

**5.21.04 JOINT DENSITY EVALUATION USING THE NUCLEAR DENSITY GAUGE**  
**(For metric projects use metric units)**  
**(For English projects use English units)**

**OBJECTIVE.**

The objective of these instructions is to give procedures for evaluating traveled way joint density. This is accomplished by taking two or three readings in the transverse direction one paver width wide. The traveled way joint density, either one or two locations, is subtracted from the interior density and the difference in density compared to the allowable limits. It is important to record the profile location to permit possible future evaluation of this location.

**PROJECT STARTUP.**

At the start of the project, allow the paving unit 300 m (1000 ft) progress with each mix designation before implementing the joint density evaluation. During this initial 300 m (1000 ft) the contractor should be establishing laydown and compaction procedures and training personnel. The contractor should make preliminary nuclear gauge evaluations of their procedures.

**SELECTION OF JOINT DENSITY EVALUATION LOCATIONS.**

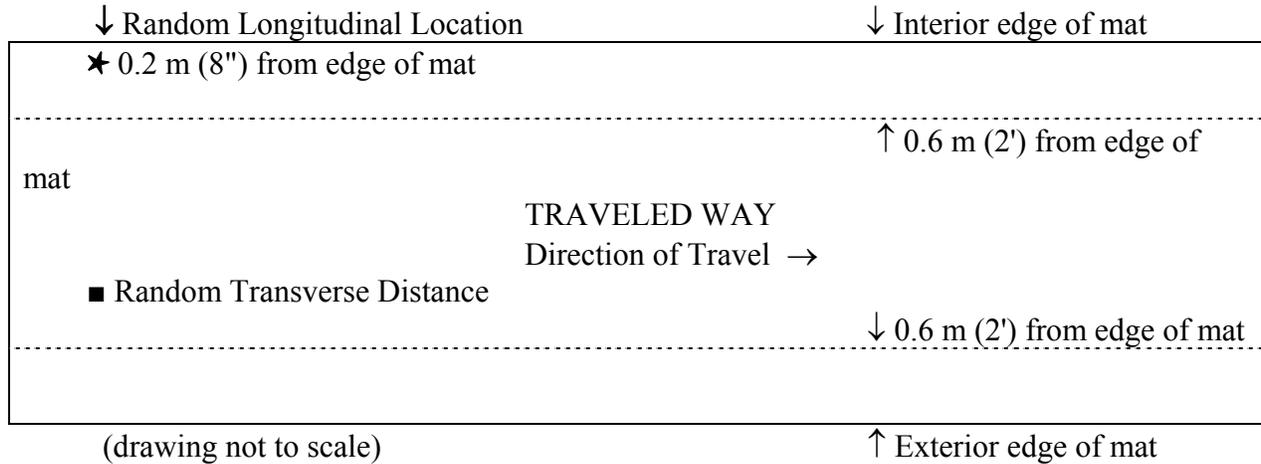
A lot is defined as the distance paved with each mix designation per day. Determine the number of sublots from Table 1. Make each subplot approximately the same length. Randomly select one longitudinal location within each subplot.

**Table 1. Determination of Number of Sublots Per Day**

<b>Distance Paved</b>		<b>Number of Sublot</b>
<b>English</b>	<b>Metric</b>	
0' - 500'	0 m - 150 m	0
501' - 1000'	151 m - 300 m	1
1001' - 2000'	301 m - 600 m	2
2001' - 3000'	601 m - 900 m	3
3001' - 4000'	901 m - 1200 m	4
4001' and greater	1201 m and greater	5

At each subplot longitudinal test location, determine the nuclear density on the traveled way at two or three transverse locations. (See Figures 1A and 1B.) Sublot joint density evaluation will be completed before compaction is completed in the third subplot. (Second subplot evaluated before fourth subplot compaction completed. Third subplot evaluated before fifth subplot completed.)

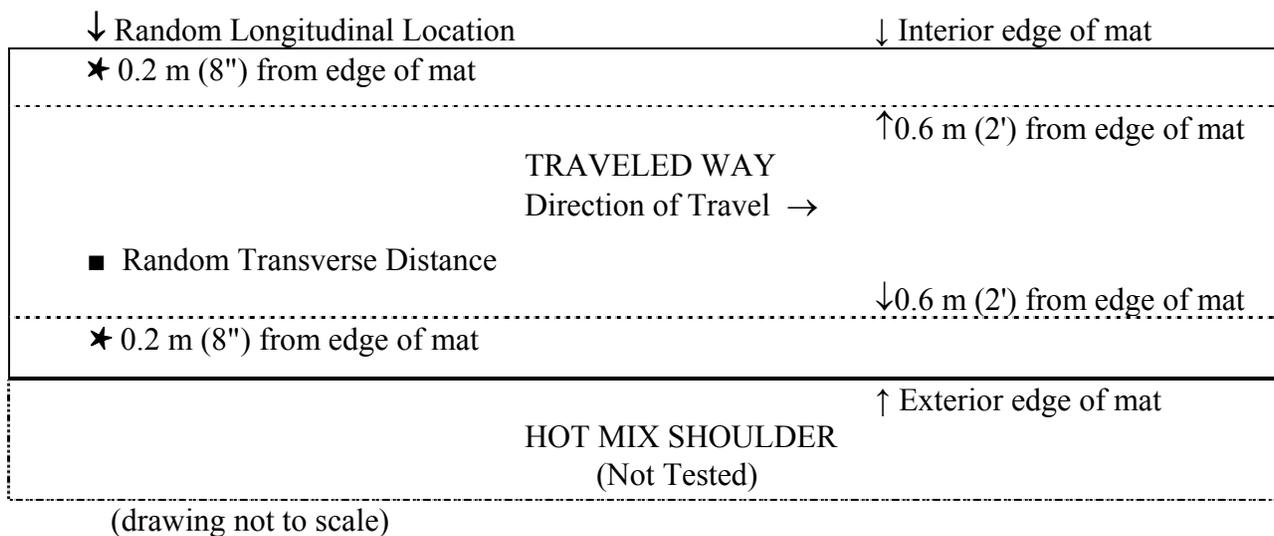
Figure 1A- Traveled way without hot mix shoulders or shoulders placed at the same time as the traveled way. Test two transverse locations. Test each lane as placed.



Test two or three locations as follows: (For three locations, see Figure 1B)

1. Locate the random longitudinal location as described above in selection of Joint Density Evaluation Locations.
2. ★ Determine "joint density" with the source rod of the gauge 0.2 m (8") off the mat edge that will become a longitudinal joint. Position the source rod so it is closest to the laydown machine (point the gauge towards the roller).
3. ■ Randomly select a transverse location between 0.6 m (2') for each edge of the mat. Determine "interior density." Position the source rod so it is closest to the laydown machine (point the gauge towards the roller).

Figure 1B- Traveled way with hot mix shoulder or shoulders not placed at the same time as the traveled way. Test three transverse locations as described above. Test each lane as placed.



## **NUCLEAR GAUGE READINGS.**

In backscatter mode, take 3 one minute readings and average. If one of the readings varies by more than  $15 \text{ kg/m}^3$  ( $1 \text{ lb/ft}^3$ ), then discard and replace with an additional reading. It is necessary for the gauge to be calibrated to the mix.

## **PROFILE EVALUATION.**

The contractor field representative will provide the Engineer results of the joint density evaluation as they are completed. Whenever the Engineer makes independent joint density verifications, the contractor will be supplied joint density evaluation results as they are completed. Whenever one of the evaluations fails the acceptable criteria established in 90M/P-272 and 90M/P-230 or latest update of these Special Provisions, the contractor will make changes to the mix, plant or roadway operations. Production of the hot mix is to cease whenever two consecutive checks by the contractor or by the Engineer fail. The contractor will make changes to the mix or process before production is restarted. The contractor may produce enough mix to place approximately 600 m (2000 ft) of pavement one paver width wide. Two joint density evaluations will be taken within this 600 m (2000 ft) of production. If both joint density evaluations meet acceptable criteria, the contractor may resume normal production. If one or both of the joint density evaluations fail, the contractor will make changes before production is restarted. The contractor may then produce enough mix for an additional 600 m (2000 ft) of pavement and this production will be evaluated as was the previous 600 m (2000 ft) of production. This procedure of placing and evaluating 600 m (2000 ft) sections will be continued until both joint density evaluations pass. Once the evaluation passes, normal production and joint density evaluations will resume.

Calculate the "drop in density" by subtracting the "joint density" from the "interior density." Compare drop in density to specification limits. (Note: whenever three tests are taken at one transverse location, each joint density evaluation must pass the specified limits to be considered a passing location.)