WSDOT SOP 730

Correlation of Nuclear Gauge Densities With Hot Mix Asphalt (HMA) Cores

1. When evaluating HMA compaction:
   1.1 A gauge correlation is required:
      a. For each combination of gauge and HMA Mix Design (initial JMF).
      b. When gauge mode changes (i.e., back scatter to thin layer).
      c. When wearing course lift thickness changes per Note 1.
      d. When a gauge is recalibrated.

      Note 1: For density determined with "Thin Layer Mode," a layer thickness change of greater than 0.08 feet requires a new correlation. For density determined with "Back Scatter Mode," a layer thickness change of greater than 0.15 feet requires a new gauge correlation.

   1.2 A gauge correlation is not required but may be considered by the Regional Materials Engineer when:
      a. Base material changes from the original correlation base (i.e., from a surfacing base to an asphalt base).
      b. The same gauge HMA Mix Design (Reference Mix Design) combination are used on a different contract within the same construction year.
      c. When JMF has been adjusted in accordance with *Standard Specifications* Section 9-03.8(7)A.

2. Gauge correlation is based on ten in-place HMA densities and ten cores taken at the same location as the in-place density.
   2.1 In-place HMA densities shall be determined in accordance with WSDOT FOP for WAQTC T 355.
   2.2 Cores should be taken no later than the day following paving and before traffic has been allowed on roadway. Correlation cores are not required to be taken at record density locations. Therefore, a site outside the traveled way should be considered for worker safety, as long as the lift thickness matches that of the plan lift thickness of the record density locations.

      Note 2: If a core becomes damaged, it shall be eliminated from the average.

      Note 3: Cores may be taken sooner than the day after paving if the HMA is cooled to prevent damage during coring and removal of cores. Water, ice, or dry-ice may be used to cool the pavement. Another method of cooling that may be used is substitution of nitrogen gas or CO_2 for drilling fluids.

3. Obtain a pavement core from each of the test sites in accordance with WSDOT SOP 734. The core shall be taken in the nuclear gauge footprint.

   3.1 For either gauge mode, back scatter or thin layer, locate the core in the approximate center of the nuclear gauge footprint. If the core thickness exceeds the plan pavement thickness by more than 0.04 feet, then the core shall be saw cut to the plan thickness prior to performing density testing. If a core thickness is less than the plan thickness by more than 0.04 feet, it shall be eliminated from the average.

4. Bulk Specific Gravity (G_{mb}) of core shall be determined in conformance with WSDOT FOP for AASHTO T 166 Bulk Specific Gravity of Compacted Hot Mix Asphalt (HMA) Using Saturated Surface-Dry Specimens.

   Calculate core density as follows, round to the nearest 0.1 pcf:

   Core Density = $G_{mb} \times 62.245$ pcf

   Calculate gauge correlation factor as follows:

   $$\text{Density Ratio} = \frac{\textit{(core density)}}{\textit{(nuclear gauge density)}}$$

   Round Density Ratio to the nearest 0.001

   $$\text{Gauge correlation factor} = \frac{\textit{(Sum of ratios)}}{\textit{(number of cores)}}$$

5. Gauge Correlation Factor shall be determined to 0.001.

6. Report the Gauge Correlation Factor using MATS or DOT Form 350-112.