STATE OF CALIFORNIA-BUSINESS, TRANSPORTATION AND HOUSING AGENCY

DEPARTMENT OF TRANSPORTATION ENGINEERING SERVICE CENTER Transportation Laboratory 5900 Folsom Blvd. Sacramento, California 95819-4612



METHOD OF OPERATION AND CALIBRATION OF THE ELECTRONICALLY CONTROLLED COMPACTOR

CAUTION: Prior to handling test materials, performing equipment setups, and/or conducting this method, testers are required to read "**SAFETY AND HEALTH**" in Section F of this method. It is the responsibility of the user of this method to consult and use appropriate safety and health practices and determine the applicability of regulatory limitations before any testing is performed.

A. SCOPE

This method describes the procedures for operating and calibrating the electronically controlled kneading compactor used for fabricating test specimens of treated and untreated soils, untreated aggregates, and bituminous mixtures. All compactors shall be calibrated immediately after repairs (this includes new or replacement parts, or mechanical or electrical adjustments) that may in any way affect the characteristics of the compacted specimen or the values displayed. Calibration is required immediately after a compactor is relocated, or whenever there is a reason to doubt the accuracy of the indicated load, regardless of the time interval since the last calibration.

B. APPARATUS

- 1. A mechanical compactor and accessories. See Figure 1.
- A load indicating device capable of measuring applied dynamic loads up to 8900 N to the nearest 50 N such as a load cell with a strip chart recorder or a calibrated spring device (Figure 4).
- 3. A $100 \pm 2 \text{ mm}$ diameter rubber disc $3 \pm 0.5 \text{ mm}$ thick.
- 4. A steel plate, 127 ± 2 by 152 ± 2 by 13 ± 2 mm thick with a 63.5 ± 0.5 mm diameter by 9.5 ± 0.5 mm deep recess cut in the center of the plate.

C. PRINCIPLE OF OPERATION

hydraulic system.

- The mechanical compactor is used to fabricate specimens for testing in the stabilometer.
 Operational guidelines for this equipment are described in California Tests 301, 304, 373, 375, 377, and 378.
- 2. The energy required for compaction is developed from a self-contained pressure compensated
- 3. The tamping foot may be raised or lowered through a maximum distance of 254 mm. Provision is made for individual adjustments of down stroke rate, up stroke rate, up stroke return distance and dwell in the down position. To obtain the required pressure curve, the force at the tamper foot is controlled by a hydraulic pressure regulator and a cushioning device. To compensate for any variation in specimen height automatically, a pressure sensitive device is used to determine the threshold point at which the tamping foot has encountered resistance.
- 4. The rotating table is activated by a hydraulic actuator and electronically timed to the tamper foot. The rotation is variable in infinite increments between 6 and 72 degrees for each tamper stroke. The travel adjustment can be set by the operator.

NOTE: Tamper foot rounded edges can result in low stabilometer values. Whenever rounding is observed on a tamper foot that is used for bituminous mixes, compact and test a standard sample to determine the acceptability of the foot. Fabricate the standard sample using a material that consistently results in the same test value.

D. PROCEDURE FOR CALIBRATION

- Stop the turntable rotation during the compaction operation and place the steel plate and rubber disc on the turntable. Place the load indicating device on the rubber disc. Ensure that it is centered under the compactor foot.
 - Start the compactor, turn on the recorder and adjust the compactor foot pressure to an indicated 2.41 or 3.45 MPa on the chart. Ensure that the shape of the curve (Figure 2) is free of "chatter" or evidence of impact associated changes in slope and adjust to achieve the following: (Note the chart speed when determining times.)
 - a. The time required to increase the foot pressure from 0.24 to 2.07 MPa shall be not less than 0.07 s nor more than 0.20 s for the 2.41 MPa foot pressure setting.
 - b. The time required to increase the foot pressure from 0.34 to 2.93 MPa for the 3.45 MPa foot pressure setting shall be not less than 0.07 s nor more than 0.25 s.
 - c. The tamper foot shall produce a dwell of not less than 0.15 s or more than 0.45 s. The dwell time is the time interval during which the tamper foot is delivering 2.07 MPa or more to a soil or aggregate specimen or 2.93 MPa or more to a bituminous mix specimen.
 - d. The pressure release time shall not be greater than 0.60 s.
 - e. The time interval between tamp initiation shall be 2 s.
 - f. After adjusting the time sequences, obtain recorder traces for the 2.41 MPa and the 3.45 MPa (4980 and 7120 N, respectively) foot pressures for the calibration records.
 - g. If the dial reading does not agree with the strip chart, remove the glass cover from the pressure gage and adjust the needle (or record the gage reading on the calibration report).
 - h. Place the spring deflection device under the compactor foot and note the deflection readings for 4980 N and 7120 N and record these values on the calibration report. This device can be used to check the calibration of the compactor later if the calibration becomes questionable.
 - i. After removing all calibration equipment from the turntable, start the compactor and adjust the

turntable movement to 6 ± 1 tamps per revolution.

E. HAZARDS

Caution must be exercised when operating the compactor since the compactor foot can cause severe injury if the operator's hand is caught between the compactor foot and the load-indicating device. A clear plastic guard should be installed on the compactor and then used as an aid in safeguarding against this hazard.

F. SAFETY AND HEALTH

Prior to handling, testing or disposing of any waste materials, Caltrans testers are required to read: Part A (Section 5.0), Part B (Sections: 5.0, 6.0 and 10.0) and Part C (Section 1.0) of Caltrans Laboratory Safety Manual. Users of this method do so at their own risk.

REFERENCES:

California Tests 301, 304, 373, 375, 377 and 378

End of Text (California Test 104 contains 4 pages)



FIGURE 1 - COMPACTION MOLD IN KNEADING COMPACTOR



FIGURE 2 - TYPICAL TIME-LOAD CURVE



FIGURE 3 - TAMPER SHOE FOR THE MECHANICAL COMPACTOR



FIGURE 4 - SPRING DEFLECTION DEVICE FOR CALIBRATING THE COMPACTOR