PROCEDURES FOR THE VERIFICATION OF CRITICAL DIMENSIONS AND CALIBRATION OF MANUAL AND MECHANICAL RAMMERS AASHTO T 99 AND T 180

A. PURPOSE

These methods are intended to provide instruction for the verification of critical dimensions and calibration of mechanical rammers to manual rammers to insure precise correlation between final results.

B. APPARATUS REQUIRED

1. Calibrated calipers readable to 0.001 inch (0.025 mm).
2. Carpenter's level.
3. Ruler or measuring tape with a minimum of 18.0 inches (460 mm) and readable to 0.0625 inch (1.0 mm).
4. Protractor.
5. Balance with a capacity of 5,000 grams and readable to 1.0 gram.

C. PROCEDURE

1. Manual Rammers
   a. Measure and record diameter of face of rammer by taking two (2) readings at 90° apart with calipers.
   b. Pull up rammer against top of guide sleeve and measure with ruler or measuring tape from the bottom of rammer to the end of the guide sleeve. Measure to the nearest 0.0625 inch (1.0 mm) and record.
   c. Disassemble rammer and weigh to the nearest 1.0 gram and record. (Do not weigh guide sleeve.)
   d. Check vent holes near end of guide sleeve.
2. Mechanical Rammers
   a. Measure and record diameter of circular faced rammer by taking two (2) readings at 90° apart with calibrated calipers.

      Note: If sector faced rammers are in use, the face must have an area equal to that of a circular faced rammer with a diameter of 2 inches (50.8 mm). (Instructions are on Worksheet.)

   b. Check base of mechanical rammer with level. (Make any necessary adjustments to base.)
   c. Lower the rammer to rest on slightly compacted material in appropriate density mold. (Remove any material from the face of the rammer or base.)

d. With a ruler or tape, measure from the plastic disc on the rod of the rammer to a height of 12.0 inches (305 mm) or 18.0 inches (457 mm). Make a mark on the retaining rod at the desired height required by the appropriate AASHTO Test Method.

e. While the rammer is compacting, check to see if the rammer begins to free fall within ± 0.0625 inch (2 mm) at the mark and record.

f. Make necessary adjustments to cable until the specified free fall is obtained within ± 0.0625 inch (2 mm).

3. Calibration of Mechanical Rammers to Manual Rammers

a. Check critical dimensions on manual and mechanical rammers.

b. Mix approximately 5000 grams of soil with water at a point below optimum moisture. (Three soil types are to be used: clay, sand, silty sand, etc.)

c. Compact the material with hand hammer into appropriate mold in layers specified by AASHTO Test Method. (Density mold with collar and base must be on material at least 200 PCF [90 kg].)

d. Weigh material in mold on balance and record.

e. Compact unused portion of material with mechanical rammer.

f. Weigh material in mold and record.

g. Continue to make adjustments to mechanical rammer by adding or subtracting weight until identical results are obtained between the manual and mechanical rammer on all three soil types.

D. TOLERANCE

All equipment shall meet the specified tolerances indicated in AASHTO Test Methods T 99 and T 180.

EQUIPMENT VERIFICATION RECORD

Verified By: _____ Date: _____
Equipment: Manual Rammers / Mechanical Rammers Location (Lab): _____
Identification No.: _____ Verification Frequency: 12 months
Previous Verification Date: _____ Next Due Date: _____
Verification Equipment Used: Calibrated calipers, readable to 0.001 in., SN _____
Carpenter's level, ID No. _____ Protractor, ID No. _____
Ruler or measuring tape, minimum of 18 in. (457 mm) and readable to 0.0625 in.(1.0 mm), ID No. _____ ,Calibrated balance with a capacity of 5,000 g and readable to 1.0 g, SN: _____
Verification Procedure: (In-house) OMR-CVP-4 / AASHTO T 99; T 180

T-99 (5.5 lbs. / 2.495 kg) (Circular Face) Mechanical		QC No.		
1-	Diameter of face of rammer 1.985 – 2.010 in. (50.42 – 51.05 mm)?			Replace if necessary
2-	Height of drop 11.94– 12.06 in. (303 – 307 mm)?			Adjust if necessary
3-	Base level?			Adjust if necessary
T-180 (10 lbs. / 4.536 kg) (Sector Face) Mechanical		QC No.		
1-	Area of rammer face 3.095 – 3.157 in^2. (.001997 - .002037 m^2?			Replace if necessary
2-	Face of rammer flat?			Replace if necessary
3-	Height of drop 17.94– 18.06 in. (455 – 459 mm)?			Adjust if necessary
4-	Base level?	Yes	No	Adjust if necessary
Hand Rammer Criteria (5.5 lbs. / 2.495 kg) (Circular Face)		QC No.		
1-	Diameter of face 1.985 – 2.010 in. (50.42 – 51.05 mm)?			Actual Diameter
2-	Weight of rammer (less guide sleeve) 2486 – 2504 g?			Actual Weight
3-	Height of drop 11.94 – 12.06 in. (303 – 307 mm)?			Actual Drop
4-	Unrestricted fall?	Yes	No	Repair if necessary
5-	Vent holes in each end?	Yes	No	Repair if necessary
Hand Rammer Criteria (10 lbs. / 4.536 kg) (Circular Face)		QC No.		
1-	Diameter of face 1.985 – 2.010 in. (50.42 – 51.05 mm)?			Actual Diameter
2-	Weight of rammer (less guide sleeve) 4,528 – 4,544 g?			Actual Weight
3-	Height of drop 17.94 – 18.06 in. (455 – 459 mm)?			Actual Drop
4-	Unrestricted fall?	Yes	No	Repair if necessary
5-	Vent holes in each end?	Yes	No	Repair if necessary

NOTE: After all necessary repairs and adjustments are made to both the mechanical and hand rammers, three (3) soil types will be used to calibrate the mechanical rammer.

	Soil type	Hand Rammer % Moisture	Hand Rammer Wet Density (PCF)	Mechanical Rammer Wet Density (PCF)
1-				
2-				
3-				

This calibration will be performed on an annual basis or whenever repairs or adjustments are made to the rammer which might affect the calibration. Adjustments will continue to be made to the mass of the mechanical rammer (weight added or taken off) until identical results are obtained for the hand and mechanical rammers.