CEMENT AND CONCRETE REFERENCE LABORATORY

Calibration Material for ASTM C230 Flow Table
Flow Lot - R

Instructions for the Preparation and Use of Flow Table Calibration Material

SAFETY PRECAUTIONS: contains mineral oil and silica flour (call for SDS if needed)

IMPORTANT - Do NOT allow water to get into the calibration mixture during preparation or use. It has been found that even A FEW DROPS may decidedly affect the flow. Do not use water to clean the flow table prior to using the flow material.

1. **Apparatus for mixing calibration material** - The laboratory should have the following equipment available before opening the individual containers of the calibration material:

   a. Clean, dry metal spatula with a blade 1 inch wide.

   b. Balance - conforming to standard specification ASTM C1005, readable to 0.1 g.

   c. Clean, oven-dry, wide-mouth glass jar (do not use a can or other metal container) of 1 quart capacity, with screw-on lid. (If the lid has a rubber gasket, do not allow the rubber to come in contact with the calibration mixture.)

2. (a) **Weighing** - Tare the glass jar on the mix balance, and weigh into the jar **400** grams of the special mineral oil that has been furnished. Open the bag of dry material and weigh out **500** grams of that material in a separate container to later add to the oil as described in Section 3.

   (b) **Check on Weighing** - Check the residues left in the sample containers. There should be about 40 to 60 grams of oil and 20 to 30 grams of dry material remaining. If the residues vary appreciably from these values, the weights obtained in Section 2 (a) should be checked before the materials are mixed.

3. **Mixing** - Gradually add the dry material to the oil in the glass jar, while stirring the mixture continuously with the spatula. After all 500 grams of powder have been added to the oil, stir the mixture with the spatula for at least 10 minutes. To prevent breaking the jar do not strike the bottom of the jar with the spatula during mixing. Then allow the mixture to stand in the tightly closed jar for 24 hours before its first use.

4. **Preparation of Flow Table** - Make sure that the vertical shaft of the flow table is clean and lubricated with a thin oil. There must be no accumulation of oil between the contact shoulder of the tabletop and the arresting frame. Drop the table 5 or more times just before the calibration test to ensure that the table is operating freely. Mark the tabletop so that each complete test may be made in a predetermined position [See Section 5 (h)]. Thoroughly clean and dry the flow tabletop and the flow mold with a clean, dry cloth before the first flow determination. Do not oil the mold before use.

5. **Flow Test** -

a) Apparatus to perform flow test - Clean flow mold of specified dimensions and calipers conforming to ASTM Standard C230. Metal straightedge to strike off the excess calibration material and thermometer to take the temperature of the calibration material.

b) It is intended that this test be conducted at a temperature of approximately 23° C, and results obtained at temperatures varying more than 5° C from that temperature should not be considered as reliable. The calibration material itself should be close to 23° C when used. If possible, check the temperature of the material while it is still on the table, just after the flow readings have been made. **The flow material should be stored in a temperature range of 20° to 25° C, as extreme temperatures can cause instability and permanent changes to the flow value of the material.**

c) Prior to performing the initial flow test the calibration material must sit for a minimum of 24 hours. Carefully center the clean flow mold on the flow tabletop. Stir the flow sample in the storage container with a spatula for at least 30 seconds. Fill the flow mold carefully, spading the material with the spatula blade to minimize "honeycombing". (Note: Avoid touching the tabletop with the end of the spatula, as the sharp edge of the hardened blade may mar the top of the table.)

d) Using a sawing motion, strike off the excess material with a straightedge, making two passes at right angles to each other. The excess material removed should be returned to the glass jar.

e) Remove the flow mold **vertically and without twisting, very slowly** so that the mixture does not adhere to the mold. The time required to remove the mold should be 1 to 1½ minutes. If more than 5 grams of the material remain in the mold, the test is invalid. The material must be removed, and the filling and mold removal procedure repeated with less than 5 grams of material remaining in the mold.

f) Drop the table 25 times in approximately 15 seconds. Using calipers (specified in ASTM C230) measure four diameters of the mixture, recording measurements to the nearest 0.1 percent. The sum of these four values represents the flow value. (Note: The flow may be defined as the resulting increase in average diameter of the mass expressed as a percentage of the original diameter.)

g) Upon completion of the flow determination, note the temperature of the calibration material and discard the test results if not within 23±5°C. Use the spatula to carefully remove all of the calibration mixture from the flow table, and return it to the glass jar. Before each additional flow test, wipe the top of the tabletop with a clean, dry cloth.

h) Repeat the test with the tabletop in three additional positions (at 90, 180 and 270 degrees from the first positions). If a flow varies by more than 2% from the average of the other three determinations, discard the results of that test and repeat the test at that position. Repeated variation form the average at a particular position may indicate a problem with the table at this particular orientation.

i) After completion of the flow tests, promptly return the calibration mixture to the glass jar and secure the lid to prevent the introduction of moisture.

6. **Use of Results** - If the average of the flow values, as described above, varies appreciably (±5 %) from the flow value assigned to the sample of calibration material used in the tests, the details of the flow table, and its mounting, should be carefully checked for compliance with the requirements of C230. If the flow value obtained with the tabletop in some positions does not agree with the value observed in other positions, it is suggested that the vertical shaft be checked for warping or bending, and that the contact faces between the tabletop and the arresting frame be checked for continuous contact. Other details that might also be taken into consideration are listed in the "Flow Table."

7. As previously mentioned, this mixture is greatly affected by moisture and temperature. Store the calibration in a dry environment at a temperature of between 20 to 25°C in a sealed jar. If stored properly, the flow properties of the material should remain substantially unchanged for a considerable period of time. After an extended period of non-use, some separation of the powder and liquid is normal. Make sure that this separation is eliminated by thoroughly mixing the calibration material before reuse. Eventually, the material may develop a rapidly increasing flow, finally becoming quite fluid. If this should occur, the calibration mixture should be discarded.

8. Please send the enclosed report of the results obtained and comments to:

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