

|   |   |                          |
|---|---|--------------------------|
|  | Work Instruction<br><h1 style="text-align: center;">Slip, Glaze Mixing &amp; Control</h1> |                          |
| Revision: 03  | Procedure No.: WI-8.2.4.27  | Date Effective: 3/9/2022 |

## 1.0 Slip Mixing

### 1.1 Standard slip for ceramic infrared heaters (CRMR-1001)

- 1.1.1 Add water to container
- 1.1.2 Mix in dry clay components while agitating water. Start with fine mesh materials and end with coarse materials
- 1.1.3 Add Darvan as required during mixing and addition of dry clay components.
- 1.1.4 Continue to mix for at least three hours after all ingredients have been added
- 1.1.5 Weigh 50 ml of slip and record weight. Record slip container number, slip mixing date, mixer initial, and “checked by” initial of 50mL slip weight initial
- 1.1.6 Refer to Table 1 for acceptable limits on specific gravity. If measurement is outside of this range, notify supervisor or department manager for disposition on material
- 1.1.7 If transferring slip to another container, mix thoroughly before transferring

### 1.2 Near-zero expansion slips for VS Glow and select ceramic infrared heaters (CRMR-1015 and CRMR-1019)

- 1.2.1 Add water to container
- 1.2.2 Add Darvan to container in its entirety, as written in formula
- 1.2.3 Mix in dry clay components slowly. Add very small amounts of Darvan only as necessary, and as little as is necessary
- 1.2.4 Continue to mix for at least 15 minutes after all ingredients have been added
- 1.2.5 Weigh 50 ml of slip and record weight. Record slip part number instead of container number, slip mixing date, mixer initial, and “checked by” initial of 50mL slip weight initial
- 1.2.6 Refer to Table 1 for acceptable limits on specific gravity. If measurement is outside of this range, notify supervisor or department manager for disposition on material
- 1.2.7 If transferring slip to another container, mix thoroughly before transferring

|   |   |                          |
|---|---|--------------------------|
|  | Work Instruction                          |                          |
|   | <h1>Slip, Glaze Mixing &amp; Control</h1> |                          |
| Revision: 03  | Procedure No.: WI-8.2.4.27                | Date Effective: 3/9/2022 |

## 2.0 Glaze Mixing

- 2.1 Add water to container
- 2.2 Add all ingredients except CRM-101-113 to container
- 2.3 Mix at least 30 seconds
- 2.4 Add CRM-101-113 while mixing
- 2.5 Mix thoroughly for two hours minimum
- 2.6 Weigh 50 ml of glaze and record weight, which glaze mixture, mixer initial, and 50 ml "checked by" initial
- 2.7 Refer to Table 1 for acceptable limits on specific gravity. If measurement is outside of this range, notify supervisor or department manager for disposition on material
- 2.8 Strain glaze mixture through mesh screen before use

## 3.0 Specific Gravity Measurement

- 3.1 Mix glaze or slip well before measuring
- 3.2 Put empty graduated cylinder on scale and zero the scale
- 3.3 Fill graduated cylinder to 50 ml
- 3.4 Weigh graduated cylinder and record value on the scale in the specific gravity log

## 4.0 Viscosity Measurement & Control

- 4.1 Viscosity to be measured with stopwatch and Ford viscosity cup, 0.156" hole size. Slip and glaze should be measured daily and adjusted as necessary
- 4.2 Make sure cup is clean and hole at bottom of cup is free from obstructions
- 4.3 Fill cup or dip entire cup into container of slip or glaze
- 4.4 Remove cup and begin stopwatch the moment the slip or glaze starts to flow out of the cup
- 4.5 Stop timer when flow out the bottom of the cup stops
- 4.6 Verify cup is empty. If empty, time on stopwatch is correct. If not empty, check for obstructions and measure again. If no obstructions, disregard time and treat material as having too high viscosity
- 4.7 Compare time taken to time on table 2
  - 4.7.1 If time falls within acceptable range for that material, no adjustment is needed
  - 4.7.2 If glaze is too thick, add in small amounts of water, mix thoroughly, and re-test viscosity. Changes in specific gravity can be ignored here, because the change will be small.
  - 4.7.3 If glaze is too thin, add in small amounts of Epsom salt (CRM-101-151), mix thoroughly, and re-test viscosity
  - 4.7.4 If slip is too thick, add in small amounts of deflocculant (CRM-101-106), mix thoroughly, and re-test viscosity
  - 4.7.5 If slip is too thin, notify department manager or supervisor



Work Instruction

# Slip, Glaze Mixing & Control

Revision: 03

Procedure No.: WI-8.2.4.27

Date Effective: 3/9/2022

| Material                           | Min. drain time (seconds)   | Max. drain time (seconds) |
|------------------------------------|---|---------------------------|
| CRMR-1001 Slip (in mixing room)    | 30  | 35                        |
| CRMR-1001 Slip (in tanks on floor) | 32  | 45                        |
| CRMR-1015 Slip                     | Too thick to be measured with Ford cup. Thin just enough so slip pours well from a cup. |                           |
| CRMR-1019 Slip                     |   |                           |
| White glaze                        | 19  | 22                        |
| Coral glaze                        | 19  | 22                        |
| Yellow glaze                       | 19  | 22                        |
| Black glaze                        | 26  | 30                        |
| Extra white glaze                  | 26  | 30                        |
| Extra coral glaze                  | 26  | 30                        |

Table 1: Acceptable Ford cup times for different mixtures

| Material          | Min. 50 ml weight (g) | Max. 50 ml weight (g) |
|-------------------|-----------------------|-----------------------|
| CRMR-1001 Slip    | 89.18                 | 92.82                 |
| CRMR-1015 Slip    | 89.67                 | 93.33                 |
| CRMR-1019 Slip    | 89.67                 | 93.33                 |
| White glaze       | 63.70                 | 64.93                 |
| Coral glaze       | 63.70                 | 64.93                 |
| Yellow glaze      | 63.70                 | 64.93                 |
| Black glaze       | 63.04                 | 59.96                 |
| Extra white glaze | 63.70                 | 64.93                 |
| Extra coral glaze | 63.70                 | 64.93                 |

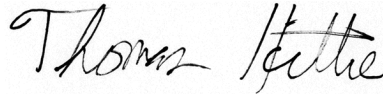

Table 2: Acceptable 50 ml weights for different mixtures

|   |                              |                          |
|---|------------------------------|--------------------------|
|  | Work Instruction             |                          |
|   | Slip, Glaze Mixing & Control |                          |
| Revision: 03  | Procedure No.: WI-8.2.4.27   | Date Effective: 3/9/2022 |

#### Revision History

| Revision Level | Date of Revision | Sections                          | Description of Change   | Initial |
|----------------|------------------|-----------------------------------|---|---------|
| 00             | 5/25/2009        | All                               | Initial Release   | -       |
| 01             | 2/22/2010        | 3.1;<br>3.3;<br>4.1 & 4.2;<br>4.3 | <p><b>Change in Wording:</b></p> <p>if a change is noticed in the thixotropic structure of the slip then small additions of electrolyte are allowed that would not affect the final physical characteristics of the heater, i.e. thermal expansion. It is recommended that small additions of electrolyte be added at a time and its effects on the thixotropic structure recorded;</p> <p>Range changed from 1.79 - 1.81 to 1.81 - 1.85 to better control of slip rheology;</p> <p>If measured specific gravity is out of the approved range, notify immediately to production engineer. Do not use it;</p> <p>Mixing instructions for Glaze Formulations.</p> | -       |
| 02             | 6/11/2012        | All                               | Complete rewrite - too much detail in some areas, incomplete or wrong information in others   | TCH     |
| 03             | 3/9/2022         | All                               | Introduce numbering structure; remove note regarding access to formulations; remove note within step 1.1.3; slips were mixed for one hour; remove old notes 1e and 1f for slip mixing; slip weight measurement was between 90.0 and 92.5 g; "checked by" initial was "witness" in note 1.1.5 and note 2.6; add what information to record in note 1.2.5; steps 2.2 and 2.4 were reversed; added step 2.3; "CRM-101-113" was "suspension agent" in note 2.4; glaze was mixed for only one hour; was 62.5 g maximum in note 2.7; added section 3 for specific gravity   | TCH     |

#### Authorization

| Position                         | Held By       | Signature   |
|----------------------------------|---------------|---|
| Product Manager                  | Thomas Hittie |  |
| Senior Management Representative | Samir Patel   |   |