

# **Volumetrics**

## **Section 9 Gyratory Compactor AASHTO T312-22**

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- **Preparing and Determining the Density of Asphalt Mixture Specimens by Means of the Superpave Gyrotory Compactor.**
- **This standard covers the compaction of cylindrical specimens of asphalt mixtures using the Superpave gyrotory compactor.**
- **This standard is used to prepare specimens for determining the mechanical and volumetric properties of asphalt mixtures. The specimens simulate the density, aggregate orientation, and structural characteristics obtained in the actual.**

# APPARATUS

- **Superpave Gyrotory Compactor—An electrohydraulic or electromechanical compactor with a ram and ram heads.**
  - ▶ **The axis of the ram shall be perpendicular to the platen of the compactor. The ram shall apply and maintain a pressure of  $600 \pm 18$  kPa perpendicular to the cylindrical axis of the specimen during compaction.**
  - ▶ **The compactor shall tilt the specimen molds at an average internal angle of  $1.16 \pm 0.02$  degrees, determined in accordance with T 344. The compactor shall gyrate the specimen molds at a rate of  $30.0 \pm 0.5$  gyrations per minute throughout compaction.**

# Full Size Gyrotory Compactor



# Large Size Pine Compactor



# Field lab size Pine Compactor



# APPARATUS (CONTINUED)

- ▶ **Specimen Height Measurement and Recording Device—When specimen density is to be monitored during compaction, a means shall be Provided to continuously measure and record the height of the specimen to the nearest 0.1 mm during compaction once per gyration.**
- ▶ **The system may include a connected printer capable of printing test information, such as specimen height per gyration. In addition to a printer, the system may include a computer and suitable software for data acquisition and reporting.**
- ▶ **The loading system, ram, and pressure indicator shall be capable of providing and measuring a constant vertical pressure of  $600 \pm 60$  kPa during the first five gyrations, and  $600 \pm 18$  kPa during the remainder of the compaction period.**

# APPARATUS (CONTINUED)

- **Specimen Molds—Specimen molds shall have steel walls that are at least 7.5 mm thick and are hardened to at least a Rockwell hardness of C48. The initial inside finish of the molds shall have a root mean square (rms) of 1.60 mm or smoother when measured in accordance with ASME B46.1. New molds shall be manufactured to have an inside diameter of 149.90 to 150.00 mm. The inside diameter of in-service molds shall not exceed 150.2 mm. Molds shall be at least 250 mm in length. The inside diameter and length of the molds shall be measured in accordance with Annex A.**

# APPARATUS (CONTINUED)

- **Ram Heads and End Plates**—Ram heads and end plates shall be fabricated from steel with a minimum Rockwell hardness of C48. The ram heads shall stay perpendicular to their axis. The platen side of each end plate shall be flat and parallel to its face. All ram and end plate faces (the sides presented to the specimen) shall be flat to meet the smoothness requirement and shall have a diameter of 149.50 to 149.75 mm.
- **Thermometers**—Thermometers for measuring temperature of aggregates, binder, and asphalt mixtures shall meet the requirements of M 339M/M 339 with a temperature range of at least 10 to 230°C, and an accuracy of  $\pm 2.5^{\circ}\text{C}$  ( $\pm 4.5^{\circ}\text{F}$ )

# APPARATUS (CONTINUED)

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- **Balance**—A balance meeting the requirements of M 231, Class G 5, for determining the mass of aggregates, binder, and asphalt mixtures.
- **Oven**—An oven, thermostatically controlled to  $\pm 3^{\circ}\text{C}$ , for heating aggregates, binder, asphalt mixtures, and equipment as required. The oven shall be capable of maintaining the temperature required for mixture conditioning in accordance with R 30.
- **Miscellaneous**—Flat-bottom metal pans for heating aggregates, scoop for batching aggregates, containers (grill-type tins, beakers, containers for heating asphalt), large mixing spoon or small trowel, large spatula, gloves for handling hot equipment, paper disks, mechanical mixer (optional), lubricating materials recommended by the compactor manufacturer.

# PREPARATION OF APPARATUS

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- **Immediately prior to the time when the asphalt mixture is ready for placement in the mold, turn on the main power for the compactor for the manufacturer's required warm-up period.**
- **Verify the machine settings are correct for angle, pressure, and number of gyrations.**
- **Lubricate any bearing surfaces as needed per the manufacturer's instructions.**
- **When specimen height is to be monitored, the following additional item of preparation is required. Immediately prior to the time when the asphalt mixture is ready for placement in the mold, turn on the device for measuring and recording the height of the specimen, and verify the readout is in the proper units, mm, and the recording device is ready. Prepare the computer, if used, to record the height data, and enter the header information for the specimen.**

# ASPHALT MIXTURE PREPARATION

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## **Plant produced materials:**

- **Place the compaction mold(s) in an oven at the required compaction temperature. Place any additional compaction surfaces, such as base plates and upper plates, into the oven with and for the same time frame as the molds, according to the manufacturer's instructions.**
- **Obtain the sample in accordance with R 97.**
- **Reduce the sample in accordance with R 47.**
- **Place the sample into a pan to a uniform thickness.**
- **Bring the asphalt mixture to the compaction temperature range by careful, uniform heating in an oven immediately prior to molding.**

# COMPACTION PROCEDURE

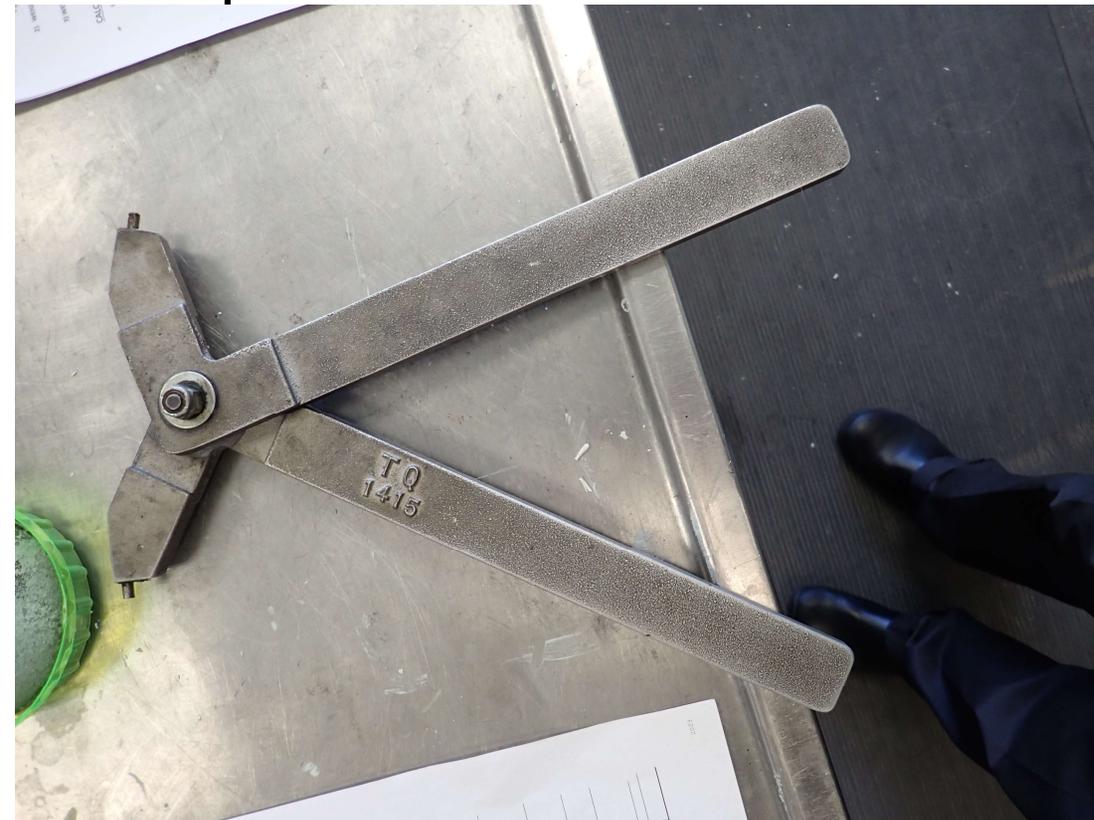
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- **When the compaction temperature is achieved, remove the heated mold and any compaction surfaces from the oven. Place the base plate and a paper disk in the bottom of the mold.**
- **Place the mixture into the mold in one lift. Care should be taken to avoid segregation in the mold. After all the mix is in the mold, level the mix, and place another paper disk on top of the leveled material. Complete any remaining mold assembly, load the mold into the compactor, and center the loading ram according to the manufacturer's instructions.**
- **Apply a pressure of  $600 \pm 18$  kPa on the specimen.**

# Oven



# Use proper equipment



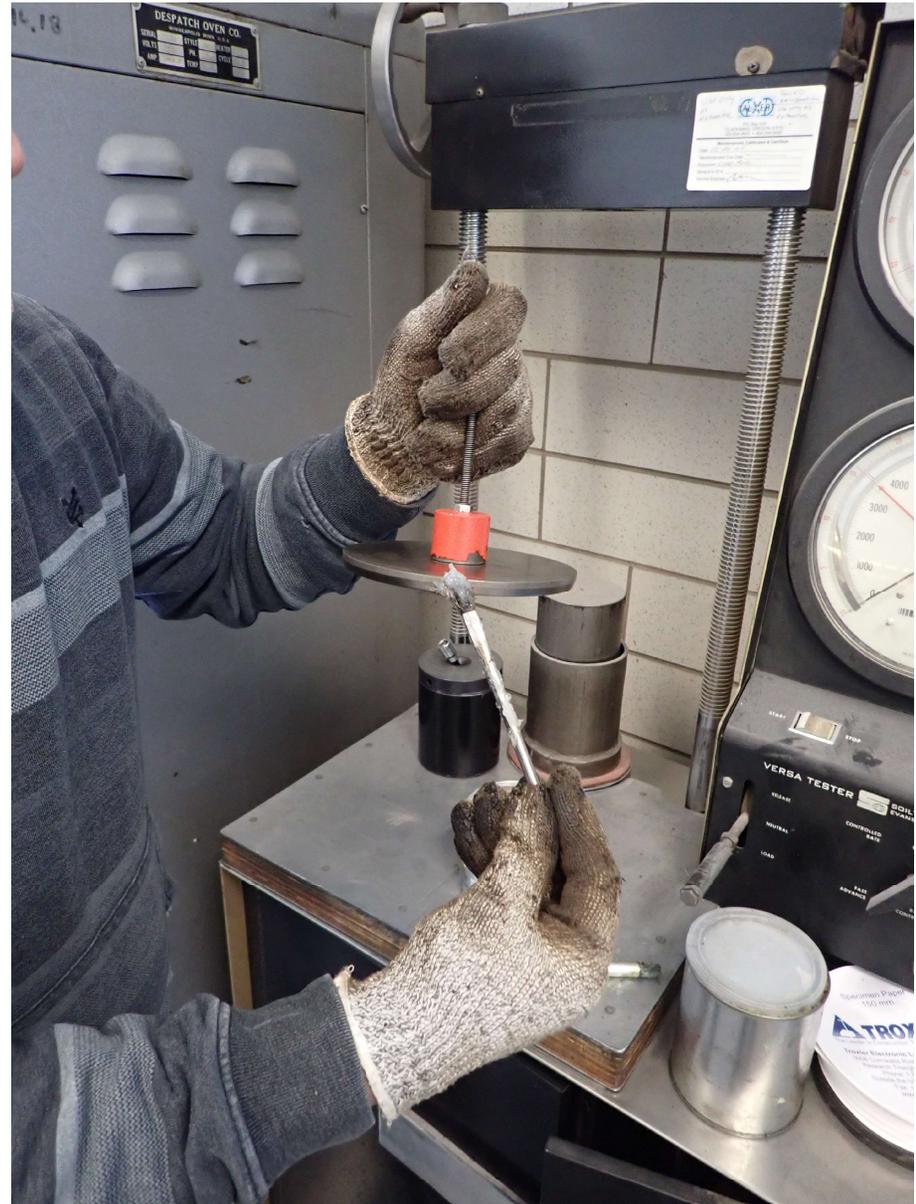
# The compactor is ready



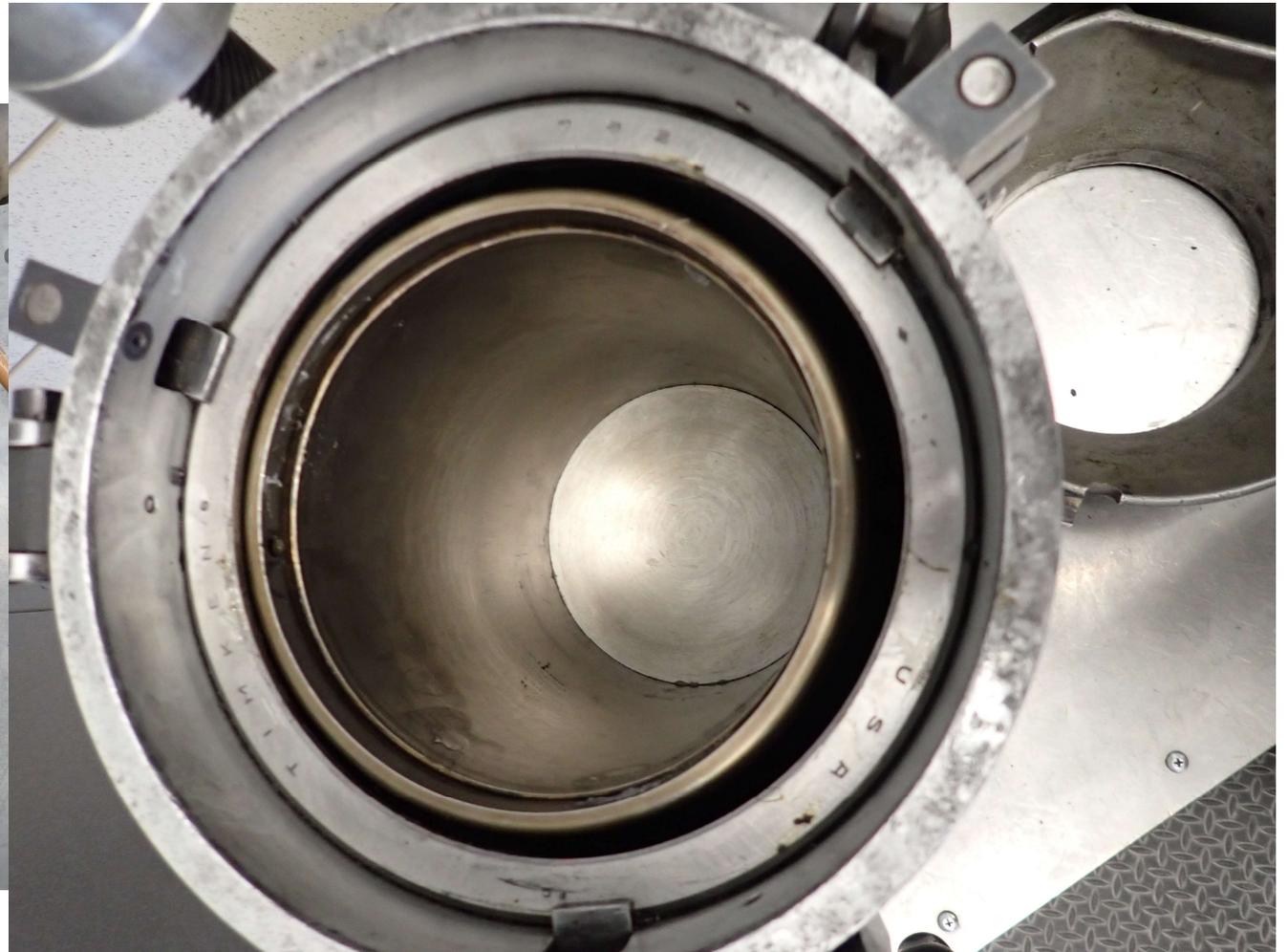
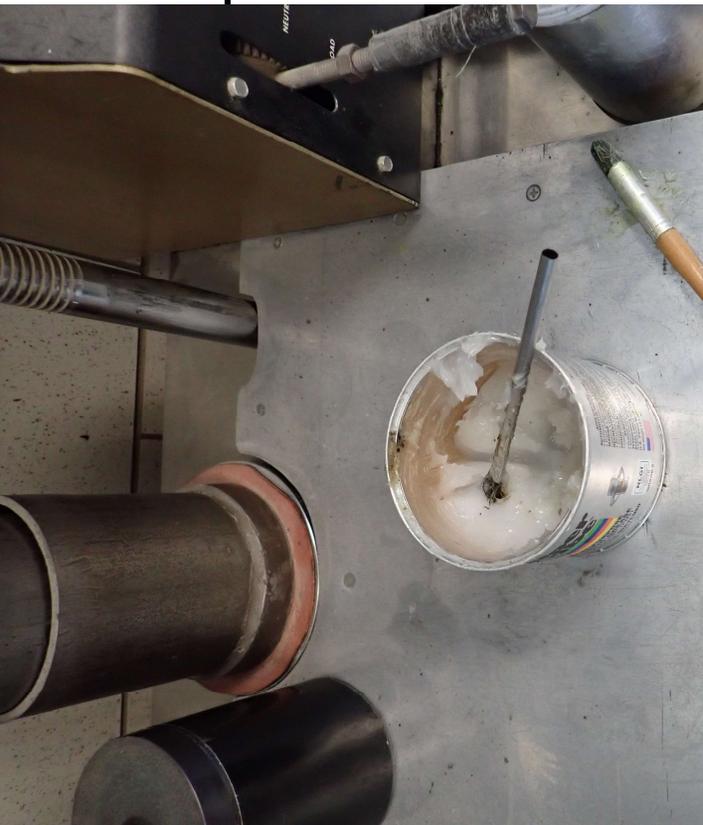
# Insert hot mold in the compactor



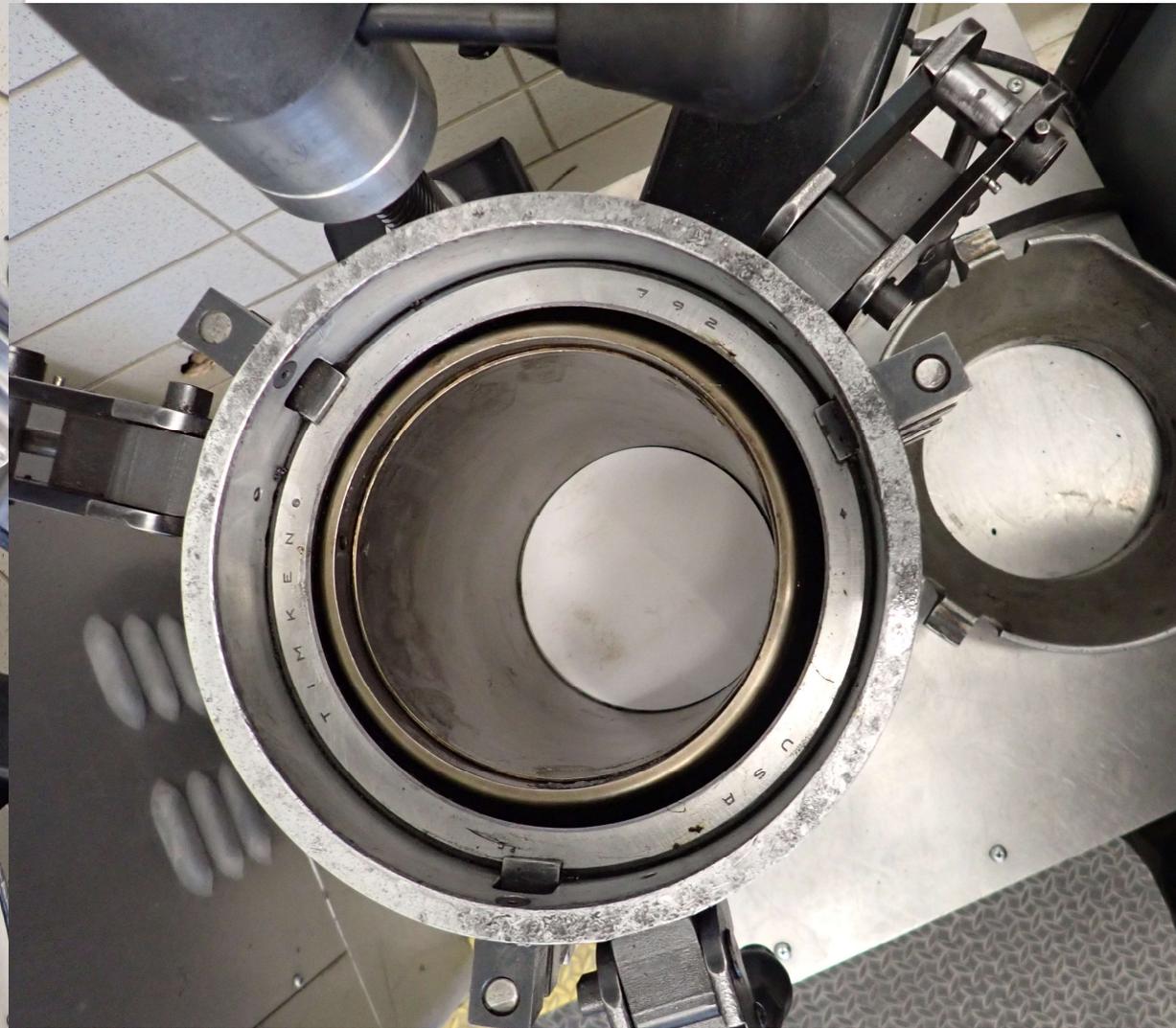
# Place the hot base plate in the mold after lubrication



# Place the hot base plate in the mold after lubrication



# Add the paper disk



# Get the funnel out of the oven



# Get the mix out of the oven



# Get the sample ready

