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METHOD OF TEST FOR OPERATION AND CALIBRATION OF THE ELECTRONIC HYDRAULIC KNEADING COMPACTOR

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 must 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. REFERENCES

California Test 301 – Resistance "R" Value of Treated and Untreated Bases, Sub-base and Basement Soils by the Stabilometer
California Test 304 – Preparation of Hot Mix Asphalt for Test Specimens
California Test 373 – Unconfined Compressive Strength of Lime Treated Soils and Aggregates
California Test 375 – In-Place Density and Relative Compaction of Hot Mix Asphalt Pavement Using Nuclear Gages
California Test 377 – Percent and Grade of Recycling Agent to Use for Hot Recycling of Asphalt Concrete
California Test 378 – Percent and Grade of Recycling Agent to Use for Cold Recycling of Asphalt Concrete

C. APPARATUS

1. Compactor: an Electronic Hydraulic Kneading Compactor and accessories (Figure 1).

2. Load Indicating Device: a load indicating device capable of measuring applied dynamic loads up to 2,000 lb sensitive to the nearest 10 lb such as a load cell with a strip chart recorder and a calibrated spring device (Figure 5).

3. Rubber Disc: a 3.90 in. ± 0.08 in. diameter rubber disc 0.12 in. ± 0.02 in. thick and having a durometer hardness of 80 ± 5 (Garlock 22 or equivalent).

4. A steel plate, 5.0 in. ± 0.08 in. × 6.0 in. ± 0.08 in. × 0.51 in. ± 0.08 in. with a recess 2.5 in. ± 0.02 in. diameter by 0.37 in. ± 0.02 in. deep cut in the center of the plate.

D. PRINCIPLE OF OPERATION

1. The compactor is used to fabricate specimens for testing in the stabilometer.

   Operational guidelines for the kneading compactor are described in California Test Methods 301, 304, 373, 375, 377, and 378.

2. The energy required for compaction is developed from a self-contained pressure compensated hydraulic system.

3. The tamping foot can be raised or lowered through a maximum distance of 10 in. 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.

   NOTE: Rounding of the tamper foot edge at the mold side can result in low stabilometer values. Whenever rounding is observed on a tamper foot that is used for bituminous mixes, the tamper foot needs to be rotated. If three sides of tamper foot are rounded, the tamper foot needs to be replaced or reshaved.

4. The rotating table is activated by a hydraulic actuator and electronically timed to the tamper foot. The turntable rotation should be set at 6 segments ± 1 segment or between 52 and 72 degrees per segment for each tamper stroke.

   The travel adjustment can be set by the operator and must be verified after warm up procedure at beginning of each test.

E. PROCEDURE FOR CALIBRATION

Warm-up the compactor by placing a "dummy" specimen into the mold and exercising the compactor at 350 psi for 300 tamps.

1. 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.

2. Start the compactor, turn on the recorder, and adjust the compactor foot pressure to an indicated 350 to 500 psi 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:

   a. The time required to increase the foot pressure from 35 to 300 psi for the 350 psi foot pressure setting must be not less than 0.07 s nor more than 0.20 s.

   b. The time required to increase the foot pressure from 50 to 425 psi for the 500 psi foot pressure setting must be not less than 0.07 s nor more than 0.25 s.

   c. The tamper foot must 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 300 psi or more to a soil or aggregate specimen or 425 psi or more to a hot mix asphalt specimen.

d. The pressure release time must not be greater than 0.60 s.

e. The time interval between tamp initiation must be approximately 2 s.

f. After adjusting the time sequences, obtain recorder traces for the 350 psi (1,100 lb applied load) and 500 psi (1,571 lb applied load) 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 1,100 lb and 1,571 lb applied loads 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 tamps ± 1 tamp per revolution.

NOTE: Compactors that are used to run both R-values (for soils) and S-values (for HMA), and do not have the capability of holding more than one test parameter, must follow test parameters specific to the type of test being run. The operator must make sure that the correct operating parameters are being used (input manually) when the compactor is changed from one test to another. These parameters are determined during the calibration process and must be noted both in the report and attached to the machinery for operator convenience (Table 1).

This procedure is applicable to the Cox and Sons Compactors with touch screen, e.g., Model CS 1000 A, Model CS 1000 B, and Model CS 1000 C.

TABLE 1

Compactor Setup

Parameters	**R-Value**	**S-Value**
Dwell Timer		
Return Stroke Timer		
Turn Table Delay		
Turn Table Timer		
Model:	Calibration Date:	
S/N:	Name of Calibrator:	

F. HEALTH AND SAFETY

It is the responsibility of the user of this test method to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. Prior to handling, testing or disposing of any materials, testers must be knowledgeable about safe laboratory practices, hazards and exposure, chemical procurement and storage, and personal protective apparel and equipment.

Caltrans Laboratory Safety Manual is available at:

http://www.dot.ca.gov/hq/esc/ctms/pdf/lab_safety_manual.pdf

End of Text
(California Test 104 contains 7 pages)

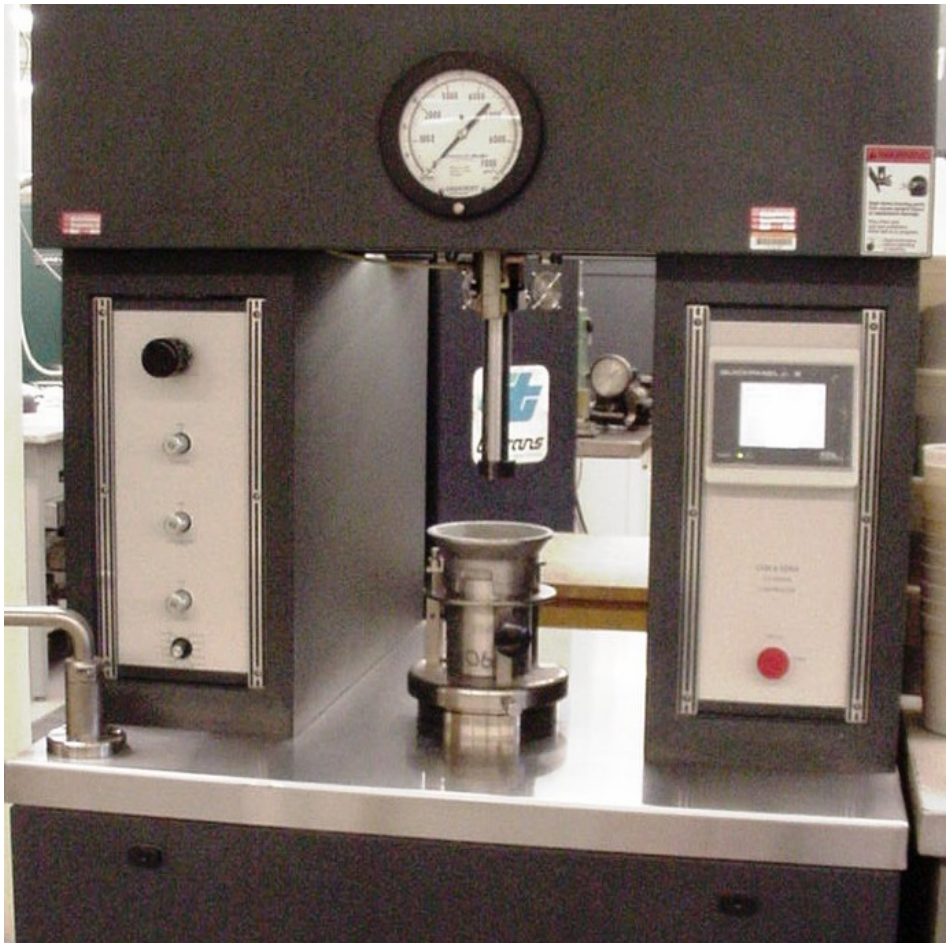

FIGURE 1. Compaction Mold in Kneading Compactor

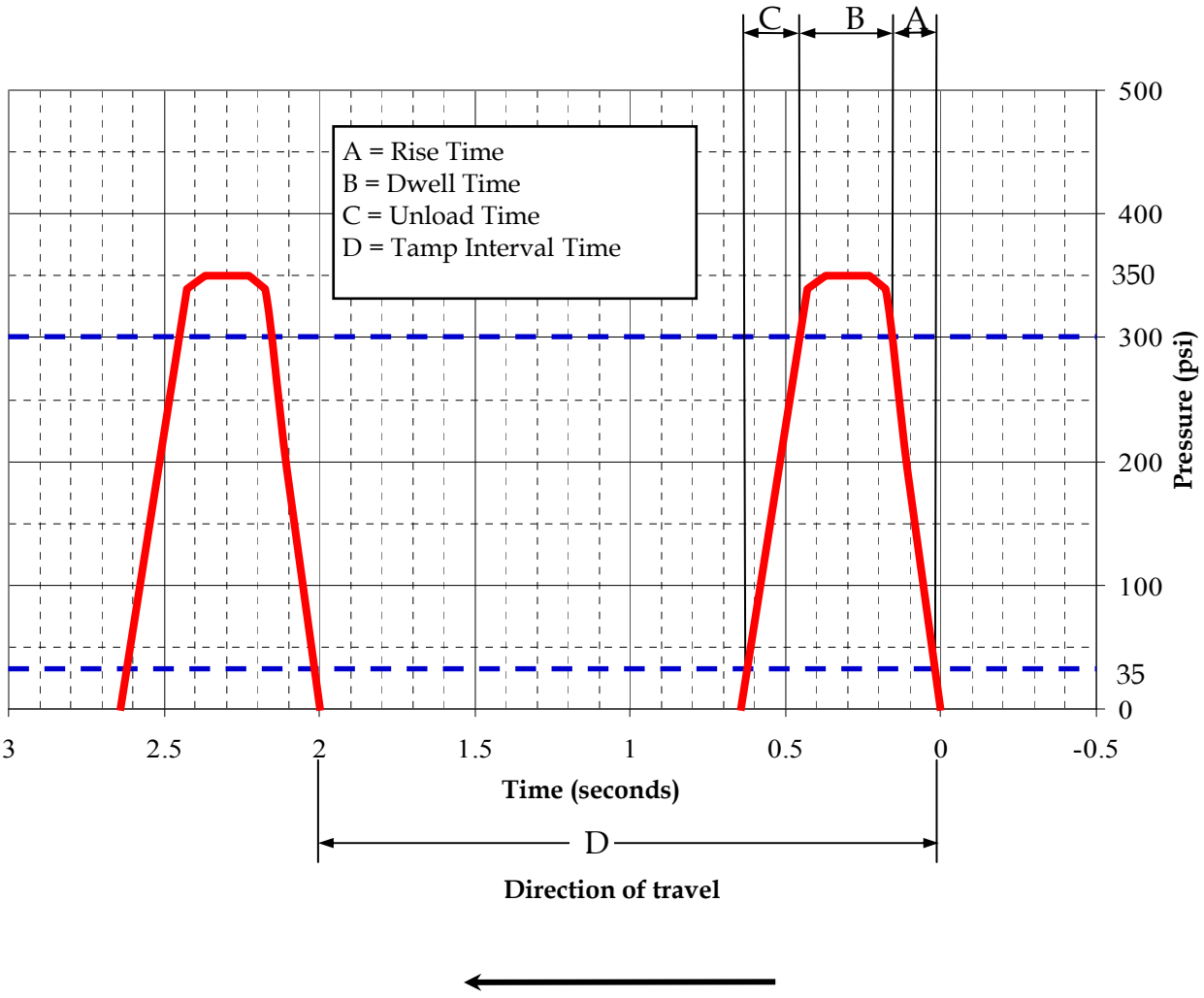

FIGURE 2. Typical 350 psi Time-Load Curve

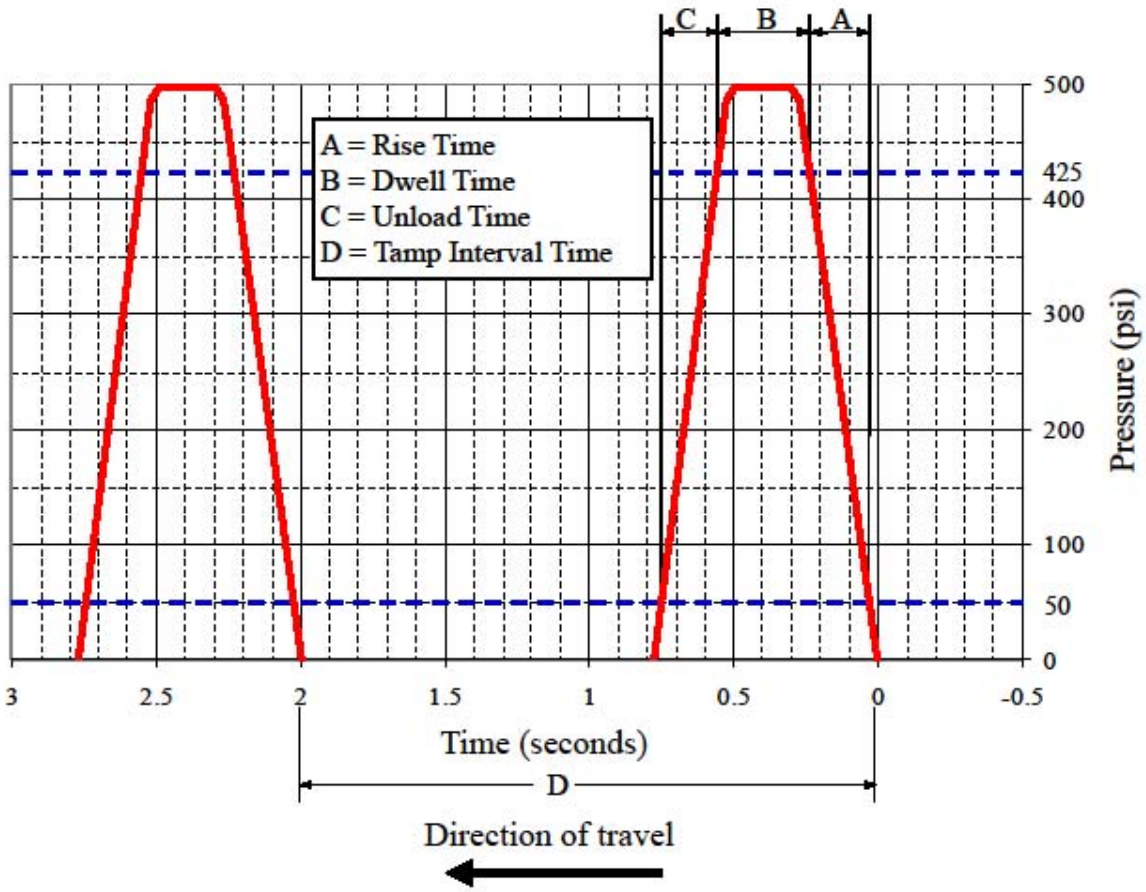

FIGURE 3. Typical 500 psi Time-Load Curve

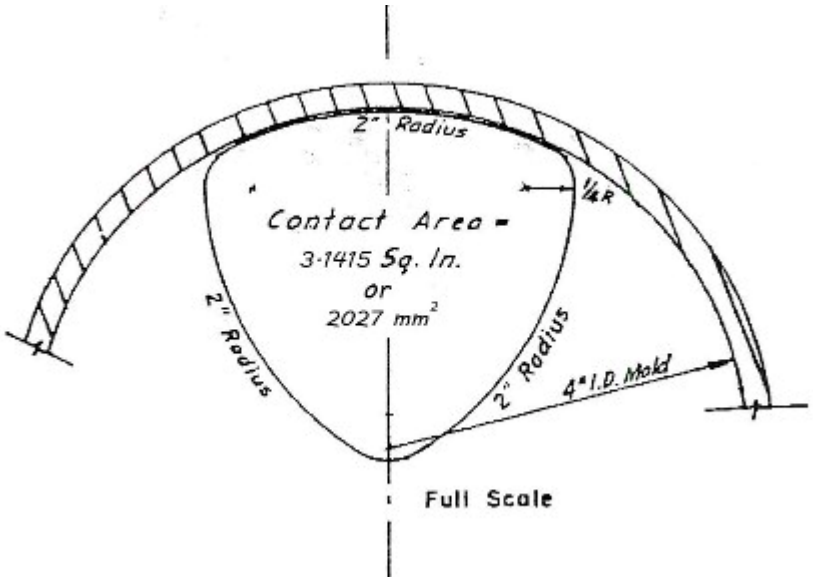

FIGURE 4. Tamper Foot for the Compactor

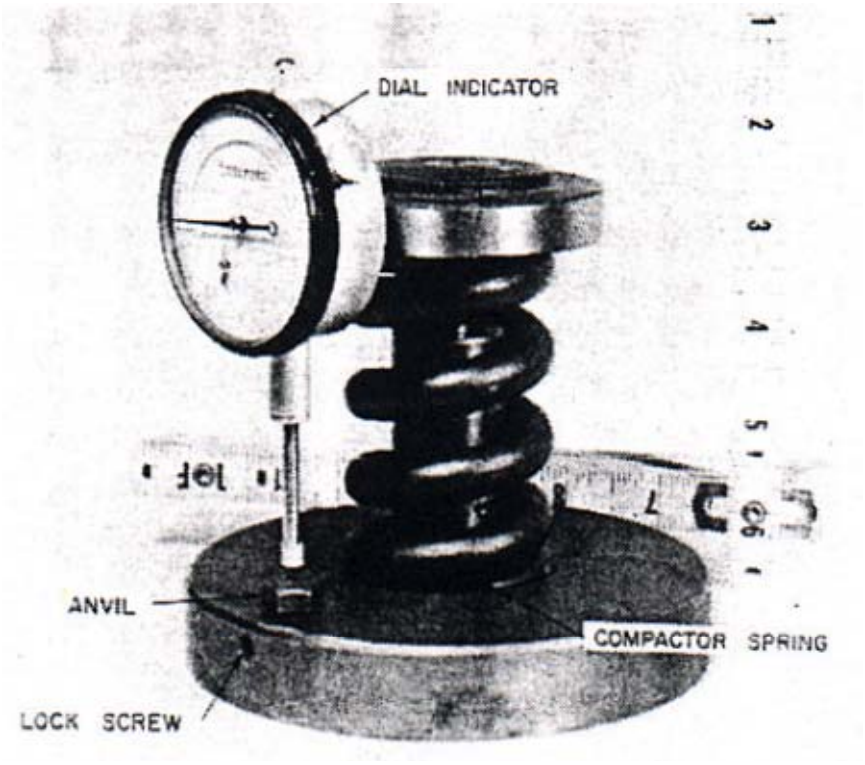

FIGURE 5. Spring Deflection Device for Calibrating the Compactor