



TEX-207-F, PART III

Determining In-Place Density (Nuclear Method)



Why

Determine the in-place density of compacted hot mix asphalt using a nuclear density testing gauge.

Accurate measurement of density will ensure adequate density of hot mix asphalt will be achieved. This will produce a less permeable, smooth, and stable roadway.



When

Measure in-place density to establish rolling patterns at the start of placement, anytime during roller compaction, or whenever there is a change in production or thickness of the mat or roadway conditions.



How

Equipment

- Nuclear Density Gauge
 - Lift thickness two inches or less
 - Thin layer or thin lift gauge
 - Backscatter Mode
 - Lift thickness greater than two inches
 - Direct transmission Mode
- Portable Reference Standard (Standard Block Supplied with the Gauge)
- Scraper Plate and Drill Rod Guide
- Drill Rod and Driver or Hammer
- Shovel, Sieve, Trowel, Straightedge, Miscellaneous Hand Tools.
- Construction Marker Paint or Crayon
- Gauge Logbook
- *Ensure all applicable regulatory certifications are current and requirements are met.*
- *Follow the manufacturer's instructions and recommendations for calibration, operation, maintenance, and standardization procedures.*

Standardization

- Perform daily when the gauge is used.
 - This will determine if the gauge is working properly.
- Turn on the nuclear density gauge and allow it to warm up and stabilize.
- Allow at least 10 minutes.
- Perform at least 25 feet away from other sources of radioactivity on a smooth and dry asphalt surface.
 - *The preferred area is the roadway location. This is best to determine day-to-day variability of the gauge.*
- Take a minimum of four repetitive readings of four minutes for each reading.

QUICK FACTS: LEVEL 1B

Standardization Results

- When the values from the standardization count are within acceptable limits.
 - *Gauge is considered to be in satisfactory operating condition and may be used for the day of use.*
- When the values from the standardization count are outside of acceptable limits.
 - *Allow additional time for the gauge to stabilize, make sure area is clear of sources of interference, then conduct another standardization.*
- When the values from the second standardization count are within limits.
 - *Gauge may be used.*
- When the values from the second standardization count also fails the test.
 - *Gauge may not be used and must be adjusted or repaired as recommended by manufacturer.*

Procedure

1. Select an area free of loose material, voids, or depressions.
 - *Select an area at least 12 inches away from obstructions, such as curbing.*
 - *It is optional to use fine sand to fill any voids or minor depressions.*
2. Firmly seat the gauge on the selected area so it is in full contact with the surface.
 - *When the surface is hot, do not leave the gauge on the mat for a long time as erratic readings may result from the hot surface.*
3. When thickness is greater than two inches, use a gauge in direct transmission mode.
 - *Use the drive pin and guide plate to make a hole into the mat. It may be necessary to drill the hole.*
 - *Make a hole as close as possible to 90 degrees from the plane surface.*
 - *Make the hole two inches deeper than the lift thickness.*
 - *Lower the handle to the bottom of the lift.*
4. Measure the density of the compacted mat.
5. Determine the density of the tested area.
 - *Models are programmable to provide direct readings of density or percent compaction (air voids).*
 - *Divide the field counts by the standard counts.*
 - *When necessary, use appropriate calibration curves.*
6. Hydrocarbons from the asphalt may influence results and not produce accurate values compared with the actual density measured from roadway cores.
7. When more accurate results are needed, determine a correlation factor for gauge readings using the bulk specific gravity of roadway cores.
 - *Use a minimum of seven core densities and seven nuclear gauge readings.*