

VIRGINIA DEPARTMENT OF TRANSPORTATION
Materials Division
Radiation Protection Program Manual for Portable Nuclear Moisture-
Density Gauges
VDOT State Radiation Safety Officer: Paul Baldwin
Issued March 2018

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1. PURPOSE

This manual describes the radiation protection program in place for use of Virginia Department of Transportation's (VDOT) Portable Nuclear Moisture – Density Gauges under the control of the Central Office Materials Division. The instructions herein are for safe and proper operation of the equipment; and to state how the Department will fulfill the requirements found in the radioactive materials license. This manual does not address Hand-held/portable XRF Analyzers.

2. SCOPE

VDOT uses Troxler Nuclear surface moisture-density gauges and thin-lift asphalt surface density gauges for measuring soil, aggregate, and asphalt density and moisture. This comprises all of VDOT's equipment containing radioactive material that is addressed in this manual. The VDOT ***Radiation Protection Program Manual (VDOTRPPM)*** has been prepared to describe the program of ownership and operation.

This manual covers:

- Virginia Department of Health License agreement and requirements
- Program Administration
- Personnel safety and monitoring and training
- Gauge storage (including transportation) and safety procedures
- Emergency actions

Material contained herein is drawn from many sources in an effort to provide necessary information and instructions in a readily available format. The material is not intended to conflict with any regulations or procedures established by VDH or equipment manufacturers regarding safe and proper operation of equipment containing radioactive material.

All operators of such equipment containing radioactive material shall be required to receive a ***Certificate of Qualification*** before handling gauges (see Chapter 9 for training requirements). The reason is to ensure all employees involved with radioactive gauges are aware of the Department's radioactive materials license, the obligations of the license, and the basic safety practices associated with operating gauges containing radioactive materials.

3. RADIATION LICENSE INFORMATION

Under the ***Atomic Energy Act of 1954***, the United States Nuclear Regulatory Commission (USNRC), formerly the Atomic Energy Commission was given responsibility for all control over radioactive materials. Under the ***Department of Transportation Act of 1966***, the United States Department of Transportation (USDOT) was given regulatory responsibility for safety in the transportation of all hazardous materials, including radioactive materials. Except for certain small

quantities and specific products, a license is required from the USNRC for possession and use of such materials.

Virginia is an agreement state, which issues a license to those possessing and using equipment containing radioactive materials within the Commonwealth. An Agreement State is a state that has entered into formal agreements with the USNRC whereby the regulatory authority over by-product, source, and less than critical quantities of special nuclear material has been transferred to the state from the USNRC. An Agreement State has recognized an agreement with the USNRC under the authority of *Subsection 274 of the Atomic Energy Act of 1954*, as amended, as authorized by compatible state legislation providing for acceptance by that state of licensing authority for agreement materials and the discontinuance of such activities by the USNRC. As an agreement state, the Commonwealth of Virginia issues a license to those possessing and using radioactive material within the Commonwealth.

Licenses are issued by:

Virginia Department of Health
Radioactive Materials Program
109 Governor Street, Room 730
Richmond, VA 23219

VDOT license information is as follows:

Virginia Department of Transportation
License No.: 087-437-1
Central Office Materials Division
Mailing Address: 1401 East Broad Street
Richmond, VA 23219
Physical Address: 6200 Elko Tract Road,
Sandston, VA 23150
Division Administrator: Charles A. Babish
License State Radiation Safety Officer, Paul M. Baldwin, Jr
Soils Engineering Laboratory
License SRSO Phone Contact: 804-328-3142; Fax: 804-328-3136

The State Radiation Safety Officer (SRSO) is assigned primary responsibility for administering the license and compliance with all requirements necessary for the Department to possess the license. As administrator, the SRSO is responsible for maintaining the records as required by the license and all regulations within.

Possession of a license obligates the Department to meticulously perform the actions it stated it would perform to comply with all the requirements of its license. This commitment is the condition under which VDOT is able to receive and retain that privilege. Failure to comply could result in a severe fine, loss of license, or both.

It is important that all persons involved with radioactive materials be aware of the authority, which is the source of the regulations governing use of these materials. These regulations begin with the USNRC and the USDOT. Regulations and requirements for compliance are made known to owners of equipment containing radioactive material through issuance of a license by the USNRC or a state issued license, ultimately having the absolute authority over VDOT. This information reaches Department users through information and instructions contained in the ***VDOTRPPM***.

A. Compliance

Department Personnel – Shall comply with all provisions of the ***VDOTRPPM*** and all other pertinent instructions and requirements so as to ensure safe handling and transporting of equipment containing radioactive material, and to ensure continuance of the Department’s license. For unacceptable standards of conduct, corrective actions will be taken for violations once reported and investigated.

Supervision at the Project Level – On a VDOT construction project, the Project Inspector is directly responsible for the safe keeping and proper operation of nuclear gauges by department personnel. If the equipment is in operation in the field the person in charge at the location of the activity is directly responsible for the safe and proper operation. Directly responsible means ultimate responsibility for ensuring compliance with the requirements of the ***VDOTRPPM*** and all other relevant documents.

District Level Actions by the District Radiation Safety Officer – The DRSO or authorized designee should be frequently available to gauge operators and Project Administrators to help with implementing the requirements of the ***VDOTRPPM***. Assistance may be in many forms such as issuing gauges, field cleaning, instructing, pointing out violations, examining density gauges, leak testing, accountability, etc., i.e. all those activities necessary to help ensure safe and proper operation of nuclear gauges.

Actions for Noncompliance – Once a violation is reported the employee will immediately be suspended from using a gauge until an investigation can be performed. The SRSO, DRSO, District Materials Engineer (DME), employee’s supervisor and the employee will hold a meeting for discussion of the reported violation. In conclusion, if found negligent appropriate actions will be taken. This could result in relinquishing all privileges to the employee from operating a gauge.

If an operator from Central Office is found for negligence the SRSO will perform the same process as the district but at the state level.

Non-departmental (Consultant) Personnel – During the period of construction, those handling and transporting equipment containing radioactive materials when on VDOT Right of Way shall comply with the provisions of their radioactive materials license authorizing their possession of nuclear gauges. A consultant License must be issued by the USNRC, VDH or an “agreement” state where the company possesses their Radioactive Materials License. If the license is not from Virginia it must accompany a general license issued by VDH granting the use of operating gauges

in the Commonwealth. The term Right of Way is defined in Section 101 titled “DEFINITIONS OF ABBREVIATIONS, ACRONYMS, AND TERMS” in Division I GENERAL PROVISIONS, of the VDOT Road and Bridge Specifications.

Violations by Non-Departmental (Consultant) Personnel – It is the responsibility of each licensee to enforce the provisions of their license; nevertheless, If VDOT personnel is observing continuous radiation safety violations by Consultant personnel on VDOT construction projects or property’s, they should report such violations to the SRSO, who will take appropriate actions to contact the Consultant Licensee to resolve. In the attempt that the violation is not resolved, the SRSO will contact VDH to report noncompliance activities.

B. Loaning Department-owned Nuclear Gauge Equipment

Loaning to Contractor– VDOT owned nuclear gauges shall **not** be issued to contractors nor their Sub-Contractors or Suppliers for any purpose for testing.

Radioactive Materials License – Before the transfer of VDOT nuclear gauges to Non-departmental (Consultant) personnel, a review of the consultant’s license will be performed with all supporting documents by the SRSO prior to commencement of work for license compliance to transfer VDOT gauges. At the request from the consultant a copy of VDOT’s license will be presented for compliance and filing information.

Loaning nuclear gauges to Consultants – Once the Consultant’s license is reviewed and approved a MEMORANDUM OF AGREEMENT will be issued to the consultant company’s RSO for signature of acceptance of the terms and conditions between consultant and VDOT. Troxler Model 3440 moisture /density gauge(s) will be issued to perform testing on VDOT projects. The MEMORANDUM OF AGREEMENT Final Version-4-16-14 rev 03 2017 is located in the appendices. If the consultant disagrees with the memorandum, no gauge will be issued.

4. SAFETY

A. ALARA Philosophy

All authorized users and personnel involved with equipment containing radioactive materials must know and practice the ALARA philosophy – to keep radiation exposure **As Low As Reasonably Achievable**. It is the policy of the Virginia Department of Transportation (VDOT) that all procedures are to be used in such a manner that keeps any exposure **As Low As Reasonably Achievable**.

B. Departmental Commitment

The Department is committed to the ALARA philosophy of minimizing occupational and public exposures. The oversight and review of the radiation safety program is performed by the SRSO, the position, which is occupied by a Central Office Manager indicating the qualifications of management commitment by VDOT.

All personnel using density gauges will be made aware of our commitment by reading this manual about VDOT's ALARA philosophy to keep their exposures as low as possible.

All reasonable modifications will be made to procedures, equipment, and facilities to reduce exposures if needed.

C. Training

Proper training is the most important factor contributing to safety in the handling, transporting and storing of nuclear equipment. Radioactive materials shall be used only by individuals who are qualified by the proper training and experience to safely use nuclear gauges. Only personnel who have received the required approved nuclear gauge safety training (see Chapter 9) are permitted to use equipment containing radioactive materials. A list of approved vendors offering nuclear gauge safety training can be found at:

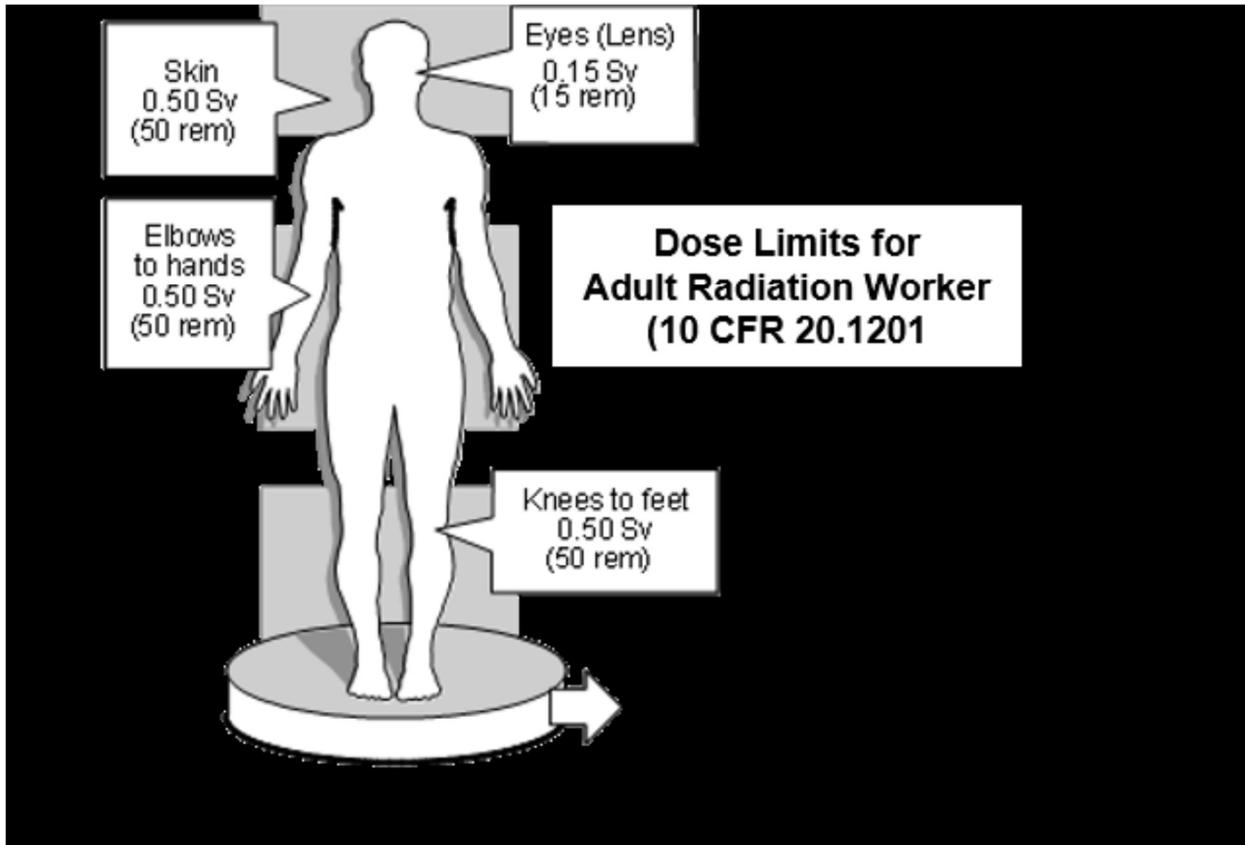
http://www.virginiadot.org/VDOT/Business/asset_upload_file33_3529.pdf.

D. Limiting Radiation Exposure

In practicing the ALARA philosophy, no matter how low the exposure rate, there are ways available to limit exposure. When in the vicinity of radiation, there are three ways to limit or minimize your exposure. These are time, distance, and shielding.

- Time – The effect of time on radiation exposure is very simple. The shorter the time of exposure to radiation the smaller the amount of exposure to that radiation will be. Time is used as a safety factor by limiting the amount of time you are with a gauge. When starting a test, push the start button. If permissible, it is recommended to back away from the gauge about 10 feet until it stops counting. Retract the source handle back into the safe position, record your results and lock up your gauge in the vehicle. Thus your time being spent around a gauge can be measured in seconds, not in minutes.
- Distance – Radiation exposure decreases rapidly with distance. Radiation follows the “inverse square” law that states radiation intensity falls as the inverse square of the distance from the center of the source to the objective. For example, if a person standing one meter from a source was receiving 40 millirem per hour, moving back another meter would cut the intensity to 10 millirem per hour.
- Shielding – The best means of decreasing radiation exposure is to place something between you and the source to limit the radiation. This is why the source of any nuclear equipment should be in the shielded or “safe” position when not required for use. The gauge is acting as a shield in the “safe” position.

E. Personnel Monitoring

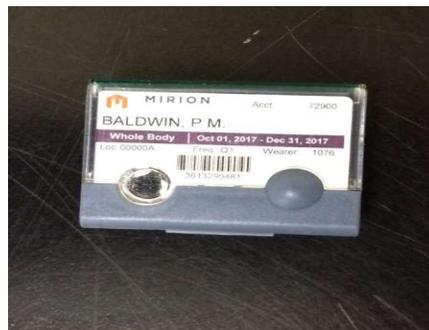


ANNUAL DOSE LIMITS TO ADULT RADIATION WORKERS

Total effective dose equivalent (TEDE) equals the effective dose equivalent (for external exposures) plus the committed effective dose equivalent (for internal exposures).

Personal Dosimeter Badge

VDOT currently uses the Genesis thermoluminescent dosimeter (TLD) badges. It responds accurately to beta, gamma, X-ray, and neutron radiation. The response of each element is corrected by the application of its own unique element correction factors and allows for the reporting of deep, lens of eye and shallow doses. The minimum reportable dose (MRD) for these type badges is 1 millirem.



Control Dosimeter Badge

A control dosimeter badge is included with each shipment of dosimeter badges to determine radiation doses received during transit, and should be stored in a radiation-free area during the wear period. The control dosimeter badge reading is subtracted from the personal (employee) dosimeter reading of each participant. The control dosimeter badges are kept with each DRSO and SRSO materials sections. Failure to include the control dosimeter badge will cause possible transit doses to be reflected in the personnel badge dose. Personnel dosimeter badges that are not in use will be stored with the control dosimeter badge until needed by the employee (gauge user).

Information needed prior to issuing personnel dosimeter badge;

Proof of training: (certificate of completion)

Name: (first, middle initial, last)

Date of birth:

Location: (specify District, Central Office)

If you have had any history of occupational exposure to radiation from a previous employer, please request a copy of your exposure history report and forward it to your respective district or to the SRSO. This information will be added to your current exposure lifetime history.

Instructions for Use of Personnel Dosimeter Badges

Personnel are not permitted to operate or transport nuclear equipment unless wearing a dosimeter badge.

Dosimeter badges shall be worn only by the employee to whom it is assigned.

Clip-on dosimeter badges should be worn in a location that is most likely to receive the highest exposure. Recommendation is wearing it on the torso (at waist area) of the body.

If a dosimeter badge is lost, contact your SRSO or DRSO as soon as possible for a replacement to be ordered. You will not use the gauge until you receive the replacement. If lost on a frequent basis you will be responsible for the cost at the current contract price.

Care of Dosimeter Badges – It is necessary that dosimeter badges receive the proper care, so true exposure values are provided when read. When not wearing a dosimeter badge, the following actions should be taken:

Do not allow the dosimeter badge to be exposed to radiation when the employee is not receiving exposure.

Do not store near radiation sources.

Do not wear during medical X-rays because they are not occupational exposures.

Do not store on dashboards where there can be both heat and sunlight.

If caught in the rain, try to keep it dry. If it is wet, place in a jar with rice to remove the moisture and contact Materials representative making them aware of it.

Never loan your dosimeter badge to anyone.

G. Requirements for Declared Pregnancies

Definition - A declared pregnant woman is a woman who has voluntarily informed her immediate supervisor in writing of her pregnancy and the estimated date of conception. For more information please contact the SRSO.

Procedure for Declared Pregnant Women. A declared pregnant woman will need to complete a Declaration of Pregnancy form per 10 CFR 20.1502 (a) to use a gauge.

F. Public Dose Limits

Anyone who does not work directly with sources of ionizing radiation is a member of the public and their maximum allowable radiation exposure is 2 millirem in any one hour and 100 millirem per year. Members of the public who enter restricted areas remain subject to these same dose limits. The Department conducts its operations so that compliance with these dose limits is maintained. The SRSO and DRSSOs are responsible for verifying radiation levels and establishing restricted areas.

G. Instructions to Gauge Operators

Employee's operating gauges shall read and follow the guidelines of this manual pertaining to the hazards associated with gauges containing sources of radiation.

Only VDOT employees authorized by SRSO and DRSSO may operate a gauge.

Applicable regulations and license provisions for the protection of personnel and public from exposures to radiation or radioactive material shall be followed by gauge operators.

It is your responsibility to report any condition which may constitute or lead to unnecessary exposure to radiation from a nuclear gauge or cause a violation of VDOT's radiation protection policy.

H. Notifications and Reports to Individuals

Radiation Dosimetry Reports - The vendor mails VDOT's dosimetry reports (paper) to the SRSO. Scanned copies of the reports are sent to all district RSO's for record keeping. These records will be filed in such a manner so that the District Materials Engineer can access them if needed. The reports provide quarterly, year-to-date, and lifetime dose data.

Review of Exposure Reports - The SRSO reviews all reports upon receipt from the vendor and signs and dates them acknowledging review was made. Reports are available for review upon request from the employee at any time. Dosimeter badges with elevated doses warrant special attention. Absent dosimeter badges must be located and sent in for processing. The SRSO contacts the DRSO or the dosimeter badge wearer and investigates to attempt to determine the cause of the elevated dose reported. If the cause of the elevated dose cannot be determined, the reported dose will remain unchanged. If the dose is determined not to be an occupational exposure, the worker's dose record will be noted and the wearer notified of findings.

Annual Dose Reports – Upon request monitored operators will be provided an official Occupational Dose Record Report (NRC Form 5). If an operator receives an annual dose of 100 millirem of exposure or more, they will receive a copy of the NRC's Form 5 report.

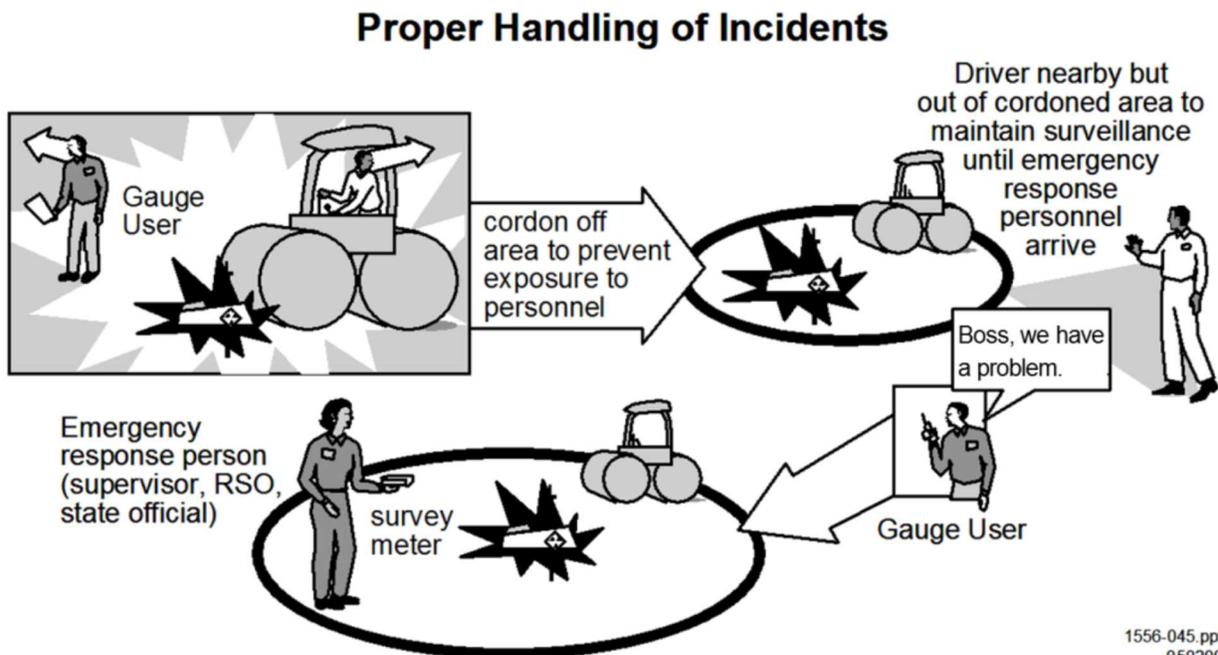
Termination Dose Reports - After monitoring ends for whatever reason a written notification of occupational radiation dose received during employment is provided upon request by the operator.

I. Retention of Occupational Dose Records

Personnel monitoring results must be retained until termination of the Department's license. All VDOT operators' annual dose reports will be maintained at the Central Office Materials Division where the License is located.

5. EMERGENCY PROCEDURES

This chapter applies to VDOT's nuclear gauges when involved in situations requiring emergency procedures to be implemented.



A. General Information

Incident Definition

“Incident” refers to any instance, event or situation resulting in damage or the possibility of damage to a nuclear gauge. Incidents fall under the following categories: accident, equipment misadventure, fire, loss or theft.

Incident Categories

Accident – An unforeseen and unplanned event or circumstance involving nuclear equipment (gauge).

Stationary Gauge – A situation in which a gauge may have been damaged from being hit or run over by a vehicle or construction equipment.

Transported Gauge – A situation in which a gauge or gauge case that is being transported sustains damage as a result of a vehicular accident.

Equipment damaged – Anything out of the normal scope of operation that does not match any other category is considered damaged equipment. Examples: a gauge is dropped, the source rod cannot be retracted due to an indexing rod problem or the source rod has become lodged in the ground, etc.

Fire – A gauge is in a vehicle or building that caught fire and burned. Do not move damaged packages, only move if undamaged out of the fire zone.

Water Damaged Gauges - Water damage alone is not an incident category and it is not necessary to implement emergency procedures. If apparent water damage occurs in conjunction with an incident, implement emergency procedures for that category. If water damage is suspected and no incident has occurred, inform the SRSO or DRSO as soon as possible. Do not turn the gauge on for usage. Moisture in electronics causes severe damage and can be very costly in terms of possible repairs or loss of the gauge entirely due to severe damage. Current values of nuclear gauges vary but can be in excess of \$7,000.00.

B. Instructions

Category

Determine the category of the incident and follow emergency procedure checklist in the shipping packet.

Damaged or Exposed Source

Follow the steps below if it appears that conditions may cause the spread of radioactive materials before the VDOT Materials personnel can respond.

If a sealed source appears to be damaged, cordon off a 15 foot radius cover gauge with some type of plastic to prevent the spread of radioactive material and keep unauthorized personnel away from site until authorized personnel have arrived.

Movement of Gauges Involved in Incidents

If, as a result of an incident, the location of a gauge is considered unsafe, likely to impede the normal flow of traffic, or present potential hazards, the gauge may be relocated to a safe location in the immediate vicinity.

Do not transport a damaged gauge from the incident site.

In the event of a severely damaged gauge, only authorized personnel are to remove it.

DO NOT move a gauge involved in a fire.



The picture above is where two gauges were stored inside a trailer where an electric heater was left on overnight resulting in total destruction of the trailer and its contents. In the ash the gauges were recovered. With the sources removed and leak tested, the test results found no removable radioactive materials from the sources.

Contacting Law Enforcement

If a gauge being transported or in storage is lost or stolen,

1. Contact your immediate supervisor.
2. Contact your DRSO
3. If stolen contact the Virginia State Police to report gauge has been stolen.

Initial Notification

The operator or individual involved in or discovering an incident will immediately go to the shipping papers for the emergency notification contact list and call their district authorized

designee. Refer to the Department's Emergency Procedures for more information located in the shipping papers.

Verify the local law enforcement agency has been advised if applicable in an incident involving a vehicle.

Verify that all appropriate actions are being taken according to particular occurrence. Do not remove the gauge if in a fire. Minimize radiation exposure if source is damaged or exposed, etc.

Remind the applicable person(s) of any required report(s).

Verify the accuracy and reliability of the report and talk to the operator or individual who reported the incident, and get the checklist that was in the Shipping Papers document your report.

Make sure the police report is included if the report provides relevant information.

C. Instructions for Non-authorized personnel

General Procedure

If an incident involving a non-Department gauge occurs on a VDOT project site, the Consultant using the gauge must follow the emergency procedures specified by their company's radioactive materials license.

6. TRANSPORTATION AND STORAGE

This chapter describes how the Department's radiation protection program implements federal and state requirements for gauge transport, storage and security.

It provides instructions on safe transport and storage of gauges.

A. Signs, Forms, and Labels

State and federal regulations require the Department to use certain types of signs, labels, notices and forms in its radiation safety program.

Signs -

Caution - Radioactive Materials Signs – For gauge(s) being stored inside of a building, a sign will be posted on the storage door entrance showing that it is a restricted area. A good example would be a designated closet / storage room. Storage areas that are outside shall have a sign posted on the inside of the entrance storage door. For an outside facility refer to Road & Bridge Standards-605.01.

Postings -

VDH Notice to Employees – It is to be conspicuously posted at storage locations. This notice provides information on radiation protection standards and employee/employer rights and responsibilities to operators. It is to be posted inside of office trailers, construction projects, area headquarters and residency offices.

Emergency Notification Contact list – This list contains all VDOT radiological safety officers' emergency notification numbers and their respective districts. It is to be conspicuously posted at storage locations along with the VDH Notice to Employees. You will also find it in the shipping papers document folder provided with the gauge. On sites where gauges are stored without offices, a list shall be posted on or near the storage area.

Forms -

Shipping Papers – Kept in the passenger compartment of vehicles within the drivers reach while transporting gauges; identifies the shipper, type of radioactive material, gauge manufacturer, model and serial numbers of the gauge being transported. The shipping documents folder contains the shipping papers and lists of emergency procedures provided by the gauge manufacturer and VDOT, current copy of the gauge leak test, and current gauge calibration report. When a gauge is not in transit the shipping papers stay with the gauge in storage or in a known file where operators and Materials personnel have access to it.

Emergency Response Information – This is the gauge manufacturer's emergency information titled TROXLER NUCLEAR GAUGE EMERGENCY RESPONSE INFORMATION REQUIRED FOR TRANSPORTATION) sheet. It is similar to a Safety Data Sheet (SDS) for nuclear equipment and provides VDOT personnel and Emergency services the necessary information in case of an incident.

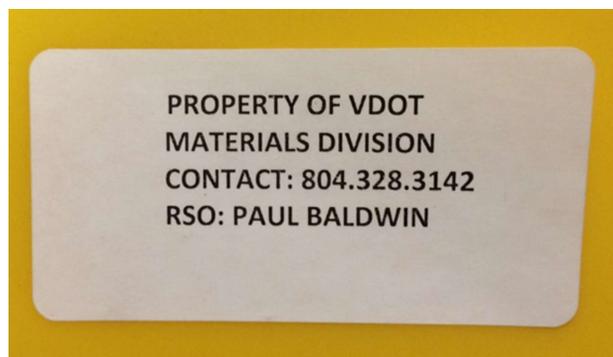
Nuclear Accident Checklist – This is located in the shipping documents folder. This list is to assist the operator as to what information is needed with various types of incidents involving nuclear equipment.

Labels –

Radioactive Yellow II Label – Used on gauge transport/storage containers; two labels required; one on each long side of the container. Must list the contents (radionuclide, or radioactive materials), source activities, and transport index.



VDOT ID Label – Used on gauge transport/storage containers with contact information (Central Office Materials address, phone number and SRSO) in case gauge is lost or stolen.



Shipping by aircraft label – When shipping a gauge by aircraft, this label must be on the shipping case to warn the handler that the gauge cannot be transported on passenger aircraft. One label on each long side of case is required.



US DOT Type 7A Package Label- The shipping case must be marked with the proper shipping name and labeled on both long sides. Yellow II label which must denote the radionuclide, activity, and transport index. In addition, Type A packages must be labeled "US DOT 7A Type A".



Empty Label – Used on empty gauge transport/storage containers if transporting case without a gauge. Example would be a blank 2"x4" label with hand written "EMPTY" on it.

B. Security of Radioactive Material

Gauge security measures are described below. The requirements apply to storage areas and vehicles used to transport/store gauges.

Unless under direct surveillance, gauges must be kept locked and have two locks between the gauge and the public. The locks must provide two independent physical controls preventing removal of the gauge. A lock on the transport/storage case does not count as an independent control if the case can be removed with the gauge inside it.

Try to maintain visual contact with parked vehicles containing gauges.

Gauges cannot be left in vehicles taken to a maintenance or repair shop.

C. Transportation of Gauges

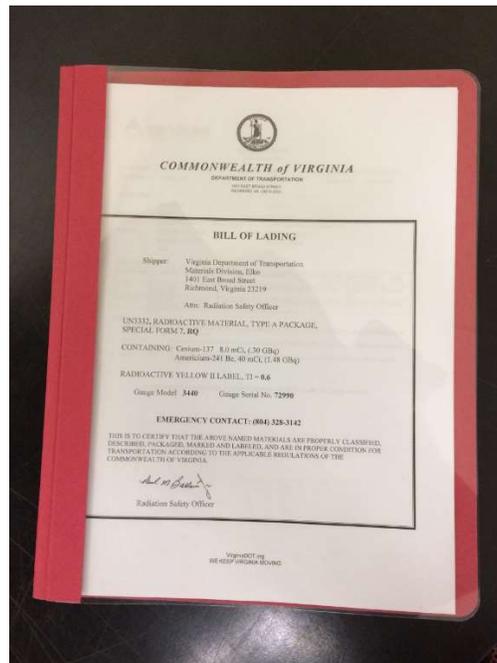
Inspect Before Transporting

Before transporting, the operator must inspect the package (shipping case) to ensure it is in good physical condition other than superficial marks and that all closure devices are in good working order and secured.

The below requirements apply to any vehicle used to transport VDOT owned radioactive equipment.

Shipping Papers

Vehicles transporting gauges must have the shipping papers listed below (kept in a transparent document protector) that are available to authorities in the event of an accident or inspection, and kept within the driver's immediate reach while restrained by the lap belt. The papers must be readily visible to a person entering the driver's compartment, or in a holder mounted to the inside of the door on the driver's side of the vehicle. This folder of documents include: Bill of Lading, (shipper, type of package, package contents, contact phone number and radiation safety officer), manufacturer's gauge certificate, VDOT emergency procedures, gauge manufacturer emergency procedures, accident checklist, emergency notification contact list, leak test certificate and latest gauge calibration report.



Example of VDOT's shipping documents

Vehicle Requirements

Gauges must be transported in their manufacturer case (Yellow) or the VDOT (Blue) transport/storage container. Transport containers must have all required U.S. DOT- markings and labels, and they must be legible. Working hasps with locks on source rod handle and case is required.

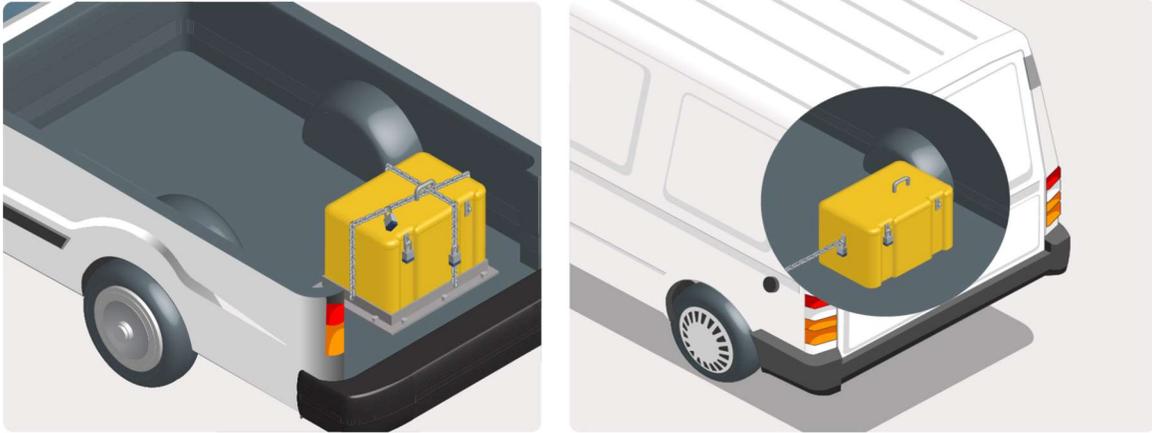
Gauges cannot be transported in passenger compartments, should be placed as far from occupied areas as possible, must be blocked and braced to prevent movement, and double-locked to provide two independent physical barriers.

Licensees commonly use a chain and a padlock to secure a portable gauge in its transportation case to the open bed of a pickup truck, while using the vehicle for storage. Because the transportation case is portable, a theft could occur if the chain is cut and the transportation case with the portable gauge is taken. If a licensee simply loops the chain through the handles of the transportation case, a thief could open the transportation case and take the portable gauge without removing the chain or the case. Similarly, because the transportation case is also portable, it must be protected by two independent physical controls if the portable gauge is inside. A lock on the transportation case, or a lock on the portable gauge source rod handle, is not sufficient because both the case and the gauge are portable.

A vehicle may be used for storage. However, it is recommended by VDOT and the U.S. DOT that this practice only is used for short periods of time or when a portable gauge is in transit for long distances. **VDOT** owned gauges will not be stored in vehicles after work hours. Storage in a hotel room is not permitted at any time. When a portable gauge is being stored in a vehicle, the licensee is specifically required to use a minimum of two independent physical controls to secure the portable gauge.

These are three examples of two such independent physical controls approved by VDH to secure portable gauges:

1. The locked transportation case containing the portable gauge is physically secured to a vehicle with brackets, and a chain or steel cable (attached to the vehicle) is wrapped around the transportation case such that the case cannot be opened unless the chain or cable is removed;
2. The portable gauge or transportation case containing the portable gauge is stored in a box physically attached to a vehicle, and the box is secured with (1) two independent locks; (2) two separate chains or steel cables attached independently to the vehicle in such a manner that the box cannot be opened without the removal of the chains or cables; or (3) one lock and one chain or steel cable is attached to the vehicle in such a manner that the box cannot be opened without the removal of the chain or cable; or
3. The portable gauge or transportation case containing the portable gauge is stored in a locked trunk, camper shell, van, or other similar enclosure and is physically secured to the vehicle by a chain or steel cable in such a manner that one would not be able to open the case or remove the portable gauge without removal of the chain or cable.



Examples for properly transporting a gauge

D. Storage of a Gauge

This section describes securing a gauge at a VDOT facility;

When a gauge is stored at a licensed facility, the licensee is required to use two independent physical controls to secure the gauge. Prior to gauges being stored the facility will be examined and approved by the SRSO or DRSO. Here are some examples of two independent physical controls (barriers) used to secure a portable gauge when stored at a licensed facility --

1. The portable gauge or transportation case (blue VDOT or manufacturer's yellow case) containing the gauge is stored inside a locked storage facility within a secured outdoor area, such as a fenced parking area with a locked gate at all times;
2. The portable gauge or transportation case containing the gauge is stored in a room with a locked door within a secured building for which the licensee controls access by lock and key or by a security guard;
3. The portable gauge or transportation case containing the portable gauge is stored inside a locked, non-portable cabinet inside a room with a locked door, if the building is not secured;
4. The portable gauge or transportation case containing the portable gauge is stored in a separate secured area inside a secured mini-warehouse or storage facility; or
5. The portable gauge or transportation case containing the portable gauge is physically secured to the inside structure with an (eye bolt and chain) of a secured mini-warehouse or storage facility.

When a job requires storage of a gauge at a **temporary** VDOT jobsite or at a location other than a licensed facility, the licensee should use a permanent structure for storage (refer to Road & Bridge Standards- 605.01). When storing a portable gauge at a temporary jobsite, the licensee should limit access by storing the gauge as far away from members of the public as possible. VDOT

Storage Facilities are recommended in R&B Section 514.02 c placing them at 10 feet away from field office or directed by the SRSO or DRSO staff. The licensee must also meet the radiation exposure limits. When the portable gauge is taken out of its assigned storage area for use the operator must fill out the gauges transport log sheet. These transport log sheets are to be maintained on file for 3 years. Portable gauge(s) stored at temporary jobsites or at a locations other than an authorized facility, are required to use two (barriers) independent physical controls.

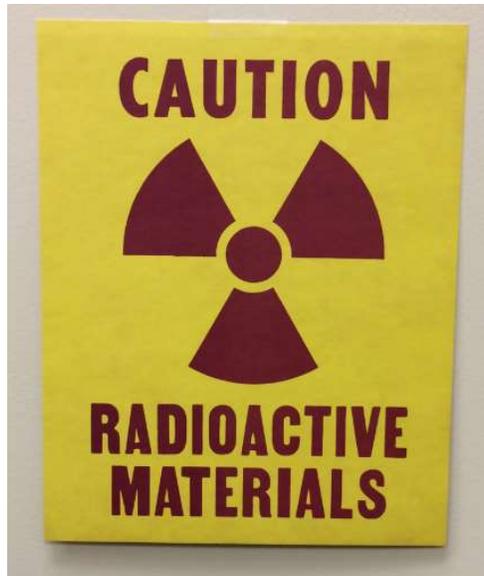
Three examples of two independent physical controls to secure portable gauges at these locations are --

1. At a temporary job site, the portable gauge or transportation case containing the portable gauge is stored inside a locked building or in a locked non-portable structure (e.g., construction trailer, sea container, single axle enclosed trailers etc.), and is physically secured by a chain or steel cable to a non-portable structure in such a manner that an individual would not be able to open the transportation case or remove the portable gauge without removing the chain or cable. A lock on the transportation case or a lock on the portable gauge source rod handle would not be sufficient because the case and the portable gauge are portable;
2. The portable gauge or transportation case containing the portable gauge is stored in a locked garage, and is within a locked vehicle or is physically secured by a chain or steel cable to the vehicle in such a manner that an individual would not be able to open the transportation case or remove the portable gauge without removing the chain or cable;
or
3. The portable gauge or transportation case containing the portable gauge is stored in a locked garage, and is within a locked enclosure or is physically secured by a chain or steel cable to a permanent or non-portable structure in such a manner that an individual would not be able to open the transportation case or remove the portable gauge without removing the chain or cable.

NOTE: Non-Departmental owned nuclear gauge(s) are permitted on VDOT projects where contracts allow. Storage of gauges within VDOT's right of way also has to meet the terms and conditions of the contract.

E. Signs and Notices

Caution - Radioactive Materials Signs – When a gauge(s) is being stored inside of a building, a sign will be posted on the storage door entrance showing that it is a restricted area. A good example would be a designated closet / storage room. Storage areas that are outside shall have a sign posted on the inside of the entrance storage door. Refer to Road & Bridge Standards- 605.01 for outside facility.



Local law enforcement and fire departments must be notified of all construction office locations where gauges are routinely stored if the local jurisdiction requires it.

7. EQUIPMENT CARE

This chapter provides information, instructions, and procedures regarding the requirements of possessing equipment containing radioactive materials. It addresses license and VDOT requirements regarding nuclear surface moisture-density gauge (gauge) operation, security, maintenance, and associated equipment.

A. Leak Testing

Each sealed source of radioactive material shall be tested for leakage annually, in July unless otherwise specified. (VDOT was given authorization by VDH to leak test annually vice the usual not-to-exceed 6-month requirement).

A record will be made showing that a leak test has been performed for each sealed source. Sources (gauges) will not be used until leak tested. If an incident occurs with a gauge an additional leak test is performed to verify that no leakage has occurred. Leak tests are performed by the State or District RSO only.

Leak test kits are to be furnished by an authorized vendor. Information required for each gauge is documented on the card that accompanies the test kit.

Information includes – Company, contact name, address, gauge model, gauge serial number, source serial numbers, signature and date of test.

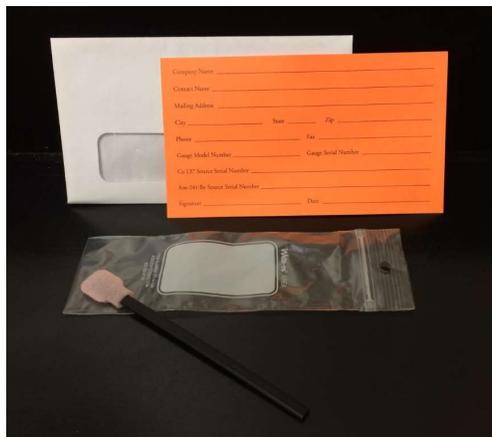
Results of leak tests will be furnished in a reporting format from the vendor to the SRSO for review, signature, files and distribution. You can see a copy of the most current test placed in the Bill of Lading or in their respective districts as well. The original report of leak test results is maintained for a minimum of three years and is located in the Central Office Materials Division.

Leak tests will be conducted as outlined below:

The SRSO or DRSO fills in the card information: write in the serial number on the plastic zip lock bag test date and Signature of

On gauges with two separate sealed sources (e.g., the Troxler Model 3440), remove the density gauge keypad and rub the wipe across the radiation label covering the sealed source or the source holding area located inside. With the same wipe, rub the scraper ring or orifice for the second source located where the source rod indexes through. The source rod must remain in the shielded position during this procedure.

On gauges with one sealed source (e.g., the Troxler Model 4640) located on the source rod, rub the wipe on the scraper ring or orifice that the sealed source is indexed through. The source rod will remain in the shielded position during the test. Return the wipe to its plastic sealable (Ziploc type) bag with the card but do not seal the envelope, and place the gauge serial number on the outside front top left corner.



B. Gauge Inventory

SRSO and DRSOs performs an inventory on all departmental gauges. All VDOT's gauges are purchased; ID tagged, inventoried and disposed of by Central Office Materials Division.

Physical Inspection – Every 6 months (January-July), the general condition of each density gauge and its equipment will be evaluated to determine if any damage to the source housing or shielding has occurred. The inspection will also verify that all required identification and warning labels are attached and legible. If the inspection reveals damage missing or illegible labels or incorrect information the gauge will be removed from service until the problem can be corrected. Any

apparent damage to a gauge will be reported immediately. If excessive radiation levels are detected VDH will be notified.

Inventory Records – For gauges that are assigned to districts, the DRSOs will send their inventory reports to the SRSO for accountability, condition and to verify location of all department owned gauges. The SRSO will maintain inventory records a minimum of three years after the date of inventory. Refer to VDOT's TL-61 form that contains this information.

C. Equipment Security

A gauge should never be left unattended when not in the transporting or storage mode. Most accidents causing damage to a gauge have occurred while the gauge was unattended before or after a density test. The below practices should be followed.

The operator will maintain visual contact with the gauge at all times and be in sufficiently close proximity to protect the gauge from tampering, being involved in an incident, or theft.

When the visual contact and proximity cannot be maintained, the gauge will be locked in the safe position and returned to its case.

Under no circumstances will a gauge be transported on the tailgate of a vehicle.

D. Periodic Field Maintenance

The operator shall perform periodic maintenance actions according to the manufacturer instruction/operation manual. This includes charging batteries only when gauge display indicates that they are low, and cleaning the bottom plate and block.

Reporting Problems – Depending upon which is most expedient, the operator, should advise their respective DRSO or designee of conditions that prevent safe practices or prevent reliable density gauge operations. These conditions might be; missing support documentation, an actual malfunctioning density gauge, or indications of potential density gauge problems.

E. Radiation Survey Instruments

The SRSO and DRSOs shall maintain a calibrated and operable radiation survey instrument to make physical radiation surveys. Survey Instruments are calibrated annually.



F. Gauge Disposal and Transfer

Licensed materials must be disposed of in accordance with VDH requirements by transfer to an authorized recipient. Appropriate records must be maintained of such disposal and transfer.

When disposing of portable gauges, licensees must transfer them to an authorized recipient. Authorized recipients are the original manufacturer of the device, a commercial firm licensed by VDH, the NRC or another Agreement State to accept radioactive waste from other persons, or another specific licensee authorized to possess the licensed material.

Before transferring radioactive material, a licensee must verify that the recipient is properly authorized to receive it using one of the methods described in 12VAC5-481-570 D. In addition, all packages containing radioactive sources must be prepared and shipped in accordance with VDH and DOT regulations. Records of transfer must be maintained as required by 12VAC5-481-100 and 12VAC5-481-571.

8. PERSONNEL

This chapter provides a summary of personnel duties and responsibilities relating to the VDOT radiation safety program (*VDOTRPPM*). The chapter covers the duties and responsibilities required for proper implementation. When situations arise which are not specifically addressed, diligent application of common sense, judgment, and experience is expected.

A. State Radiation Safety Officer (SRSO)

The State Radiation Safety Officer (SRSO) is an individual who has the knowledge, duties, responsibilities, and authority to administer a radiation safety program. For VDOT the term State Radiation Safety Officer is used to mean the ultimate responsible party for the departments Radioactive Materials License.

A SRSO must be appointed with the authority to fulfill the duties and responsibilities of the position.

The Virginia Department of Health (VDH) must be notified in writing within 30 days after a SRSO permanently discontinues performance of the position's duties and who VDOT has appointed as interim until the position has been filled.

The SRSO must have sufficient training and experience with radioactive materials to be a user of the radioactive materials authorized by the license. Training must include practical experience in the safe use of radioactive materials and knowledge of procedures, facilities and equipment.

The duties and responsibilities of the SRSO include the following:

Ensure compliance with all terms and conditions of the license and regulations;

Ensure that sealed sources are leak tested in a time line as prescribed by the license;

Ensure that radioactive materials are used only by individuals who are authorized by the license and that all individuals wear required personnel monitoring equipment;

Stopping licensed activities that the SRSO considers unsafe;

Maintain all records required by the license and regulations, including personnel monitoring records, leak test records, inventory records, training records, and receipt, transfer and disposal records;

Ensure that radioactive materials are properly secured against unauthorized access or removal;

Serve as a contact with the VDH for events such as loss, theft or damage to gauges;

Implement audits of VDOT's radiation safety program state wide;

Assist the District DRSOs in implementing the safety program at each district level across the Commonwealth;

Conduct a formal annual review of the radiation protection program's content and implementation, as required by the license. The review is conducted by the SRSO. See the audit check list located on page 40 of this manual for specific topics assessed. The SRSO also assesses trends in occupational exposures as an index of the program's success and determines if any modifications to the program are needed. A summary of the results of each annual review, including a description of actions proposed and taken (if any) will be filed and maintained for a minimum of 3 years from the date of the review;

Licensed material is disposed of properly;

Up-to-date license is maintained and amendment and renewal requests submitted in a timely manner.

B. District Radiation Safety Officer (DRSO)

The DRSO serves as an extension of the SRSO within the districts, fulfilling the applicable duties and responsibilities of the SRSO but at the district level.

The District Radiation Safety Officer is a designated position authorized by District Materials Engineer and the State Radiation Safety Officer.

Training requirements include that they have successfully completed an approved Nuclear Gauge Safety with Hazardous materials class.

Has knowledge and can operate portable nuclear gauges.

DRSO's are responsible for maintaining their recurring US DOT Hazmat Refresher training.

DRSO's duties include but are not limited to:

Ensure compliance with all terms and conditions of the license and regulations.

Perform leak tests annually to assure no gauge is leaking.

Perform semi-annually an inventory of gauges: verifying locations, correct gauge ID's, and that gauges are stored and secured properly.

Ensure that radioactive materials are used only by individuals who are authorized by the license and that all individuals wear required their personnel monitoring badges.

Contacting SRSO to order, delete and update district personnel's dosimetry badges when needed.

Nuclear Gauge assignments- Upon completion of transferring a gauge (TL-122 form), will be sent by email or faxed within 48 hours of transfer. The original signed form (White top sheet) is to be mailed to Central Office Materials Division's SRSO to be filed as a permanent record until the gauge is disposed of.

Stopping a licensed activity that is considered unsafe;

Maintain copies of all records provided by the SRSO and all generated within the district reports that are required by the license and regulations;

Ensure that radioactive materials are properly secured against unauthorized access or removal;

Serve as a contact with the SRSO for events such as the loss, theft or damage to gauges.

Gauge Operator

Know and practice the ALARA philosophy.

Do not operate or handle gauges unless wearing your assigned dosimeter badge and take proper care of the gauge;

Lock the gauge when not in use and secure in an approved location when not directly under the operator's surveillance;

When removing from storage always sign out the gauge in the utilization log (that remains at the storage location) including the date(s) of use, name(s) of the authorized users who will be responsible for the gauge and the temporary jobsite (project number) where the gauge will be used (Refer to section 6 TRANSPORTATION AND STORAGE);

Before transporting the gauge, ensure that the gauge source rod is in the fully shielded position and locked;

Place the gauge in the transport case (VDOT blue or manufacturer's yellow case) and lock the case;

Block and brace, and lock the case to prevent movement during transportation;

Do not touch the unshielded source or place hands, fingers, feet, or other body parts in the radiation field from an unshielded source;

Unless absolutely necessary, do not look under the gauge when the source rod is being lowered into the ground. If you must look under the gauge to align the source rod with the hole, follow the manufacturer's procedures to minimize radiation exposure;

After completing each test in which the source is unshielded, immediately return the source rod to the shielded position;

Always maintain constant surveillance and immediate control of the gauge when it is not in storage;

Do not walk away from the gauge when it is left on the ground;

Take the necessary actions to protect the gauge and yourself from danger;

Know the categories of incidents and how to implement emergency procedures.

Ensure that shipping papers stays accessible when transporting a gauge and comply with all transportation and security requirements.

Perform routine cleaning of the gauge, and charging of batteries when the gauge display indicates that they are low.

9. TRAINING

This section addresses training requirements for personnel permitted to operate, transport, or handle portable VDOT nuclear moisture-density gauges (gauges).

A. Training Requirements

Only personnel who have received nuclear gauge safety training and have been approved by the SRSO or DRSO are permitted to use a gauge. Training records will be maintained in the employee's VDOT University's Manuscript for verification purposes.

For a list of approved training companies refer to VDOT's Materials Certification School website or contact the district or central office materials division.

Initial training is good indefinitely but the Hazardous Materials portion is required to be refreshed at least once every 3 years to be compliant with USDOT requirements.

NOTE: All VDOT personnel that are currently operating and **transporting** gauges are responsible for keeping their USDOT HAZMAT re-fresher training current. Please keep your VDOT University transcript up to date with your most current certifications.

Effective Date of Certification – An employee is certified on the date the exam is passed. But the employee cannot operate a gauge until verified by the State or District RSO and issued a TLD (dosimeter) badge.

Annual Refresher Training is required for employees (gauge operators) who have received an annual occupational exposure of 100 millirems or greater. This training may be accomplished by attending classroom training or through self-administered computer based-training. The SRSO determines if the operator is required to take the training based on the employee's Annual Occupational Exposure History Report (NRC FORM 5).

B. Practical Training

Personnel should receive supervised practical training in proper use of density gauges before operating a gauge alone. On-the-job training as an apprentice operator is recommended.

APPENDICES

VDOT's Shipping Papers

Bill of Lading

Gauge Certificate (with transfer data)

Troxler Emergency Response Procedures

VDOT Portable Nuclear Gauge Emergency Procedures

Nuclear Accident Checklist

Emergency Notification Contact List

Leak Test Certificate

VDOT Gauge Transferal Receipt (TL-122)

Notice to Employees (VDH)

VDOT Annual Internal Audit Checklist

Memorandum of Agreement

Transport Log Sheet for Multiuse Project

Transport Log Sheet for Projects



COMMONWEALTH of VIRGINIA

DEPARTMENT OF TRANSPORTATION

1401 EAST BROAD STREET
RICHMOND, VA. 23219-2000

BILL OF LADING

Shipper: Virginia Department of Transportation
Materials Division, Elko
1401 East Broad Street
Richmond, Virginia 23219

Attn: Radiation Safety Officer

UN3332, RADIOACTIVE MATERIAL, TYPE A PACKAGE,
SPECIAL FORM 7, RQ

CONTAINING: Cesium-137 8.0 mCi, (.30 GBq)
Americium-241 Be, 40 mCi, (1.48 GBq)

RADIOACTIVE YELLOW II LABEL, TI = 0.6

Gauge Model 3440 Gauge Serial No. 72990

EMERGENCY CONTACT: (804) 328-3142

THIS IS TO CERTIFY THAT THE ABOVE NAMED MATERIALS ARE PROPERLY CLASSIFIED,
DESCRIBED, PACKAGED, MARKED AND LABELED, AND ARE IN PROPER CONDITION FOR
TRANSPORTATION ACCORDING TO THE APPLICABLE REGULATIONS OF THE
COMMONWEALTH OF VIRGINIA.

Radiation Safety Officer



Gauge Certificate
(with transfer data)

Gauge model: 3440
Transferred on: 19-Sep-2017

Serial no: 72990
Sales order: S48703

SS&D registry: NC-646-D-130-S
Date Printed: 19-Sep-2017

Transfer Data:

	Transferee	Transferor
License:	87-437-1	032-0182-01
Company:	Virginia Department of Transportation	Troxler Electronic Laboratories, Inc.
Address:	6200 Elko Tract Road Sandston, VA 23150 USA	3008 Cornwallis Rd RTP, NC 27709 USA

Sealed Source Data:

Radionuclide	Activity	Serial No.	Certification Date	Assay Date	Leak Test Date	Troxler Drawing	Special Form Certificate	ANSI Class
CS-137	0.300 GBq (8.000 mCi)	77-16028	20-Jun-2017	20-Jun-2017	27-Jun-2017	102112	USA/0356/S-96	C66535
AM-241 BE	1.480 GBq (40.000 mCi)	78-11329	26-Jun-2017	26-Jun-2017	27-Jun-2017	102451	CZ/1009/S-96	C66545

Notes:

1. Certification Date: The most recent date the source was inspected and tested as meeting stringent quality control standards for source integrity.
2. Assay Date: The date the source activity was determined and the reference date for calculation of the current source activity.
3. Leak Test Date: The date the source was leak tested and found to have removable activity of less than 185 Bq (0.005 microcuries).

You should permanently retain this document as a record of gauge receipt.



TROXLER NUCLEAR GAUGE EMERGENCY RESPONSE INFORMATION
REQUIRED FOR TRANSPORTATION

Call Troxler Electronic Laboratories, Inc, at (919) 549-9539 for Emergency Assistance

1. PROPER SHIPPING NAME:

- ◆ RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM, UN3332

POTENTIAL HAZARDS

2. HEALTH HAZARDS

- ◆ Radiation presents minimal risk to lives of persons during transportation accidents.
- ◆ Undamaged packages are safe; damaged packages or materials released from packages can cause external radiation hazards. Contamination is not suspected.
- ◆ Packages (cartons, boxes, drums, articles, etc.) identified as "Type A" by marking on packages or by shipping papers contain non-life endangering amounts. Radioactive sources may be released if packages are damaged in moderately severe accidents.
- ◆ Packages (large and small, usually metal) identified as "Type B" by marking on packages or by shipping papers contain potentially life-endangering amounts. Because of design, evaluation, and testing of packages, life-endangering releases are not expected in accidents except those of utmost severity.
- ◆ Commonly available instruments can detect most of these materials.
- ◆ Water from cargo fire control is not expected to cause pollution.

3. FIRE OR EXPLOSION

- ◆ Packagings can be consumed without content loss from sealed source capsule.
- ◆ Radioactive source capsules and Type B packages are designed to withstand temperatures of 1475 °F (800 °C).

EMERGENCY ACTION

4. IMMEDIATE PRECAUTIONS

- ◆ Priority response actions may be performed before taking radiation measurements.
- ◆ Priorities are life saving, control of fire and other hazards, and first aid.
- ◆ Isolate hazard area and deny entry. Notify Radiation Authority of accident conditions.
- ◆ Delay final cleanup until instruction or advice of Radiation Authority.
- ◆ Positive pressure self-contained breathing apparatus (SCBA) and structural firefighter's protective clothing will provide adequate protection against internal radiation exposure, but not external radiation exposure.

5. FIRE

- ◆ Do not move damaged packages; move undamaged packages out of fire zone.
- ◆ Small Fires: Dry chemical, CO₂ water spray or regular foam.
- ◆ Large Fires: Water spray, fog (flooding amounts)

6. SPILL OR LEAK

- ◆ Do not touch damaged packages or spilled material.
- ◆ Slightly damaged or damp outer surfaces seldom indicate failure of inner container.
- ◆ If source is identified as being out of package, stay away and await advice from Radiation Authority.

7. FIRST AID

- ◆ Use first aid treatment according to the nature of the injury.
- ◆ Persons exposed to special form sources are not likely to be contaminated with radioactive material.

VDOT Portable Nuclear Gauge Emergency Procedures

These emergency instructions apply whenever a nuclear gauge is involved in an event that might cause damage to the source or its shielding or prevent the return of the source to the shielded position (e.g. when the gauge is struck by a piece of equipment, is contained in a vehicle involved in an accident or involved in a fire).

- Gauge User / Operator:

Immediately cordon off the area around the gauge (approximately 15 foot radius) and prevent unauthorized personnel from entering the area to minimize personnel exposure. The gauge operator should stand by outside the cordoned area and maintain constant surveillance of the gauge until emergency response personnel arrive.

- Detain any equipment or vehicle involved in the accident and the operator until it is determined that no contamination is present. Gauge users and other potentially contaminated personnel should not leave the scene until they have been checked for contamination by emergency response personnel.

-Notify appropriate emergency response personnel (See VDOT Emergency Phone List for your Districts area RSO located in this Bill of Lading) as soon as possible.

-RSO and Licensee Management:

Evaluate the condition of the gauge. Determine if the source(s) are present and if they are in the shielded position (if applicable). If the source(s) are out of the gauge they must be located immediately.

-Arrange for a radiation survey to be conducted if necessary (ASAP) by a knowledgeable person using appropriate radiation detection instrumentation. This person could be a VDOT, emergency personnel or a consultant competent in the use of radiation survey meters. The Troxler gauge operation manual contains a radiation profile chart which gives the normal radiation levels near the gauge. The radiation survey readings can be compared to the radiation profile for the gauge contained in the gauge operation manual to determine if the readings are normal.

-The radioactive materials in Troxler gauges does not pose an immediate health hazard. However, prolonged direct contact with the sources should be kept to a minimal for potential radiation exposure.

NUCLEAR ACCIDENT CHECKLIST

Do not discuss incident with anyone except police, VDOT materials personnel and your immediate supervisor.

Driver Name: _____
 Phone Number: _____ Work _____
 Accident Date: _____ Time _____
 Exact Location of Accident: _____

What is the serial number of the Gauge? _____

1. Was there any damage to the nuclear gauge? Yes No
2. Was there any damage to the carrying case Yes No
3. Was there any damage to the transport enclosure? Yes No

If the answer to the above 3 question is "NO", discontinue checklist. If the answer to question 1 above is "YES", complete the following:

Did the accident occur on a project site? Yes No
 To whom was the gauge assigned too at the time of accident:

Name: _____
 Phone Number _____

Was a Nuclear Gauge involved in a fire? Yes No

If so, what Fire Department was called?

Was any other vehicle(s) involved? Yes No

Name: _____

Phone Number _____

Name: _____

Phone Number _____

Was there damage to the source rod? Yes No

Can all nuclear sources be accounted for? Yes No

Was area around the accident cordoned off the required 15 ft. perimeter? Yes No

Was a survey of the area made to verify that there was no radiological contamination? Yes No

Was VDH called? Yes No

Was there any radioactive material detected? Yes No

If yes, what action was taken?

VA State Police Officers Name: _____ Badge Number: _____

Judicial District: _____

Any other drivers involved? Yes No Name:

Were any persons injured? Yes No

Name	Address	Phone
_____	_____	_____
_____	_____	_____

Nearest Radiation Safety Monitor's Name

Phone Number: _____ Time: _____ Date: _____

Your immediate Supervisor contacted - Name:

Phone Number: _____ Time: _____ Date: _____

District Radiation Safety Officer's Name:

Phone Number: _____ Time: _____ Date: _____

State Radiation Safety Officer Name: Paul Baldwin, Jr.

Phone Number: (804)328-3142 Time: _____ Date: _____

HOME: (804) 677-0293

EMERGENCY NOTIFICATION CONTACT LIST

Rev. Date: 11/15/2017

Follow these steps in case of Emergency:

1. From list below Notify Personnel in your respective District (if can't be reached, go to next step).
2. Central Office Materials Division's (ELKO) State Radiation Safety Officer (if can't be reached, go to next step).
3. The VDH Radiological Health & Safety unless none of the other contacts listed below can not be reached.

<u>Districts</u>	<u>Contact Name:</u>	<u>Business Phone No.</u>	<u>Cell Phone</u>
Bristol	Mike Austin	276-696-3313	423-502-4606
	P. A. (Trish) Miller	276-696-3311	
	Brian Truelove	276-696-3318	276-608-3282
Salem	Jeffrey Padgett	540-312-3451	276-733-6806
Lynchburg	Bill Wise	434-856-8105	434-841-7079
	Roger Falls	434-856-8358	434-907-1030
Richmond	Danny Morris	804-524-6200	804-720-6428
Hampton Roads	Thomas Bazemore	757-925-2687	757-334-1562
	William Jenkins	757-925-2277	757-334-2812
Fredericksburg	Michael Whanger	540-899-4243	540-207-6855
	Brian Buckle	540-899-4243	540-907-6047
Culpeper	John (Dicky) Finks	540-829-7580	540-718-7412
	David Routt	540-829-7572	540-717-2862
Staunton	Darren Galford		540-280-3591
NOVA	John Russell	703-259-1955	703-975-0185
	Ronnie Seale	703-259-1987	703-409-0030

Central Office Materials Division (ELKO)

Paul M. Baldwin, Jr.

State Radiation Safety Officer

paul.baldwin@vdot.virginia.gov

Office - 804-328-3142
Home Cell - 804-677-0293
Fax - 804-328-3136

Richmond District Office

Anthony Sanchez

Asst. State Radiation Safety Officer

anthony.sanchez@vdot.virginia.gov

Office - 434-944-6107

VDH Emergency Contact (24/7):

- Virginia Emergency Operations Center (VEOC):
- (804) 674-2400
- In-state toll free 1-800-468-8892
- Ask for Rad Health Duty Officer

VA Department of Emergency Management

After normal business hours

24-Hour Emergency No.: 800-468-8892



Troxler Electronic Laboratories, Inc.
 3008 Cornwallis Rd., P.O. Box 12057
 Research Triangle Park, NC 27709
 Tel (877) 876-9537 Fax (866) 391-2759
 License: NC 032-0182-1

Cust ID: 7365

TROXLER
 3008 E. CORNWALLIS RD
 RTP, NC 27709

LEAK TEST CERTIFICATE

DEVICE:

Model: 3440 Serial No: 72990

SEALED SOURCES:

Serial No.	Measure Date	Nuclide	GBq	mCi
77-16028	6/20/2017	Cs-137	0.296	8
78-11329	6/26/2017	Am-241/Be	1.48	40

LEAK TEST ANALYSIS:

Sample collected on: 09/14/2017
 Sample analyzed on: 9/18/2017 12:40:47 PM Position: 2
 Analyzed by: HEB

	ALPHA	BETA-GAMMA
Conversion factor (cpm/Bq)	1.24E+01	1.97E+01
Background measurement (cpm)	0	24
Sample measurement (cpm)	1	22
Activity (Bq)	< MDA	< MDA
Min. Detectable Activity (Bq)	3.7E-01	1.3E+00

This certifies that the leak test results are:

- Less than 185 Bq (0.005 uCi) Greater than 185 Bq (0.005 uCi)

Rev. 9/2006

VIRGINIA DEPARTMENT OF TRANSPORTATION

MATERIALS DIVISION

NUCLEAR GAUGE TRANSFERRAL RECEIPT

District _____ Date _____

Project Number _____

I have assumed responsibility for the care and safekeeping of the following equipment:

Gauge Model Number _____ Gauge Serial Number _____

Additional Equipment; Hammer Yes No ; Driving Pin Yes No

Battery Charger Yes No ; Leveling Plate Yes No

Standard Block Yes No

Print Name _____

Title _____

Address _____

Signature _____ Phone# _____

When the above equipment is returned to the custody of the State or District Materials Engineers Staff, have the individual sign below.

Signature _____

Title _____

Address _____

White- Central Office Materials Division

Yellow - District Materials Engineer

Pink - Person assuming responsibility



NOTICE TO EMPLOYEES

The Virginia Department of Health (VDH) has established standards to protect you from hazards associated with radioactive materials and radiation emitting machines and has established certain provisions for the options of workers engaged in work under a VDH license or registration. In particular, the following information is available for your review:

Virginia Radiation Protection Regulations 12VAC5-481; Part IV - Standards for Protection Against Radiation;
Virginia Radiation Protection Regulations 12VAC5-481; Part X - Notices, Instructions and Reports to Workers; Inspections; and
Any other documents your employer must provide, as listed in "Your Employer's Responsibility" below.

A copy of the regulations specified above and the documents listed in Item 2 of "Your Employer's Responsibility" may be found at the following locations:

Virginia Department of Transportation; License No.: 087-437-1, 1401 East Broad Street, Richmond, VA 23219

Radiation Safety Officer for this License is: Paul M. Baldwin, Jr. (804) 328.3142

YOUR EMPLOYER'S RESPONSIBILITY

1. Apply the provisions of Virginia Radiation Protection Regulations to work involving radiation sources.
2. Post or otherwise make available to you a copy of the license, certificate of registration, conditions or documents incorporated into the license by reference and amendments thereto, and the operating procedures applicable to activities under the license or registration.
3. Post any notice of violation involving radiological working conditions, proposed imposition of civil penalty, or order issued pursuant to the Virginia Radiation Protection Regulations, and any response from the licensee or registrant.

YOUR RESPONSIBILITY AS A WORKER

1. Know the provisions of the Virginia Radiation Protection Regulations and the precautions, operating procedures, and emergency procedures applicable to the work in which you are engaged.
2. Observe the provisions for your own protection and protection of your co-workers.
3. Report unsafe working conditions or violations of the license or registration conditions or regulations to your employer or VDH.

WHAT IS COVERED BY THESE REGULATIONS

1. Limits on exposure to radiation and radioactive material in restricted and unrestricted areas;
2. Measures to be taken after accidental exposure;
3. Personnel monitoring, surveys, and equipment;
4. Caution signs, labels, and safety interlock equipment;
5. Exposure records and reports;
6. Options for workers regarding VDH inspections; and
7. Related matters.

REPORTS ON YOUR OCCUPATIONAL RADIATION DOSE HISTORY

1. 12VAC5-481 Sections 640, 700, and 710 establish limits for occupational dose resulting from exposure to radiation and concentrations of radioactive material in air and water. 12VAC5-481-2380 requires your employer to provide you a written report if you receive a dose in excess of those limits. While these are your maximum allowable limits, your employer is required to take steps to keep your radiation dose as far below limits as is reasonably achievable.
2. If the monitoring of your radiation dose is required by 12VAC5-481-760, your employer must provide a written report of your radiation dose:
 - a. Annually.
 - b. At your request, for the current year upon your termination of employment in work involving radiation or radioactive material.

INSPECTIONS

All licensed or registered activities are subject to inspection by VDH. Any worker or representative of workers who believes that a violation of Virginia Radiation Protection Regulations or license conditions has occurred in work under a license or registration with regard to radiological working conditions may request an inspection. The request must be in writing and sent to the address listed below. The request must describe the alleged violation in detail and must be signed by the worker or representative of workers. During inspections, VDH inspectors may confer privately with workers, and any worker may bring to the attention of the inspectors any past or present condition believed to have contributed to or to have caused a violation. Refer to 12VAC5-481-2310.

Direct all inquiries on matters outlined above to:

Virginia Department of Health, Radioactive Materials Program, 109 Governor Street, Room 730, Richmond, VA 23219. Phone: (804) 864-8150

POSTING REQUIREMENTS

Copies of this notice must be posted in a sufficient number of places to permit individuals engaged in work under the license or registration to observe them on the way to or from the work location. Each posted copy must be conspicuous and replaced if defaced or altered. Refer to 12VAC5-481-2260.

VDOT RADIATION SAFETY PROGRAM AUDIT CHECKLIST

License No. _____

Auditor's Name (print) _____ Date of Audit _____

Auditor's Signature _____

AUDIT ITEM	YES	NO	Comments
1. Audit History			
a. Last audit at this location (date)?			Last audit performed on ____-____-____
b. Were previous Audits conducted yearly?			
c. Were any deficiencies noted during the last two audits? Any deficiencies repeated?			
d. Were corrective actions taken?			
2. VDOT and Scope of Program			
a. Was amendments done to the License?			
b. If the RSO changed, was the license amended? Does the new RSO meet the training requirements? RSO class completed?			
c. Does the license authorize all of the radionuclides in the gauges possessed?			
d. Are the actual uses of the gauges consistent with the authorized uses on the license?			
3. Training and Instructions to Operators			
a. Have all workers received initial radiation safety training? Annual refresher training?			
b. Annual refresher training if needed?			
c. Have all workers received required Hazmat refresher training? 3 year requirement.			
d. Are training records maintained for each Individual?			
e. Are emergency procedures known throughout VDOT?			

4. Radiation Detection Instruments			
a. Is a survey meter available for radiation?			
b. Have the instruments been calibrated within the last year? Annual requirement.			Date of Cal ____-____-____
c. Are calibration records maintained? 3 years			
5. Gauge Inventory			
a. Is a record kept showing receipt of each gauge and their locations?			
b. Are all gauges physically inventoried at least every six months?			
c. Are records of inventories maintained? 3 years			
6. Personnel Radiation Protection			
a. Are ALARA rules being followed?			
b. Are all gauge users assigned TLD badges?			
c. Do all personnel wear their TLD badges in the restricted area and when handling gauges? Are badges properly stored when not in use?			
d. Are TLD badges exchanged quarterly?			
e. Are dosimetry reports reviewed by the RSO when received and signed for verification?			
f. If a worker declared her pregnancy, were the applicable requirements met? Notify VDH			
7. Public Dose			
a. Has a survey or evaluation been performed to demonstrate public dose limits are met? (indicate the date) Area badge is sufficient if Must be below 100 mrem per year			

b. Have there been any changes in the use or storage of gauges or in the use of surrounding areas that would necessitate a new survey or evaluation? Any new gauges?			
c. Are unrestricted area radiation levels less than 2 mrem in any one hour?			
d. Are gauges stored in a manner to prevent unauthorized use or removal?			
8 Operating and Emergency Procedures			
a. Are current copies of operating and emergency procedures available to each individual?			
b. Did any emergencies occur? If so, were they properly handled?			
9. Leak Tests			
a. Are records of leak test results maintained for each gauge? 5 years			
b. Are leak tests performed in accordance with procedures?			
c. Is each gauge in inventory leak tested at least every 5 years? 5 years			
d. Were any sources found leaking? Notify VDH			
10. Maintenance of Gauges			
a. Are procedures followed for cleaning and lubrication of gauges?			
b. Do personnel observe good ALARA practices? Transport away from driver.			
11. Transportation			
a. Are DOT 7A packages used for transport of gauges? Is documentation of package testing maintained? Type A package test results			
b. Is special form source documentation maintained? Beginning 2 digits of source s			

c. Packages have two labels. Yellow-II on opposite sides with TI, Activity and hazard class? Type A label.			
d. Packages are inspected prior to transport by technicians?			
e. Cases are locked? In good repair with no holes			
f. Shipping papers are properly prepared for all gauges shipped?			
g. Shipping papers (Bill of Lading) and emergency instructions are within drivers reach during transport?			
h. Gauges are not carried in passenger area of vehicle?			
I. Gauges are secured against movement in vehicle?			
12. Notifications and Reports			
a. Was any radioactive material lost or stolen? If so, were reports made to VDH?			
b. Did any overexposures occur? Were reports made? Over 150 mrem per quarter deep dose			
c. If any events occurred, was the situation investigated and determined with corrective actions taken and reported?			
13. Posting, Labeling, Regulations	YES	NO	
a. VDH "Notice to Employees" posted?			
b. Copy of current license on file?			
c. Latest dosimetry Reports on file?			
d. Caution radioactive materials sign(s) in proper locations.			

14. Summary of Deficiencies Identified During Audit (attach additional sheets as necessary)			
Deficiencies		Proposed Corrective Actions/Planned Completion Date	
15. Other recommendations for improvement (attach additional sheets as necessary)			

[rev. 03/2017)

**MEMORANDUM OF AGREEMENT
BETWEEN VIRGINIA DEPARTMENT OF TRANSPORTATION
AND CONSULTANT COMPANY
(Radioactive Materials Licensee's of Virginia)**

Effective this date this agreement is between Virginia Department of Transportation (owner) referred to as VDOT and Consultant Company (Client) for the transferring of licensed radioactive materials (portable nuclear density gauge(s)) from VDOT's Virginia Department of Health (VDH) Radioactive Materials License to the Client's VDH Radioactive Materials License for performing testing of materials on VDOT construction and maintenance projects in the Commonwealth of Virginia.

A current copy of the Client's Radioactive Materials License provided to VDOT for review prior to this agreement for compliance of VDH regulations.

Terms and conditions are as follows:

Damage, Loss or Theft – The Client agrees to accept liability only for physical damage to the gauge other than through normal wear and use of the gauge and loss or theft of said equipment to the extent that new equipment must be purchased. In the event that said equipment or any components thereof are damaged beyond repair, stolen or destroyed, the value of such damage, for which the Client shall be liable, shall be based on the purchase value of the equipment. In the event of an incident concerning damage, loss, or theft of a gauge, the Client is responsible for taking appropriate and reasonable emergency procedures to contain and secure the gauge and its contents. VDOT does not provide survey meters for source detection.

Storage – An approved storage facility supplied by VDOT or by Company to maintain the security and prevent the unauthorized removal of said equipment per 12 VAC5-481. Locks for the storage facility will be provided by the Client. Any type of storage other than the VDOT-supplied storage meeting the requirements of Standard 605.01 will be the responsibility of the Client.

Routine Field Maintenance – Routine field maintenance (cleaning) and the charging of the batteries shall be the responsibility of the Client. Routine Field Maintenance is defined as cleaning of the sliding block and lubrication while the gauge is being used for testing on a project. WD40 is not to be used on gauges for lubrication.

Annual Maintenance, Repair and Calibration – VDOT agrees to maintain the equipment and its components at no cost to the Client. Further, VDOT will replace any components associated with the equipment as a result from normal wear and use providing the equipment has not been subjected to any misuse.

Leak Wipe Testing – VDOT will perform all leak wipe testing of said equipment, and will furnish the test report verifying its current status to the Client.

Acceptance of Conditions – VDOT and Client(s) witness hereby that the foregoing terms and conditions are satisfactory and that this agreement shall be binding on both parties until the end of the contract and satisfactory return of the gauge to VDOT, or cancellation as provided herein.

Integration – This document contains the entire agreement between VDOT and the Client(s). Any representations or statements, whether written or oral, not set forth in this agreement shall not be deemed to be part of this agreement. If the Client agrees to this document, a current copy of VDOT's VDH Materials license will be given to the Client and in return a copy of the Client's materials license will be submitted to VDOT for review prior to the signing of this agreement, per 12VAC5-481-570-571 of the code of Virginia. At the completion of work the gauge with equipment shall be returned by completing the VDOT Form TL-122. The form identifies the type and serial number of the gauge(s) and equipment used.

Company (Client) Name

Company (Client) Address

Company (Client) RSO or Representative (print name)

Company (Client) Representative (signature)

Company (Client) VDH Materials License Number: _____

Date: _____

Nuclear Gauge Transferal and Transporter's Log

rev. 03/27/2014

I (the undersigned) have assumed responsibility for the care and safekeeping of the following equipment for the recorded time.

Gauge Model Number : 3440

Gauge Serial # _____

Date	VDH Lic. #	Company	Gauge User	Project Number	Veh. Lic. No.	Time Out	Time In

Location of Storage Area: _____

**** VDH Lic. # for VDOT Inspectors - 087-437-1 ****

Nuclear Gauge Transferal and Transporter's Log

rev. 03/27/2014

PROJECT SPECIFIC

I (the undersigned) have assumed responsibility for the care and safekeeping of the following equipment for the recorded time.

Gauge Model Number : 3440

Gauge Serial # _____

Date	VDH Lic. #	Gauge User	Veh. Lic. No.	Time Out	Time In

Location of Storage Area: _____

**** VDH Lic. # for VDOT Inspectors - 087-437-1 ****