

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
MATERIALS CONTROL, SOILS AND TESTING DIVISION

MATERIALS PROCEDURE

CALIBRATION OF THERMOMETERS AND PYROMETERS AT BITUMINOUS
CONCRETE MIXING PLANTS

1.0 PURPOSE

1.1 To provide a test procedure for field calibration of thermometers and pyrometers used at bituminous concrete mix in the truck.

2.0 SCOPE

2.1 This procedure is applicable to devices used to measure temperature in bituminous material lines, temperature in aggregate dryers, and temperature of the completed mix on the truck.

3.0 CALIBRATION

3.1 Thermometers and pyrometers shall be calibrated at least once per year.

4.0 CALIBRATION TEMPERATURE RANGE

4.1 Devices used to measure in the bituminous material lines shall be checked at a minimum of three different temperatures, over a range extending from approximately 25^oF below to 25^oF above the normal dryer operating temperature.

4.2 Devices used to measure the temperature of the mix in the truck shall be checked at intervals of approximately 25^oF through the range of temperature permitted by the specifications for the type of materials to be produced.

5.0 TEST PROCEDURES

- 5.1 The following materials will be needed: a sample can or other suitable container of at least two gallon capacity; sufficient oil, asphalt or sand to fill the container; a source of heat, such as a hot plate, propane stove or oven; and a calibrated thermometer. Calibrated thermometers may be obtained from the Materials Control, Soils and Testing Division.
- 5.2 Fill the container with sand, oil, or asphalt. Sand is preferable, if the test is to be conducted outdoors, since it retains heat longer than oil or asphalt. In order to reduce testing time, hot asphalt from the storage tank, or hot sand from the dryer may be used.
- 5.3 Heat the material to the first test temperature and remove from the heat source.
- 5.3.1 If using sand, stir the sand thoroughly, and place the calibrated thermometer and the device being tested in the sand, positioned so that the temperature measuring elements are as close together as possible and are located near the center of the container.
- 5.3.2 If using oil or asphalt, place both the calibrated thermometer and the device being calibrated in the container, positioned so that the temperature sensing elements are located as close together as possible, and stir the oil or asphalt to equalize the temperature.
- 5.4 If a pyrometer is being tested, leave the protective shield in place, and be sure that the temperature sensing element is completely immersed in the liquid or sand.
- 5.5 Wait until the temperature indicated by both devices has stopped rising and either remains constant or begins to drop slightly. Then record the temperature indicated by both devices.


- 5.5.1 If there is an excessive temperature drop (more than two degrees per minute) it will be difficult to obtain accurate test results, especially if one thermometer responds to a change in temperature faster than the other. In order to decrease the temperature loss, place the container on a hot plate or propane stove and apply sufficient heat to reduce the rate of temperature decrease.
- 5.5.2 In order to obtain greatest accuracy, the temperature should be recorded as soon as both temperature measuring devices have reached equilibrium. It does not matter if this is not exactly the temperature specified, since the temperatures specified in Section 4 of this MP are approximate.
- 5.6 Heat, or cool the material to the next test temperature. Repeat the test procedure. When using sand, be especially sure to stir thoroughly in order to equalize the temperature throughout the containers.
- 5.7 Apply correction factors to the temperatures recorded for the calibrated thermometer. These are obtained from the calibration chart which is furnished with the calibrated thermometer.
- 5.8 Plot the test data on graph paper. An example is shown in Attachment A.
- 6.0 USE CALIBRATION DATA
- 6.1 Bituminous Mixture Thermometers
- These thermometers are used to determine compliance with temperature specifications, and therefore, it is important that they be accurate. Correction factors, from the calibration graph, should be applied when determining compliance with temperature specifications.

6.2 Bituminous Line Thermometer

The primary reason for checking this thermometer is to see that it is working properly and is reasonably accurate. If the thermometer does not operate properly, it should be repaired or replaced. If it does not operate properly, but there is a significant error in the temperature, the error should be taken into account when setting the bitumen temperature.

6.3 Dryer Pyrometer -

A properly adjusted pyrometer is probably more accurate than the thermometer used to check it. A slight temperature difference between pyrometer and calibrated, thermometer is considered significant and may be ignored. However, in such cases, the calibration graph should be drawn and kept on file to show that the pyrometer was checked and found to be accurate. If there is a large difference in temperature between pyrometer and calibrated thermometer, it should be assumed that the pyrometer is in error, and this error should either be taken into account when setting the dryer temperature, or the pyrometer should be adjusted.



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Attachment

