Purpose - The purpose of this document is to establish guidelines on nuclear density gauge daily usage, gauge transportation, and outline an Emergency Response Plan for TDOT Radiation Safety Technicians. A TDOT Radiation Safety Technician is an individual who has successfully completed the TDOT Radiation Safety training and demonstrated a basic understanding of radiation safety and compliance, nuclear density gauge operation, testing procedures, and maintenance.

Background- Tennessee Radioactive Material License No. R-19017-K16 requires that TDOT technicians attend the appropriate training to operate and transport nuclear density gauges. The license also requires TDOT to have a radiation safety emergency response plan.

Each Regional Materials and Tests Office has a regional Radiation Safety Officer (RSO) in the Materials and Tests Office as well as the Statewide RSO in Headquarters Materials and Tests. Each gauge operator is responsible for knowing the current contact information of their regional RSO.

1 Storage Site

1.1 The handle shall be locked and the gauge stored in its transport case.
1.2 The transport case shall be locked.
1.3 The gauge and transport case shall be stored at least 15 ft (5 m) from work areas, in a locked closet/storage area in a dry location (indoors).
1.4 The storage area shall be marked with a radiation sign that reads "CAUTION RADIOACTIVE MATERIALS" (can be obtained from HQ RSO).
1.5 Do not store a nuclear gauge in a motor vehicle except:
   1.5.1 The nuclear gauge may be stored inside the gauge operator’s truck when not in use on a construction site or at a location in transit between the permanent storage site and the project site. With permission of the gauge operator’s supervisor, the gauge operator may store the gauge overnight in their truck, provided it is secured per section 4, at a location between the permanent storage site and the project site. In all other cases the gauge operator shall return the gauge to the permanent storage location.
   1.5.2 Any time the gauge is stored in the truck it shall be secured for transport per section 4.
1.6 A log of all gauges stored at the site will be maintained at the storage site. All gauges must be checked in when not stored and checked out by the operator when in use.
1.7 Storage site must be enclosed (four walls and a roof) and it must protect gauges from the elements.
1.8 Only nuclear gauges are allowed to be stored inside the storage site. No tools/equipment/debris of any kind is allowed to be placed inside the storage site.

2 Inspections:

2.1 Inspect the gauge before use to ensure proper operation of all safety features as follows:
   2.1.1 Push the source rod down into the backscatter position, and then raise it back to the SAFE (shielded) position. The source rod opening in the bottom of the gauge is equipped with a spring-loaded tungsten sliding block that shuts when the source rod is in the SAFE position. Turn the gauge over and verify that the sliding block is completely shut.
If any portion of the opening is uncovered, the clean the sliding block before using, transporting, or storing the gauge.

2.1.2 Do not store or transport the gauge unless the sliding block is completely closed. Increased radiation levels may violate transportation regulations and cause excessive personal radiation exposure.

2.1.3 If a radiation survey instrument is available, verify that the radioactive gamma source is in place by measuring the exposure rate at the surface of the gauge. If the exposure rate is not in the approximately range of 10 - 20 mrem per hour contact the regional RSO and discontinue use of the gauge until further notice.

2.2 Biannual Inspection

2.2.1 Gauges shall be leak tested every April and October. The Regional RSO shall conduct a ‘swipe’ test and submit the sample to the HQ RSO who will submit all samples to the lab for testing. In conjunction with the ‘swipe’ test, an inventory check must be completed. This means that the gauge must be physically located and accounted for.

3 Operator Certification and Monitoring:

3.1 Anyone operating a nuclear gauge shall be a certified TDOT Radiation Safety Technician.

3.2 The technician must wear their assigned dosimeter while operating or transporting the nuclear gauge. Dosimeter may not be shared between individuals and may only be used by the person who is named on the dosimeter.

3.3 Badges shall be turned in every March, June, September, and December to the regional RSO to be checked for individual exposure.

4 Transporting Nuclear Gauge to Project

4.1 The handle for the gauge shall be locked into the safe position during transport.

4.2 The nuclear gauge shall be locked inside the transport case during transport.

4.3 Transport the nuclear gauge in the rearmost part of the bed of a truck inside either:

4.3.1 a locked bed cover with the device secured in place with heavy chain to prevent the case from moving or

4.3.2 a mounted transportation box, specifically designed for the nuclear gauge case.

4.4 No one other than the operator of the nuclear gauge is allowed in the vehicle while the nuclear gauge is in the vehicle.

4.5 While in transit the following paperwork must be in the vehicle and readily accessible by the driver:

- nuclear gauge bill of lading (BOL),
- operator’s nuclear safety certificate,
- nuclear gauge shipping paper,
- TDOT Radiation Safety Plan (SOP 7-2).

4.6 At any time the vehicle is parked while the gauge is stowed for transit, the shipping paper must be place face up in the driver’s seat.

5 Operating Nuclear Gauge at the Project

5.1 See SOP 7-1 for instructions on how to calibrate and run tests.

5.2 Only remove the nuclear gauge from the truck when testing is eminent.
5.3 If the gauge is unsecured (i.e. not stored for transport per section 4 or stored per section 1), it shall be in the possession of the operator. The nuclear gauge shall never be left unattended on site.

5.4 If it becomes necessary to move between locations inside the project, lock the handle into the SAFE position and replace the nuclear gauge into the transport case and place in the rear of truck bed. At no time shall the nuclear gauge be placed into the cab of the truck.

5.4.1 It is not necessary to lock the case and bed cover for short trips inside the project limits.

5.5 When the nuclear gauge is in operation all personnel besides the operator must be a minimum of 30’ away from the gauge.

5.6 Once the operator has set the gauge and it is reading, the operator shall walk a minimum distance of 30’ away from the gauge.

6  Emergency Response Plan: In the case of accident, damage, loss, or theft of nuclear gauge adhere to the following procedure:

6.1 Priority Response Actions To Be Taken By Gauge Operator

6.1.1 FIRST PRIORITY: Render aid as necessary for lifesaving, first aid, control of fire and other hazards. (Note: Radiation presents minimal risks to lives of persons during transportation accidents. Packages identified as “Type A” by markings on the shipping containers contain only non-life endangering amounts of radioactive materials.)

6.1.2 ADDITIONAL ACTIONS BY GAUGE OPERATOR:

6.1.2.1 Visually inspect gauge for damage, including visual inspection of source rod. Determine if sources are, or can be placed in their shielded positions.

6.1.2.2 Locate sources if separated from the gauge. DO NOT TOUCH OR MOVE RADIOACTIVE SOURCES. Locate, mark, and secure but do not pick up with bare hands.

6.1.2.3 Secure Area – Evacuate an area of at least a 15 ft. radius around the damaged gauge and/or radioactive sources. (Note: if a source cannot be located, THEN evacuate and secure an area large enough to include any possible locations where the source might be located. Prevent entry by all unauthorized persons into the evacuated area.

6.1.2.4 If a vehicle or construction equipment is involved in the incident, detain the equipment until it is determined that there is no contamination.

6.1.2.5 As soon as possible after these actions have been accomplished, notify the RSO of the incident.

6.1.2.6 Describe in detail the incident, condition of the gauge, and actions taken. Follow any additional instructions given by the RSO as soon as possible.

6.2  Response Actions to Be Taken By the Regional RSO

6.2.1 Give additional advice to gauge operator (if needed).

6.2.2 Notify the police, fire, or other emergency agencies as needed or required.

6.2.3 Notify the HQ RSO

6.2.4 The HQ RSO will notify the Tennessee Department of Environmental Conservation Division of Radiological Health at (615) 532-0364.

6.2.5 The HQ RSO will notify the following as needed or if required:

TEMA
1 (800) 262-3300
Troxler 24-Hour Hazmat Emergency
(919) 549-9539
May 1, 2017

Humboldt 24-Hour Hazmat Emergency
1 (800) 535-5053
U.S. DOT
1 (800) 424-8802

6.2.6 Travel to the accident site and perform the following:
6.2.6.1 Confirm the actions taken by the operator to be correct.
6.2.6.2 Conduct a visual inspection of the gauge, shielding, and source rod to determine if radioactive sources are still in the gauge.
6.2.6.3 If radioactive sources are found to be missing, or damage to the shielding is suspected:
   6.2.6.3.1 Use survey meter to conduct a radiation survey of the gauge to assess the integrity of the source encapsulation and shielding. Compare the survey radiation levels to the gauge radiation profile. If the any reading is greater than the listed values you can suspect that the source shielding has been violated.
   6.2.6.3.2 If source(s) are not present in the gauge, perform the necessary surveys to locate and properly secure the source(s). (Note: DO NOT pick up radioactive sources with your hands. Use tongs or pliers to place the source in a properly shielded container. Container may be a source “pig”. The source may also be returned to the gauge shielding if uncompromised.
   6.2.6.3.3 Perform a leak test on the gauge and source rod.
   6.2.6.3.4 With gauge sources at least 30 feet away, check leak test filters with a survey meter and proceed as follows: If the wipe shows a reading greater than background reading, STOP all other actions. Leave any suspected contaminated material in the secured area and notify the appropriate regulatory agency. Increase the secured area and maintain security until proper authorities arrive.
   6.2.6.3.5 If no contamination is found, notify the Regional RSO and request permission to transport the gauge. Once gauge has been approved for transporting, any involved vehicle or equipment may be released and the secure area re-opened.
   6.2.6.3.6 Document all actions taken, or not taken, and provide sketches and/or photos.

6.3 Follow Up Actions Taken By Regional Radiation Safety Officer
6.3.1 Take photos of the damaged gauge prior to shipping for repairs or disposal.
6.3.2 Place gauge in secure storage location until approved for shipment to manufacturer if needed.
6.3.3 Notify the gauge manufacturer of gauge damage and accident.
6.3.4 Send photos of the gauge along with leak test info to the manufacturer for clearance and shipping instructions.
6.3.5 Document any actions and instructions given for records.
6.3.6 Notify by telephone or mail/email ALL regulatory agencies as required of post-accident corrective actions and safety precautions taken.
6.3.7 Ship the damaged gauge to manufacturer per instructions given. (Note: NEVER ship a damaged nuclear gauge until it has been leak tested and the wipe cleared.)
6.3.8 Review accident causes and measures taken. Establish new or revised guidelines to prevent similar future occurrences.