole cone-pack in a pinch-formed tray to catch melting cones.
- Hold the base of a cone against a flat, level surface and observe the correct angle and direction of tilt. When you push the cone into the clay, ***make sure it tilts at the correct angle or slightly more***. Make sure the cone number is visible from the side when the cone is in place.
- Place lowest melting cone directly adjacent to and leaning towards one end of the cone pack or the molded catch-basin so it falls unobstructed.
- Each cone should be pressed in as far as it will go, displacing almost all clay beneath it.
- Place each subsequent higher cone so that it falls towards the previous one.
- Place the cones directly next to each other with no space between them at all in order to keep the pack as short as possible and maximize visibility through a small spyhole in the kiln wall.
- If more than five cones, make two cone packs, place in front of each other with cones leaning in opposite directions, lower-melting cone pack in front, note location and lean in kiln log.
- After you press all the cones into the flattened coil, squeeze the coil from both sides where it is thicker between each adjacent pair of cones in order to lock the cones in place.
- Trim off any excess clay at the ends of the cone pack.
- If the cone pack is for bisque-firing, it can be used immediately with no ventilation holes.
- If the cone pack is for a glaze-firing, use a needle tool to thoroughly poke ventilation holes throughout the clay, especially in the thicker areas between cones.

What to Do if a Poorly-Made Cone Pack Explodes

If an improperly made cone pack explodes in the early stages of a glaze-firing, and you catch it before red heat, shut the kiln off, cool it completely, unload the wares, and remove all residue. Make proper cone packs and re-start the firing.

If you don't discover an exploded cone pack until the kiln reaches red heat, it's very risky to shut off the kiln and cool it, because in some cases the sintered glaze coating can separate from the sintered claybody in large flakes, and much or all of the ware could be ruined. If you ever find yourself in this situation, it is best to use a pyrometer and the color inside the kiln to gauge temperature and complete the firing without cones. The cone-pack fragments in some wares are far less of a problem than an entire ruined kilnload.

Placing Cone Packs in the Kiln

Standard protocol is to place cone packs at least four inches inside the top and bottom spyholes. Placing them closer to the spyholes results in an inaccurate reading and makes it harder to see the whole cone pack. Ensure that the cone packs are level, and support them only on very stable arrangements of bricks, kiln posts, and/or shims made from broken kiln-shelf pieces. Make certain that the entire cone-pack (aside from the tip of the melt basin) is clearly visible through spyhole, including the tips of the cones and the entire base. This is very important. If you cannot see the entire cone pack, it can be difficult to tell which cone you are looking at or how much it has fallen, especially at high-fire temperatures.

It is often advantageous to include additional cone packs distributed through the set in order to determine temperature variations. You do not need to be able to see these cones during the firing – you check them when you unload the kiln and carefully note any variations in your notebook. Over a series of firings you can get a good sense of temperature variations throughout the kiln, and adjust your placement of wares accordingly. Obviously these cone packs need only include the warning, firing, and guard cones.

Cone Packs in Salt and Soda Firing

Cone packs for salt and soda firing are made in exactly the same way, but in soda firing the bottom surface of the cone pack can be dipped in shelf wash and requires no wadding. Salt is far more invasive, and the cone pack should always be wadded.

Using Cones to Check Accuracy in Programmable Kilns

Even though thermocouples respond only to temperature, it is possible to get accurate and consistent results from a thermocouple-based programmable electric kiln as long as accuracy is frequently checked and the control unit adjusted to compensation for gradual deterioration of the thermocouples. The operator's manual will give instructions for calibration, and it depends on periodically including cone packs at different levels in the kiln to see if the correct target cone is reached. Place one cone pack at each shelf level somewhere in the kiln, and carefully check and note the condition of the cones when you unload the kiln. A single cone in a small wad of clay will tell you if you reached the target cone, but a three-cone pack with warning, firing, and guard cones will tell you more.