

## INTRODUCTION TO THE BISQUE KILN

READ THIS INFORMATION ARMED WITH THE KNOWLEDGE THAT NOT ALL BISQUE KILN FIRING PROCEDURES ARE THE SAME. VARIABLES CHANGE DEPENDING ON WHAT CLAY IS USED, WHAT TYPE OF WARE IS PRODUCED, AND WHAT KIND OF KILN IS EMPLOYED. THE FOLLOWING APPLIES SPECIFICALLY TO THE SKUTT 1027 KILN IN THE WILLIAM AND MARY CERAMICS STUDIO.

### WHAT HAPPENS DURING THE BISQUE

Chemical changes in the body during firing are slight at first. When the temperature reaches 350-400 degrees F, all atmospheric moisture should have left the ware, causing little or no shrinkage. Most of the chemically combined water will leave the ware at temperatures between 950-1300 degrees F. During this "water smoking" period considerable shrinkage occurs as both the chemically combined water and gases from organic material leave the body. The gases expelled from the kiln are not healthy and should be removed from the studio using an exhaust system. The firing should not be too rapid, for the body is very weak. A uniform bisque temperature is necessary to create the proper absorbency for glazing. Just as the kiln must be fired slowly, so must it be allowed to cool naturally. This not only protects the ware from stress and breakage but also extends the life of the kiln.

### DETERMINING IF A PIECE IS READY TO BISQUE

Raw ware must be completely dry (bone dry) before it is loaded into the bisque kiln. If a piece is wet or damp, the unevaporated water will begin to boil before it is driven out of the piece and the piece will explode. Additionally, pieces with trapped air spaces (including air bubbles) will explode as the trapped air expands upon heating. Pieces with thick areas should be allowed to dry for several days after they appear dry on the surface to allow deep moisture to evaporate. Pieces with areas more than one inch are not suitable to bisque using the same procedure as thinner ware; they require a lengthy preheat and longer firing time to reduce the risk of cracking which can occur during chemical changes in the body.

### BISQUE KILN LOADING

Bone dry ware demands extreme care in handling due to its fragility:

- use two hands initially to lift any piece, then determine if it can be lifted with one hand,
- always lift fragile pieces from the most stable portion of the base, not the rim,
- never lift by handles, knobs, or other attachments,
- take care not to knock pieces together, be alert of handles or other extensions turned away from you.

Loading steps:

- Sort pieces by brick height: 1/4, 1/2, 3/4, or whole brick. Unglazed ware may be stacked for loading by placing one piece inside another (nesting) or by placing two pieces rim to rim. If pieces are nested, foot rims should coincide for support. If placed rim to rim, rims should be the same size; one rim should not rest within the other. Always place lighter pieces on heavier ones, not vice versa. As a general rule, more than three pieces should not be stacked. Remember that stacking pieces will change brick height. Lids should be fired in place, but tall knobbed lids can be turned upside down to save space. These precautions help guard against warping, stress cracking and other breakage.
- Check that stilt bricks are properly located in bottom of kiln. It is best to begin with 1/2 bricks for stability.
- Set kiln sitter and put pyrometric cone 06 mini-bar in place. (Note: bisque temperatures may range from cone 010 to cone 06 depending on the clay body used. The W&M Studio bisques to cone 06.)
- Begin loading directly on the bottom of the kiln. Pieces may touch each other. At least 1/2" clearance should be left between pieces and the sides of the kiln. Pieces may not touch stilt bricks; nothing should touch any coiled heating elements which may have escaped the kiln conduit. The goal is to load as many pieces on each level as possible while

following guidelines.

- When the bottom layer is full, position kiln shelves on top of the stilt bricks. Decide what brick height you will load next; select and place stilt bricks. Load pieces.
- Repeat steps until kiln is full. During loading, place a senior cone 06 pyrometric cone so it can be seen through the second or third spyhole from the top. Note that you will not need stilt bricks on the top level and that no piece should extend above the top of the kiln.
- Lower lid slowly and evenly. Stilt the lid slightly ajar using a 1/4 brick or two layers of kiln shelf.
- Plug all spy holes except the top one.

#### FIRING THE BISQUE KILN

- Check that kiln sitter is set, lid is ajar, and top spy is open.
- Turn on exhaust fan.
- Set timer beyond the number of hours needed.
- Turn on main power at box on wall.
- Depress kiln sitter button; button must stay down and light must be on.
- Turn all switches to low for two hours.
- Close lid and wait for 1/2 hour.
- Turn all switches to medium for one hour.
- Turn all switches to high.
- Kiln should reach temperature within six to eight hours after being turned on high. When interior kiln color approaches a bright glowing orange, check senior pyrometric cone frequently by looking through spyhole.
- When the cone appears bent, turn all switches off, turn main switch off, and be sure all spys are plugged (including the top one).
- The kiln sitter may shut the kiln off automatically before the cone appears bent. If the interior color of the kiln is good, simply shut the kiln down per above. If it is not, investigate to determine why the auto shut off occurred. Do not open the kiln if you believe it is above 400 degrees F. Never rely on the kiln sitter to finish the firing for you. You must be in the studio for the final stages of any bisque firing. Overfired work which has vitrified (meaning that the pores have closed) are nearly impossible to glaze.

#### UNLOADING THE BISQUE KILN

- Allow bisque to cool for at least 10-12 hours.
- Prop lid open with a 1/2 brick. Wait approximately 4 hours.
- Open lid completely. Allow to cool until ware can be touched with the hand. (It is possible to unload with gloves if absolutely necessary.)
- Remove pieces from kiln and place on bisque ware rack. Store stilt bricks and kiln shelves in their appropriate places.

#### BISQUE FIRING ALTERNATIVES

Some clay bodies can be successfully glazed in the raw state (single fired ware), but the fragility of unfired clay and the difficulty of glazing some shapes make double firing (meaning that the piece is bisque fired before the final firing) desirable. Additionally, the final firing techniques used for single fired ware are different from those used for double fired ware (different glazes must be mixed, glaze mistakes cannot be rectified, the ware must be handled with extreme care during loading, the final firing preheat is much more gradual, etc.). Consequently, the two methods are not, as a general rule, mixed in final firings. The William and Mary ceramics studio employs the bisque method. Single fired ware is not an alternative in our high fire or raku kilns.

Sometimes, the bisque firing is the final firing of a piece. This is not atypical for sculptural earthenware and some porcelain work. A bisqued piece may be left as it emerges from the kiln or finished with a substance other than glaze, such as paint, varnish, or shellac. However, because bisque ware has not been fired to its maturation temperature, its fragility makes it unsuitable virtually for all purposes except display.