# METHOD OF SAMPLING AND TESTING
# MT 335-14
# LINEAR KNEADING COMPACTION OF PLANT MIX SURFACING (PMS)

## 1 Scope

1.1 This test method is used to prepare compacted slabs of PMS for testing with the Hamburg Wheel-Track Testing Devices.

## 2 Reference Documents

***AASHTO***

R 47 Reducing Samples of Hot Mix Asphalt (HMA) to Testing Size
T 166 Bulk Specific Gravity (Gmb) of Compacted Asphalt Mixtures Using Saturated Surface-Dry Specimens

***MT Materials Manual***

MT 303 Sampling Bituminous Paving Mixtures
MT 321 Determining Theoretical Maximum Specific Gravity of Bituminous Paving Mixtures – "Rice Gravity"
MT 332 Gyratory Compaction of Bituminous Mixtures
MT 334 Hamburg Wheel-Track Testing of Compacted Bituminous Mixtures

***Manufacturer's Operation Manual***

For equipment used

## 3 Summary of Method

3.1 A slab of plant mix is compacted by applying pressure to the PMS through a series of rectangular parallel plates. The sample is placed in an open top steel box with the desired dimensions. Closely fitting steel plates are placed in a vertical row across the plant mix. A steel roller travels back and forth on the row of plates and successively applies pressure to the plant mix through the plates. This compacting motion continues until the height of the specimen of plant mix is reduced to the height calculated to yield the desired voids.

## 4 Apparatus

Ensure equipment used meets the following requirements:

4.1 *Linear Kneading Compactor* – Hydraulic powered unit, used to compact bituminous mixtures into rectangular slabs using vertically aligned steel plates that compress the bituminous mixture into a flat slab of predetermined thickness and density.

4.2 *Steel Wear Plate* – 10.125" wide, 12.6" long, 0.125" high

4.3 *Steel Compacting Plates* – 3.6" high

4.4 *Steel Compaction Carrier Box* – 10.25" wide, 12.625" long, 6" high

4.5 *Temperature Control System* – Oven which can maintain temperatures (250ºF to 350ºF).

4.6 *Shims* – Aluminum or steel plates that vary in thickness to achieve desired specimen height.

4.7 *Rubber Mallet*

4.8 *Balance* – Balance with a minimum capacity of 15,000 grams, accurate to 0.1 g.

## 5 Sample

5.1 *Field Specimens* – The top lift or lifts of PMS are tested. Ensure specimens for testing have a thickness at least two times the nominal maximum aggregate size.

*5.1.1* *Slabs* –The formula for the volume of a slab is as follows: length x width x thickness. The amount of material to batch for each slab with 7 ± 1% air voids is determined by multiplying the specimen length x width x thickness in cubic centimeters by the specimen's maximum specific gravity ($G_{mm}$) x 0.93. Mass for sample = 5283 cm3 x 1 gm/cm$^3$ x $G_{mm}$ x 0.93

*5.1.2* *Laboratory Produced Mix* – Before mixing bituminous mixtures for testing, "butter" all of the pans and implements. Heat materials to the mixing temperature range in a forced draft or convection oven. Do not overheat the specimens.

## 6 Procedure

6.1 Preheat wear and compaction plates in an oven to desired compaction temperature. Ensure PMS is heated to desired compaction temperature. If not, place in the oven to heat to compaction temperature.

6.2 Mix and reduce the sample in accordance with AASHTO R 47 to approximate sample sizes. Individually weigh enough material for each specimen.

6.3 Place the wear plate in compaction carrier box.

6.4 Load the specimen into compaction carrier box. Place the steel parallel plates vertically on top of the specimen mixture. To level plates on the specimen, use a rubber mallet if needed.

6.5 Ensure that all safety mechanisms are in place at Linear Kneading Compaction start-up in accordance with manufacturer's recommendations. Start the Linear Kneading Compactor.

6.5 Using a hydraulic jack, pressure will be applied automatically or manually to the specimen. Maintain a constant pressure until specimen reaches desired height. Ensure final compaction is 7 ± 1% air voids.

6.6 Press the stop button to complete the compaction process. Shut off the Linear Kneading Compactor and disengage safety mechanisms. Remove steel plates and side walls. Remove slab along with the bottom plate and cool to room temperature (to the touch).

6.7 Repeat the procedure for any additional specimens.

## 7 Calculation

7.1 Using AASHTO T 166 and MT 321, calculate the air void content of the specimen to the nearest tenth of a percent.

% Air Voids (Va)

$$V_a = 100 \times \left(\frac{G_{mm} - G_{mb}}{G_{mm}}\right)$$

Where:
$G_{mm}$ = Maximum specific gravity of paving mixture (Rice)
$G_{mb}$ = Bulk specific gravity of compacted mixture

Round and record to the nearest 0.1%