



Wisconsin Department of Transportation

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DATE: March 17th, 2014

TO: Consultant and Contractor Working For WisDOT

FROM: Steven W. Krebs, PE
Chief Quality Management Engineer

SUBJECT: **Nuclear Gauge Policy for Operation on WisDOT Projects
Acceptance and QMP Density Testing**

In the year 2014 construction season, all nuclear density testing for improvement projects and all acceptances testing and sampling is required to be done by certified technicians. Certified samplers and testers is a FHWA requirement of CFR 23 part 637. Only the University of Wisconsin Platteville as part of the Highway Technician Certification Program (HTCP) offers the Nucdensity tec-1 class.

Attached you will find policy information for the operation of ALL Nuclear Moisture / Density Gauges on WisDOT administered projects, including all department, consultant, and contractor gauges. WisDOT has established a list of all approved gauges to perform nuclear testing on WisDOT administered projects. Consultants and contractors must be on this list in order to perform nuclear gauge testing on WisDOT projects. This list is established and will be maintained by the Quality Assurance unit and accessible to all at www.dot.wisconsin.gov/business/engrserv/approvedprod.htm prior to each construction season, and following any new calibration of the gauge, the contractor must perform calibration verification for each gauge using the reference blocks located in the department's central office materials laboratory. All gauges used on any WisDOT projects shall make the 0.5 pcf 3 test average tolerance assigned to the department blocks. To obtain information and or schedule a time to perform calibration verification, contact the department's Radiation Safety Officer at Truax Center at 3502 Kinsman Blvd., Madison, WI 53704 Telephone: Cell 750-4153, Office 414-546-6810 or robert.schiro@dot.wi.gov.

To verify that we have the correct information for your company, you are required to submit the following information yearly:

1. Current copy of your Wisconsin Agreement State License or Your Federal Nuclear Regulatory Commission (NRC) license.
2. Copies of current 3 or 5 block calibration certificates conducted by manufacturer or approved calibration service (valid for current calendar year only).
3. Company contact person, RSO or Safety Officer, (please update as changes occur).
4. E-mail address if applicable

Please send this information to:

WisDOT DTSD
Truax Center
ATTN Matthew Platt
3502 Kinsman Blvd.
Madison WI 53704-2507

The approved list will only have the gauges that have been verified and passed the blocks in central office for the current calendar construction year if further assistance is needed, contact Robert L. Schiro, WisDOT Radiation Safety Officer, at (414) 750- 4153 Cellular (414) 546-6810 Office.

OPERATION OF NUCLEAR GAUGES ON WisDOT PROJECTS

To comply with DHS and Federal regulations, protect the safety of operators and the public, and maintain acceptable accuracy of measurement, all gauge operators shall be required to comply with all DHS and WisDOT directives, rules and policies pertaining to nuclear testing operations in the Construction Materials Manual and compliance shall include, but not be limited to, the following items:

1. When an accident including a lost or stolen gauge, stuck source, damaged gauge or a gauge involved in a vehicle accident occurs, follow your emergency procedures including contacting the Radiation Safety Officer.
2. All accidents involving nuclear density gauges must be reported to the WisDOT RSO at (414) 546-6810 (work) or (414) 750-4153 (cell) and DHS at (608) 267-4797, during daytime hours or the 24 emergency numbers at (608) 258-0099. When using the 24-hour emergency number indicate this is a “radiological incident.”
3. For the reporting requirements see HFS 157.13(17) (b) 2 and HFS 157.32(1).
4. Authorized User Training shall satisfy your license requirements.
5. Transportation of gauges shall be in an approved, properly labeled and locked transport Type “A” case. A shipper Declaration of Dangerous Goods or a bill of lading shall be properly displayed. When the gauge is not directly under direct supervision, the gauge must be locked in the transport case and protected by two separate physical barriers.
6. Evidence shall be provided to ascertain that gauges maintain acceptable levels of calibration. All gauges used on WisDOT projects shall have a documented three or five block calibration conducted by the manufacturer or calibration service within the last 12 months.
7. Storage of nuclear gauges shall meet Department of Health Services requirements.
8. All operators shall wear an appropriate personally issued Thermo Luminescent Dosimeter, Film Badge, or OSL badge.

“NOTE” The operator need not wear a badge if their DHS Radioactive Materials License or NRC license excludes the use of testers using badges.

9. All companies must have available an appropriate radiation survey meter in accordance with DHS 157.05(3).

10. Survey meter must be calibrated annually by a licensed calibration facility.
11. All accidents or incidents involving nuclear gauges shall be resolved in accordance with individual license requirements and/or with WisDOT and DHS policies and procedures.
12. Periodic review of nuclear density gauge operation and procedures will be conducted by WisDOT RSO, deficiencies will be discussed with the operator(s) and the operator(s) shall take corrective actions.
13. The duration of density tests shall be four (4) minutes in duration for Troxler, Humboldt, and CPN gauges. For Seaman Nuclear gauges testing in the backscatter mode they will use 2 minutes in both the contact and the air gap position. Seaman gauges testing in direct transmission mode the time of test will be 4 minutes.

USE OF NUCLEAR GAUGES ON HMA

1. The Region may require the moisture density gauge used on WisDOT projects be checked out on WisDOT Regional calibration / reference check blocks to ascertain their calibration is within 1 pound per cubic foot of our block values. Or the contractor can use their own reference block if checked and approved by the department. Gauges shall be warmed up if required in the manufacturer's guidelines. The regions have the ability to require gauges to be checked on their reference blocks prior to working on WisDOT projects.
2. The region or contractor will establish a reference site approved by the department. Clearly marked out on a flat surface of concrete or asphalt or other material that will not be disturbed. Perform correlation monitoring with the QA, QV, and all back up gauges at the project reference site. The region may require a project reference site on projects.
3. Conduct an initial 10 density tests using the gauge on the project reference site, and calculate the average value to establish the reference value for each gauge. Use the gauge reference value as a control to monitor the calibration of the gauge for the duration of the project.
4. Check the gauge on the project reference site a minimum of 1 test per day if paving.
5. If a single gauge reading on the reference site deviates more than 1.5 lb/ft^3 from the 10-test average for that gauge. The operator must investigate and conduct an additional 5 tests on the reference site. If the gauge does not fall within allowable tolerances contact WisDOT RSO and region contact person immediately.
6. On days that the QC, QA or QV tester is performing tests for the project he or she must take a new standard count on the material being tested.
7. During testing, the gauge shall always be set on a flat and level surface on the material being tested. A new standard must be taken on the grade before testing.

8. During tests, the following minimum distances of a gauge shall be maintained
 - a. Pavement construction joints > 20 feet
 - b. Operator > 3 feet
 - c. Bystanders > 15 feet
 - d. Equipment, manholes, etc.> 15 feet
 - e. Other nuclear devices > 30 feet
 - f. Unrestricted edge of pavement > 1.5 feet
 - g. Restricted edge of pavement > 1 foot

9. During testing, the gauge shall always be set on a flat surface, with the longest dimension of the gauge parallel to the edge of the pavement. Mark out gauge outline and show direction of source.

10. The duration of density tests shall be 4 minutes for Troxler, Humboldt and CPN gauges. Seaman gauges 2 minutes in both the contact and the air gap position.

11. Record on the pavement the lot number, test #, and the % compaction for all acceptance and verification tests.

Documentation:

The following data shall be recorded using WisDOT data work sheets.

- | | | |
|-------------------------------------|---|--|
| <input checked="" type="checkbox"/> | Reference Site / Block Data | <input type="checkbox"/> (Daily Nuclear Calibration Check) |
| <input checked="" type="checkbox"/> | Standard Block Data – Density Standard, Moisture Standard | |
| <input checked="" type="checkbox"/> | New Density & Moisture Standard Must Be Taken Every Day There Is Placement Of | |
| <input checked="" type="checkbox"/> | HMA Material That Requires Density Testing. | |
| <input checked="" type="checkbox"/> | Density Count, Moisture Counts or Contact, Air Gap | |
| <input checked="" type="checkbox"/> | Total / Wet Density or Bulk Density | |
| <input checked="" type="checkbox"/> | % Compaction | |
| <input checked="" type="checkbox"/> | Manufacture Name and Serial Number | |
| <input checked="" type="checkbox"/> | Operators Name | |
| <input checked="" type="checkbox"/> | Mix Design Number and Target Number (Gmm) X 62.24 | |

USE OF NUCLEAR GAUGES ON SOILS, BASE COURSES, ETC.

1. The Region may require the moisture density gauge used on WisDOT projects be checked out on WisDOT Regional calibration / reference check blocks to ascertain their calibration is within 1 pound per cubic foot of our block values. The region may elect to require the contractor or consultant to use the departments Validator direct transmission check gauge to be used as the reference site for the project and a 1 pound tolerance to be used. Or the contractor can use their own reference block if checked and approved by the department. Gauges shall be warmed up if required in the manufacturer's guidelines. The regions have the

ability to require gauges to be checked on their reference blocks prior to working on WisDOT projects.

2. The region or contractor will establish a project reference site approved by the department. Clearly marked out on a flat surface of concrete or asphalt or other material that will not be disturbed during the duration of the project. Perform correlation monitoring with the QC, QA, QV, and all back up gauges at the project reference site.
3. Conduct an initial 10 density tests using a gauge on the project reference site and calculate the average value to establish a reference value. Use the reference value as a control to monitor the calibration of the gauge for the duration of the project.
4. The region may require the use of the Validator to conduct an initial 10 direct transmission density tests at 6", 8", and 10". The Validator will be used as the project reference site and calculate the average value to establish a reference value. Use the reference value of 1 PCF as a control to monitor the calibration of the gauge for the duration of the project.
5. Check the gauge on the project reference site a minimum of 1 test per day during placement of all material placed within the 1 to 1 slopes on project and compare to the reference value. Maintain the reference site test data for each gauge at an agreed location.
6. If a single gauge reading on the reference site deviates more than 1.5 lb/ft^3 from the 10-test average for that gauge. The operator must investigate and conduct an additional 5 tests on the reference site. If the gauge does not fall within allowable tolerances contact WisDOT RSO and Region contact person immediately.
7. On days that the QC, QA or QV tester is performing tests for the project he or she must take a new standard count on the material being tested.
8. During tests, the following minimum distances of a gauge shall be maintained from:
 - a. Operator > 3 feet
 - b. Bystanders > 15 feet minimum
 - c. Equipment, manholes, etc.> 15 feet
 - d. Other nuclear gauges > 30 feet
9. The gauge shall be placed on a prepared surface with no mote the 1/16" void and only native material used as filler.
10. Position the gauge handle to the appropriate test location the **BS, 2", 4", 6" or 8"** depths. Test shall not excide the depth of the compacted layer.
12. After each test the operator must dig up the material below the gauge and check for voids, cobbles and or organics that could change test results.

13. After each test the operator must dig up the material below the gauge and sample a 500 gram or larger sample and perform a natural dry back and compare to the gauge moisture reading.
14. All proctor tests will have a minimum of 5 points two ascending and two descending and one at or near optimum moisture.
15. Perform at specific gravity of the stone or use 2.65 as the zero air void line.
16. The duration of density tests shall be four (4) minutes for Troxler, CPN, Humboldt and Seaman gauges with direct transmission. For Seaman gauges using backscatter the duration shall be (2) minutes in both the contact and the air gap position.
17. If the gauge needs to have a moisture biases for a specific soils the gauge operators needs to conduct 5 random test locations for that soils type. After each moisture/density gauge test has been completed the material directly below the gauge will be retained and a 1 point proctors shall be run at its natural moisture. Compare average natural moistures to the gauge moisture reading and if necessary compute moisture bias.

Documentation:

The following data must be recorded on all WisDOT project data work sheets:

- Reference Site / Block Data
- New Density & Moisture Standard Must Be Taken Every Day on reference site and new material placed
- Density Count, Moisture Counts or Contact, Air Gap
- Total / Wet Density or Bulk Density
- Dry Density or Bulk Density Dry
- Moisture # and Moisture %
- Proctor Number and Target Number
- Pit Number, Grading area, Soils Classifications, Elevation
- % Compaction
- Manufacture Name and Serial Number
- Operators Name