

State of Illinois  
Department of Transportation  
Bureau of Materials  
Springfield

POLICY MEMORANDUM

Revised: March 13, 2018

15-08.1

This Policy Memorandum supersedes number 15-08.0 dated January 1, 2008

TO: REGIONAL ENGINEERS AND HIGHWAY BUREAU CHIEFS

SUBJECT: RADIATION SAFETY REQUIREMENTS AND ACCIDENT PROCEDURES

**1.0 PURPOSE**

To establish safety requirements and accident procedures for the **Department** regarding nuclear moisture density **Gauges**.

**2.0 SCOPE**

These requirements and procedures apply to all personnel in the **Districts** and the **Bureau** who handle, use, or are in proximity to nuclear moisture density **Gauges**.

**3.0 AUTHORITY**

1. 32 Illinois Administrative Code: Chapter II, Sections 310 to 400.
2. Code of Federal Regulations (CFR) Title 49.

**4.0 DEFINITIONS**

**BRS** - Bureau of Radiation Safety, Illinois Emergency Management Agency (**IEMA**).

**BUREAU** - Central Bureau of Materials (CBM), Illinois **Department** of Transportation.

**DEPARTMENT** - Illinois Department of Transportation (IDOT), including its **Districts** and Central Bureau offices.

**DISTRICT** - District office, Illinois **Department** of Transportation.

**GAUGE** - Nuclear moisture density gauge.

**IEMA** - Illinois Emergency Management Agency.

**IMD** - Individual Monitoring Device.

**MANUFACTURER** – A business entity that manufactures nuclear moisture density **Gauges**.

**SOURCE** – A source of radioactivity.

**STATE** - The state of Illinois.

**TLD** – Thermal Luminescent Dosimeter.

## 5.0 LICENSING

The **Bureau** is licensed by the Illinois Emergency Management Agency/Bureau of Radiation Safety (**IEMA/BRS**) to use licensed material sealed **Sources** and will act as the correspondent for all **Districts**. The **IEMA/BRS** requires the registration of all **Gauges** ([32 Illinois Administrative Code: Chapter II; Section 320.10](#)). The **IEMA/BRS** also provides for an inspection of all **Districts** according to 32 Illinois Administrative Code: Chapter II and the Radioactive Materials License.

## 6.0 RADIATION SAFETY PRACTICES

- 6.1 Individual **Gauge** users will be trained in radiation safety practices as well as proper procedures for **Gauge** use in Specific Task Training Program S-34 which is conducted by the **Bureau**.
- 6.2 All **Gauges** are to be kept locked during storage and transportation. Locks are to be removed only for actual testing or for reference counts.
- 6.3 The bottom plate assembly should be cleaned with **Source** rod locked in the safe position and the bottom of the **Gauge** facing away from the user.
- 6.4 No maintenance on a **Gauge** (other than fuse replacement) by the user is permitted. All repairs will be performed by the **Bureau** or the **Manufacturer**.

## 7.0 PERSONNEL MONITORING

- 7.1 The **Department** is required to furnish a means of personnel monitoring for all those engaged in handling or operating devices containing radioactive **Sources** ([32 Illinois Administrative Code: Chapter II; Section 340.520](#)).
- 7.2 Generally, personnel monitoring will be accomplished by use of a whole body individual monitoring device (**IMD**) such as a Thermal Luminescent Dosimeter (**TLD**) ([32 Illinois Administrative Code: Chapter II; Section 310.20](#)) which is worn at the waist, chest, or lapel area ([32 Illinois Administrative Code: Chapter II; Section 340.530](#)).
- 7.2.1 **IMDs** are for monitoring of persons, not areas. An **IMD** should only be exposed to radiation when attached to the individual to whom it is assigned. This precludes storage of **IMDs** in areas containing radioactive **Sources** as well as in or near any restricted area. In addition, **IMDs** should not be stored in vehicles (heat from the sun will damage the device or cause it to accrue non-occupational exposure) at any time.
- 7.2.2 **IMDs** should be identified by the name of the individual and exposure period.
- 7.2.3 **IMDs** shall be sent to the **IMD's** monitoring supplier at the end of the monitoring period whether or not they have been used.

- 7.2.4 **IMDs**, once assigned to an individual, shall not be transferred or used by another individual without permanent reassignment by the **IMD** monitoring supplier.

## 8.0 STORAGE

When not in use or in transit, **Sources** shall be kept in protective enclosures such that the provided material and wall thicknesses ensures that no person is subjected to more than the applicable maximum permissible radiation dose ([32 Illinois Administrative Code: Chapter II; Section 340.310](#)). These enclosures should be locked to prevent unauthorized access to the **Source or Sources**. The door or doors to such an enclosure shall be labeled with the standard warning signs ([32 Illinois Administrative Code: Chapter II; Section 340.910](#)). These restricted areas should be located as far removed as is possible from any permanently occupied areas. When not practicable to locate a restricted area away from any permanently occupied areas, periodic monitoring shall be conducted in all adjacent occupied areas. A log of radiation level readings shall be maintained and the surveys shall be conducted when the maximum number of **Gauges** are present. The exposure shall be maintained below the allowable 0.5 REM per year.

## 9.0 RECORDS AND REPORTS

- 9.1 **Accountability Log.** A permanent record shall be kept of the issue and return of all radioactive **Sources** from a restricted area. This record shall include:

1. Model and serial number of **Source** or device issued and returned.
2. Date of issuance and return.
3. Purpose of issuance.
4. Signature of the person that a **Source** or device is issued to.
5. Signature of individual certifying return.

This log shall be current and available for review and inspection by **IEMA/BRS** upon request.

- 9.2 **Radioactive Material Inventory.** A list of all **Sources** and devices assigned to the restricted area shall be maintained (may be a part of the Accountability Log). Periodic physical inventories will be accomplished a minimum of every six months and any discrepancies due to loss or theft shall be reported immediately to the **Bureau** as well as to **IEMA/BRS**.

- 9.3 **Leak Testing.** Leak Testing of all licensed material sealed **Sources** shall be conducted every six months. The results, in microcuries, of each test shall be recorded along with the date on a permanent record available for review and inspection by **IEMA/BRS** upon request (see also Section 12).

- 9.4 **Personnel Monitoring Records.** A record shall be maintained of the annual cumulative radiation dosage, and total cumulative radiation dosage for each individual monitored. It is the **Department's** responsibility to see that the proper reports are provided to

exposed individuals and/or **IEMA/BRS**, as applicable, and a permanent record is maintained in each **District** and the **Bureau** ([32 Illinois Administrative Code: Chapter II; Sections 340.1230 and 340.1250](#)).

Annual readings above the limits prescribed in [32 Illinois Administrative Code: Chapter II; Section 340.210](#) are to be reported to **IEMA/BRS** according to [32 Illinois Administrative Code: Chapter II; Section 340.1230](#). Readings of this magnitude will also be the subject of an immediate investigation by **IEMA/BRS**.

## 10.0 AREA EXPOSURE RECORDS

Records shall be kept of radiation levels monitored at regular periods throughout the year in unrestricted areas adjacent to restricted areas ([32 Illinois Administrative Code: Chapter II; Section 340.320](#)). See also Section 8.0. It may be necessary to estimate individual exposures if the unrestricted area is used infrequently or if the **Sources** in the restricted area are frequently moved.

## 11.0 TRANSPORTATION

11.1 **Private/State-Owned Vehicle.** During transportation of radioactive **Sources** by private/state-owned vehicle (pickup, carryall, station wagon, sedan, etc.), the radioactive **Source** shall be located as distant as is possible from the occupants to minimize personnel exposure. Care should be exercised to maintain the integrity of shielding at all times. If a vehicle is left unattended, the moisture density **Gauge** shall be locked inside, preferably in an area not visible from the outside (e.g., automobile trunk).

11.2 **Common Carrier.** Radioactive materials may not be transported by US Mail under any conditions. However, other means of transportation are available if the applicable regulations are met. Generally, adherence to [32 Illinois Administrative Code: Chapter II; Section 341](#) and the [Code of Federal Regulations \(CFR\), Title 49, Transportation](#) will assure regulation compliance for all other means of transportation. The following detailed requirements are applicable:

1. Package Criteria. The package shall be designed as a Type A for a Class 7 radioactive material. The smallest dimension of the outside shipping container shall be no less than four inches (100 mm). The outside of the container shall be sealed with a device that will indicate if it has been tampered with. The **Source** container shall be securely packed in such a manner to ensure that its position relative to the outside of the packing container does not change. These and other Type A package requirements can be found in [CFR, Title 49, Paragraphs 173.410 and 173.412](#). In addition, "each package of Class 7 radioactive materials offered for transportation must be designed and prepared for shipment, so that under conditions normally incident to transportation, the radiation level does not exceed 200 Millirem per hour at any point on the external surface of the package, and the transport index does not exceed 10 (i.e., maximum dose rate at a distance 3.3 feet (1 meter) from any surface of the package)" according to ([CFR, Title 49, Paragraph 173.441a](#)).
2. Labeling, Marking and Other Shipment Criteria. All surface carriers have adopted policies resulting in close adherence to US Department of Transportation regulations on shipment of all radioactive materials. These policies and regulations require that any shipment containing radioactive material be correctly labeled/marked and

identified. This consists of attaching the appropriate US Department of Transportation labels and markings ([CFR, Title 49, Paragraph 172.310 to 172.442](#)) to the portion of the container bearing the consignee's name and address.

Typically used labeling, marking and other shipment criteria for the **Department** are as follows:

- a. "Radioactive Yellow - II" Label ([CFR, Title 49, Part 172.403](#)) and ([CFR, Title 49, Part 172.438](#)). For this label, the radiation exposure level shall be between 0.5 Millirem and 50 Millirem per hour at any point on the external surface of the package and shall not exceed 1.0 Millirem per hour at 3.3 feet (1 meter) from the external surface of the package. The label shall also indicate the transport index (always rounded up to the next highest tenth: e.g., 1.01 becomes 1.1). The transport index shall be indicated inside the white rectangular box near the bottom of the label as shown in Figures 1 (a) and 1 (b). These labels shall be placed on two opposite sides of a packing case and may be obtained from the **Bureau**. It should be noted that the radiation exposure level for this label to be applicable is significantly less than what is required in the Package Criteria contained in List Item 1 of this Subsection.
- b. "Type A Package" Marking. These markings shall be placed on two opposite sides of a packing case. Examples are presented in Figures 1 (a) and 1 (b).
- c. Package Seal. Each package shall have a seal, which while intact, will be evidence that the package has not been illicitly opened **or tampered with**.
- d. Leaking Source. Do not ship any source that is known to be leaking, without notification of the consignee before shipment, as proper provision for shipment is required to be made.



Figure 1. Radioactive Yellow - II and Type A - Radioactive Material Labels

## 12.0 LEAK TESTING

The "Leak Test" shall be performed by or in the physical presence of only those individuals completing the Troxler training course or the Specific Task Training Program S-34. Each piece of equipment containing licensed material sealed **Sources** shall be Leak Tested for possible leaks at intervals not to exceed six months. The six-month Leak Test should be completed as close to June 1<sup>st</sup> and December 1<sup>st</sup> as is possible. All Leak Tests conducted in the field should be placed in a plastic bag with the envelope marked "Radioactive Material Leak Test" (no label is required). Other pertinent information shall be placed in a second envelope and both shall be forwarded to the Nuclear Instrumentation Laboratory at the **Bureau** for completion of the necessary paper work. All **Gauges** at the **Bureau's** Soils Instrumentation Laboratory concurrent with the semi-annual Leak Test dates will be Leak Tested at the **Bureau**. It is a requirement of the law that an up-to-date record of all Leak Test results be kept by the owner at all times that is on file and available for inspection ([Radioactive Materials License](#)).

## 13.0 POSTING OF SIGNS AND LABELS

The presence of radiation shall be indicated by posting conspicuous signs or labels defining the nature of the hazard, e.g., "Caution - Radioactive Material" on each container or **Source** holder. A "Radioactive Yellow-II" label will be attached to the side of each moisture density gauge, as per [CFR, Title 49, Part 172.406](#), showing the proper Class II index symbol and sign. The appropriate symbols are defined in the [CFR, Title 49, Part 172.438](#). Vehicles used to transport Class II radioactive materials (all nuclear moisture density **Gauges** owned by the **Department**) are not required to use radioactive placards or signs on the vehicle per [CFR, Title 49, Part 172.504](#).

## 14.0 POSTING OF NOTICE TO EMPLOYEES

Each licensee or registrant shall conspicuously post the **IEMA/BRS** Form "[Notice to Employees](#)" in a sufficient number of places in every establishment where employees are working or frequenting any portion of a restricted area, in the presence of radiation sources ([32 Illinois Administrative Code: Chapter II; Section 400.110](#)).

## 15.0 ACCIDENT OR THEFT

Any incident of theft or damage due to collision of the **Source** container shall be reported immediately to the Radiation Safety Officer in the **District**. He/she, in turn, shall notify the **Bureau's** Radiation Protection Officer, telephone (217)782-1057 as to the nature of the incident; the type, model and serial number of the equipment involved; and the extent of personnel injury and possible exposure. Each Radiation Safety Officer has in his/her possession an 8-step procedure to follow in case of accident or theft. All steps should be followed in the order listed. After completion of the steps, the area should be secured with all equipment involved in the accident in the secured area. The safe distance in almost all cases need not be any greater than 500 feet. For nuclear equipment owned by the **Department** (i.e., moisture density **Gauges**), the safe distance need not be greater than 50 feet. All personnel should be kept out of the secured area until the area is declared safe by the Radiation Safety Officer or other appropriate agency personnel.

Although most radioactive materials used in equipment owned by the **Department** are low radiation emitters, care should be taken to find out who was exposed to the radiation and the total dose. When injured or over-exposed persons are taken to the hospital, be sure to notify the medical facility of the possibility of exposure to radiation.

## 16.0 CLOSING NOTICE

Archived versions of this policy memorandum may be examined by contacting the **Bureau**.

The current **Bureau** Chief of Materials has approved this policy memorandum. Signed documents are on file with the **Bureau**.