POTTERY DECORATION for each STAGE

1. **PLASTIC STAGE**
    a. pressing, stamping, or pinching moist clay
    b. scratching, incising (engraving), or cutting away clay with a tool
    c. adding clay to the original form with the score, slip, smear technique

2. **LEATHER-HARD STAGE**
    a. carving and incising
    b. Sgraffito - producing a design by scratching through a layer of clay slip to expose the color of the clay body
    c. Slip Trailing - using a syringe or squirt bottle to apply slip or glaze to the moist or leather-hard stage of a clay form

3. **GREENWARE STAGE**
    a. Color Oxides or Stains - applied to greenware in consistency of watercolor.
    b. Wax Resist - used to paint designs that will be left free of glaze
    c. Glazes can be cautiously applied to greenware. Glazing must be done quickly to prevent uneven moisture absorption and cause cracking.

4. **BISQUE STAGE**
    a. After rinsing, glazes can be applied in 3 to 4 even coats.
    b. Sgraffito can be applied to a glazed pot. Glaze must not be too heavy or too dry or it will flake.
    c. Oxides or stains can be brushed decorations on a bisque body.
        i. Designs incised into plastic clay are usually brushed with oxides prior to glazing.
    d. Wax resist used both over and under glaze.

Glazing

Glazing can be done at the greenware stage, however, it is most commonly done at the bisque stage. This is because the clay is sturdy enough to be handled without worry of fragility, yet the clay is porous enough to absorb the glaze.

PREPARATION FOR GLAZING

1. All surfaces of bisqueware should be rinsed with water to remove dust and oil to allow the glaze to adhere better to the pot.

2. If using the dipping technique to glaze, apply hot wax or liquid wax resist to the bottom of the pot.

METHODS OF GLAZE APPLICATION

1. Dip Glazing--This is the simplest.
    a. Plunge project into glaze, remove and allow excess glaze to run off.

2. Pouring Glaze - (use thinner glaze for this method)
    a. Pour glaze into the inside and turn as the glaze pours out.
    b. Pour over exterior surface evenly

3. Brushing Glaze - (use full brush and work quickly)
    a. Brush on 3 to 4 coats of glaze over the entire surface evenly. Some glazes may require less or more coats

4. Spraying Glaze
    a. By using a spray gun the glaze can be thinly and evenly applied to the surface of the project. Do not use glazes that are not recommended for spray application (crystal glazes). The spray gun could get clogged.

Common Glaze Faults

Crawled glaze - In "crawling", blank or bald spots appear in the glaze surface after firing. Crawling may be caused by having a dusty or dirty surface, or applying the glaze heavily. Skin oils from excessive handling may clog clay pores, causing the glaze to repel. Hard spots in the clay surface created by excessive sponging or polishing of the greenware is also a cause. To attempt to salvage such a piece, apply additional glaze to the bare spot and refire, or cover the entire piece with a textured glaze and refire.

Cratered or bubbled glaze - In this situation, the craters develop as a result of body gases erupting through the glaze and "freezing" as the kiln cools. This condition is caused by underfiring. To salvage such a piece, grind down the high spots, apply a thin coating of glaze and refire to a higher temperature.

Pinholes - Pinholes are tiny indentations in the glaze surface which are generally no larger than the point of a pin. This fault may occur in almost any type of glaze, and is caused by underfiring in either the bisque fire or glaze fire. To salvage a piece, refire at a higher temperature.

Sagging glaze on a vertical surface - Sagging or running glaze is generally caused by too heavy an application of glaze. Some glazes "move" more than others. Be cautious.

Cracks in the body - When a crack occurs in the body, examine the glaze at the edge of the crack If the glaze is inside the crack or rounded over the corners, the break occurred early in the glaze firing, and was probably present in the clay body before the piece was glaze fired.

In some instances a project will crack during a glaze firing. This can be caused by an excess of water used in the original cleanup of the greenware. Too much moisture applied to an area of greenware causes that area to expand while the dry or slightly damp areas have already gone through normal shrinkage. Even if a piece of dry, cleaned greenware shows no visible cracks, it is possible an internal stress is there. This crack can open up during later firings. If the glaze at the edge of the crack is sharp, the break developed after the glaze was fired. This type of crack is usually due to opening the kiln door or peepholes while the ware is still hot.

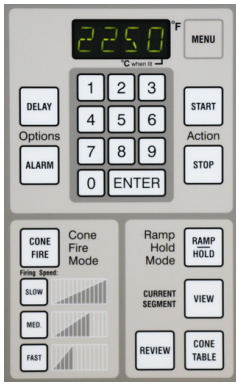
Crazing - Crazing is characterized by a network of fine cracks in the glaze surface. It may be caused by underfiring bisque, clay or glaze, incompatible clay and glaze, or by opening the kiln door before the ware is completely cooled. Crazing may be eliminated by refiring the piece to a temperature one cone higher than the original firing.

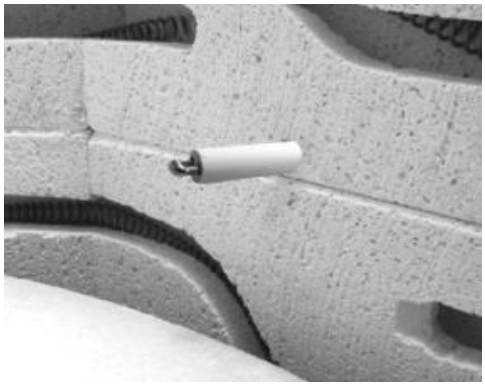
Aftercrazing - Crazing that occurs days or months after the piece has been fired. Although the finish may look perfect when it is first removed from the kiln, crazing may occur. While underfiring may not be the direct cause of immediate crazing, it is the major cause of delayed crazing. To correct it, refire the piece.

FIRING THE KILN

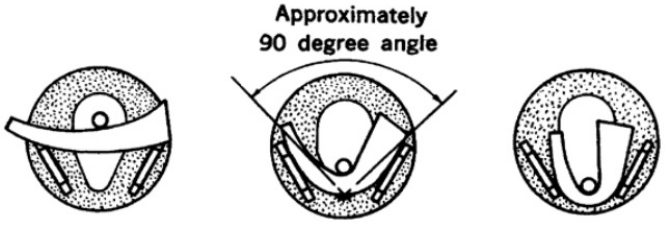
Projects undergo two firings: the **Bisque** firing and the **Glaze** firing.

1. When your projects are bone dry, they can be fired for the first time. **Bisque** firing is usually a low firing at cone 04 1926°F.
    - With the door open about an inch, the kiln is heated very slowly to allow any residual moisture to escape from projects as well as the kiln. This process is called ***Candling***. This helps to prevent projects from exploding.
    - Clay undergoes various chemical changes. By approximately 660 degrees, all atmospheric moisture is gone, causing little or no shrinkage.
    - During the ***Water Smoking*** period between 950 deg. and 1300 deg., considerable shrinkage occurs as chemically combined water and gases leave the clay.
    - Between 1750 deg. and 1850 degrees the clay gets stronger and begins to mature. It undergoes a process called ***Sintering***. This is when the surface of the clay particles start to bond to one another. The particles move closer to one another and the clay becomes denser.
    - Bisque pottery is hard but porous. That means that it will absorb water but won't dissolve.
2. **Glazed** ware is usually fired to seal the surface. Glaze coats the pottery in a glassy layer that makes the pottery water-resistant and sometimes waterproof.
    - The temperatures used for low fire glazes are cones 06 to cone 05. For high fire glazes the cones used are cones 5 through 10. At South Newton, we use **cone 05** for glaze firings.
    - Some of the materials in glaze are known as glass-formers (***Silica***). Once they reach a certain temperature, they melt and form liquid glass.
    - The ***Thermocouple*** is a temperature gauge used to turn the kiln off when it reaches a certain temperature in the electric kiln that has a digital controller.





    - If the kiln is a manual kiln, it has a ***Pyrometric Cone*** that is a temperature gauge used to turn the kiln off once it starts melting and drops in the kiln sitter cone supports.



PYROMETRIC CONES AND TEMPERATURE EQUIVALENTS

Cone Number	Final Temperature
10	2345°F
9	2300°F
8	2273°F
7	2228°F
6	2199°F
5	2165°F
4	2142°F
3	2109°F
2	2091°F
1	2080°F
01	2046°F
02	2017°F
03	1990°F
04	1926°F
05	**1891°F**
06	1819°F
07	1787°F
08	1737°F
09	1683°F
010	1632°F
011	1607°F
012	1575°F
013	1542°F
014	1488°F
015	1452°F
016	1411°F
017	1353°F
018	1314°F
019	1243°F
020	1159°F
021	1112°F
022	1087°F