



SUPERSEDED BY EB 23-024 EFFECTIVE 8/3/23		<i>New York State</i> <i>Department of</i> <i>Transportation</i> ENGINEERING INSTRUCTION	EI 99-011
Title: GUIDELINES FOR INSPECTION AND RECORD KEEPING OF NUCLEAR GAUGE READINGS			
Distribution: <input type="checkbox"/> Manufacturers (18) <input checked="" type="checkbox"/> Main Office (30) <input type="checkbox"/> Local Govt. (31) <input checked="" type="checkbox"/> Regions/Agencies (32)		Approved:  <hr/> J. F. Tynan, Construction Division Date: <u>3-26-99</u>	

PURPOSE: This Engineering Bulletin transmits guidelines for the inspection and record keeping of nuclear gauge density readings for asphalt concrete pavement. This material will eventually be incorporated into the asphalt paving section of the Construction Inspection Manual.

EFFECTIVE DATE: This EI is effective immediately.

BACKGROUND: Since the Department introduced Rut Avoidance (RA) asphalt mixes, Contractors have employed nuclear density gauges to monitor in-place density of these mixes. All Department projects will soon require SUPERPAVE asphalt mixes. The SUPERPAVE 60 and 70 compaction series mix items require the use of the nuclear gauge. The nuclear gauge readings are the sole means to determine if pavement density complies with the specification requirements for the 60 and 70 compaction series items. Therefore, it is important that inspectors have the basic knowledge of the proper use of the nuclear gauge to inspect this operation for the SUPERPAVE 60 and 70 compaction series items. The Construction Supervision Manual currently does not contain guidelines to inspect this operation. The Heavy Duty (HD) mixes and the SUPERPAVE 50 compaction series mix items do not require the use of nuclear gauges because in place density is determined by pavement coring.

The BR 340M form is used by the nuclear gauge operator to record the density measurements and readings from the nuclear gauge for the SUPERPAVE 60 and 70 compaction series mix items. This form contains a column for the inspector's initials next to each nuclear gauge reading. A gauge reading consists of the average of four gauge measurements 90° apart at one location. Neither the Manual of Uniform Record Keeping nor the Materials Inspection Manual currently addresses the number or percentage of nuclear gauge measurements that the inspector should witness and initial on the BR 340M.

GUIDANCE:

INSPECTION

The following section describes the proper techniques a nuclear gauge operator should use to properly calibrate a nuclear gauge and ensure accurate gauge readings. The inspector should use this information while observing the nuclear gauge operator to determine whether the operations are performed correctly.

Prior to the start of each day's paving and nuclear gauge measurements the nuclear gauge operator must perform a Daily Standard Count (DSC) for the gauge. The DSC is a calibration reading on a standard reference block. The DSC must be performed as follows:

- a. Nuclear gauge power is turned on and the gauge allowed to warm up for at least 10 minutes.
- b. The reference standard block must be placed on a dry, flat surface that has a density of a least 1600kg/m³ (HMA or PCC pavement). Tables, truck beds and tailgates are **not** acceptable surfaces for the reference standard block.
- c. The gauge is placed on the reference standard block with the source rod opposite the metal plate attached to the reference standard block.
- d. A four minute measurement (the source rod remains in the shielded position) is taken following the instructions for the particular gauge model. The DSC is recorded in the gauge's standard count log.
- e. The DSC is compared to the average of the last four DSCs. If the DSC is not within $\pm 1\%$ of the average of the last four DSCs, the reference block and the bottom of the gauge must be checked to make sure they are clean. If no such reason for the discrepancy can be found a new gauge must be used to determine asphalt concrete density.

When taking nuclear gauge measurements, including the DSC, the gauge must be at least 3 meters away from large objects (heavy equipment, walls, etc.) and at least 10 meters away from any other sources of radiation, such as another gauge.

Nuclear gauge measurements should be done in a **consistent** manner. Measurements must be done in the back scatter transmission mode (source rod lowered to the first notch) and should be done as follows:

- a. The gauge is placed on the paved asphalt surface so the gauge does not rock and the entire base is in contact with the pavement. Graded sand may be used to fill surface voids and provide a smooth surface, however, it must not elevate the gauge above the

surface of the pavement. If graded sand is used, the same procedure must be used for all readings.

b. The gauge is set to take a back scatter measurement. Lower the source rod to the first notch. After locking the source rod into the lowered position, the operator should adjust the rod to compensate for up and down play. The adjustment should be made in a consistent manner each time. After the adjustment has been made, the operator must push the start button initiating the count time. After the specified count time, the source rod is raised into the shielded position and the measurement recorded. The measurement will be displayed until a new measurement is taken, or the gauge is turned off. The average of four measurements taken 90° apart at the same location equals one nuclear gauge density reading.

Everyone (including inspectors) with the exception of the nuclear gauge operator should be at least 5 meters away from the gauge while it is in use. The inspector may approach closer to the gauge only when verification of measurements is required and the gauge handle is in the uppermost position. This exposure should be as short of a duration as possible. As long as these simple rules are followed the only person required to wear a personnel monitoring device is the nuclear gauge operator. For further details of the safety requirements of this operation, see MURK 1-C.

RECORD KEEPING

The BR 340M is the form to record nuclear gauge measurements and data. It has been reformatted and is included as an attachment. The nuclear gauge operator is responsible to fill in all of the information required on the BR 340M. The inspector should verify that the radiation badge number, gauge serial number, operator's name, and project target density are correctly filled out before nuclear gauge readings are taken.

Throughout a day's paving an inspector should witness and initial at least five separate density readings. An inspector should only initial the BR 340M next to a density reading when all four gauge measurements have been witnessed and the average density calculation verified to determine the resulting density reading. This minimum inspection level should only be utilized if the inspection staff has a high degree of confidence in the nuclear gauge operator and the accuracy of the readings. If the proficiency of the operator or the accuracy of the density readings is in question, the number of density readings witnessed should be increased, as needed, until the inspector is comfortable with the oversight of the operation.

The EIC or the EIC's representative must review and sign the BR 340M at the end of the day's paving. The nuclear gauge operator must turn in a copy of the signed BR 340Ms at the end of each days paving. The EIC will place the copy of the BR 340M in the project file, and at the completion of the project's paving the original BR 340s will be turned in to the EIC.

CONTACT: Questions regarding this Engineering Bulletin should be directed to Michael Gray of the Construction Division at (518) 457-6475.

