Chapter 5 – Equipment Operation

Table of Contents

Chapter 5

EQUIPMENT OPERATION

5.1 PURPOSE AND SCOPE

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

5.2 LEAK TESTING

5.2.1 Leak Testing Requirements

Each sealed source of radioactive material shall be tested for leakage at intervals not to exceed 12 months, except for Humboldt gauges, which are tested semiannually. A record will be made showing that a leak test has been performed for each source. Sources will not be used until leak tested. The FDOT Radiation Safety Officer (RSO) will send a letter to the leak test supplier and District Radiation Safety Officers (DRSO) informing them of the time frame in which annual leak tests are to occur.

5.2.2 Incident Leak Testing

A leak test may be performed after a gauge incident if recommended by the Department of Health (DOH).

5.2.3 About Leak Testing

(A) Leak tests will be conducted by the DRSO or authorized designee.

(B) Leak test kits are furnished to DRSOs by the RSO or the leak test vender. Information required for each gauge is documented on the form (see App. A-11) that accompanies the kit, which is returned to the RSO or directly to the leak test vender..

(C) Results of leak tests will be furnished to DRSOs for their files by the RSO who will also retain a copy. Records of leak test results are maintained for a minimum of three years.

5.2.4 Conducting Leak Tests

Leak tests will be conducted as outlined below:

(A) Record the district number, gauge model and serial number, source model(s) and serial number(s), test date and the tester's initials on the leak test form.

(B) On gauges with two separate sealed sources, 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 (“safe”) position during this procedure.

(C) On gauges with one sealed source 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 (“safe”) position during the test.

(D) On specialized equipment, wipe the source as prescribed in the operator’s instruction manual.

(E) Return the wipe to its respective envelope.

(F) Away from the gauge(s), a survey of the envelope with a radiation survey instrument should be performed to determine if contamination is present. If the survey indicates no contamination, the envelope is ready to be sent to vendor for analysis. If contamination is indicated, place the envelope in a plastic bag marked “Radioactive Waste”, immediately notify the RSO, and remove the gauge from service.

5.3 GAUGE INVENTORY

DRSOs or their authorized designees will perform the inventory in the districts and the RSO or designee will perform them at the State Materials Office (SMO).

(A) Physical Inspection – Every 6 months the general condition of each density gauge and its transport/storage case 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, legible, and list correct information.

If the inspection reveals damage missing or illegible labels or incorrect information the gauge or case will be immediately removed from service until the problem can be corrected. Any apparent damage to a gauge will be reported to the DRSO/RSO immediately. If excessive radiation levels are discovered, DOH, will be notified by the DRSO/RSO.

(B) Inventory Records – DRSOs will send their inventory report to the RSO and retain a copy. The RSO and DRSOs will maintain inventory records three years after the date of inventory.

Inventory report should include:

(A) District conducting inventory.

(B) Date inventory was conducted.

(C) Gauge serial number – listed in numerical order from lowest to highest serial number.

(D) Assigned location – the specific office in the district where the density gauge (or other equipment) is assigned.

(E) Present location – the actual location at the time of inventory.

(F) Model and serial number of each sealed source.

(G) The identity of each sealed source radionuclide and its activity.

(H) The signature of the DRSO or designee.

5.4 DEPARTMENT REQUIREMENTS

5.4.1 Density Gauge Diary

The diary should accompany the density gauge at all times. The diary contains the items listed below and may contain additional items as deemed beneficial:

(A) Density Gauge Calibration Parameter Data – Shows calibration date, and calibration coefficient numbers furnished by the manufacturer or the SMO,

(B) Latest issue of FM 1-T 238, Density of Soils and Bituminous Concrete Mixtures by the Nuclear Method.

(C) Latest issue of FM 5-507, Determination of Moisture Content by Means of a Calcium Carbide Gas Pressure Moisture Tester, with current Material Safety Data Sheet,

(D) Gauge Certificate – From the manufacturer, shows date of manufacture, source serial numbers and original owner (App. A-15).

(E) Type A Package Certification Sheet – From the manufacturer, certifies for the stated model series gauges, that the shipping container meets the specifications of the USDOT requirements (App. A-16),

(F) Diary data entry sheets.

(G) Record Keeping – The operator is responsible for keeping their diary up-to date.

5.4.2 Manufacturer's Instruction/Operation Manual

Manual will be kept available for reference at all times.

5.4.3 FDOT Radiation Safety Manual

A copy of the radiation safety manual must accompany the gauge at all times, in accordance with 64E-5.1302, F.A.C.

5.4.4 Inspection and Maintenance

Performed to assure the presence and proper functioning of all items and conditions important to safety. Although some maintenance items may not be safety related, they should be done periodically. Therefore, an inspection is most efficient when done simultaneously with inventory, leak testing, and safety inspections. This inspection and maintenance is directed toward the density gauges.

Inspection Frequency – The DRSO or authorized designee shall inspect gauges, their cases and documents at intervals not to exceed six months.

Gauge Inspection –Gauges shall be inspected to ensure they are operating properly and in safe operating condition. Inoperable or malfunctioning gauges should be returned to the nearest approved vendor for servicing.

5.5 EQUIPMENT OPERATION

5.5.1 Equipment Care and Security

A gauge should never be left unattended when not in the transporting or storage mode according to provisions of Chapter 4 of the manual. 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.

(A) 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.

(B) When the visual contact and proximity cannot be maintained, the gauge will be locked in the safe position and returned to its approved container, or to the transport vehicle and secured as stated in Chapter 4.

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

5.5.2 Operating the Gauge

Hands-on operation of the density gauge will be according to the manufacturer's instruction manual for that make and model unless otherwise stated in a test method approved by the Department.

5.6.2.1 Locking Radiation Sources – When not in use, gauges will be properly locked to have sealed sources in shielded or ("safe") position as identified in the operator's manual. At least two locks will be used to ensure that there are two independent physical controls in place. When the gauge is in its container, the container and vehicle will be locked when the gauge operator or other custodian is not present. Locked gauges may also be stored in permanent or field storage sites if appropriate.

5.6.2.2 Replacement Locks – The DRSO supplies new or replacement density gauge locks. A gauge lock is the lock fastening the source rod to the index rod. The DRSO should contact the RSO regarding the specific type of lock required.

5.5.3 Periodic Maintenance

The operator shall perform periodic maintenance actions according to the manufacturer instruction/operation manual, except that no maintenance actions shall be performed that require the radiation sources to be removed from the density gauge.

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

(A) Possible missing support documentation:

(1) Gauge certificate or Type A package certification,

(2) Gauge diary,

(3) Bill of Lading,

(4) Department emergency procedures,

(B) Some indications of potential density gauge problems:

(1) "Error" message is displayed after self-test.

(2) The standard and/or moisture counts are erratic or approaching allowable limits.

(3) Indexing problems.

5.5.4 Removal of Radioactive Sources

Sources of radiation will not be removed from any gauge or other equipment by anyone other than authorized vendors.

5.5.5 Repairs of Gauges

Only approved vendors are authorized to make repairs to gauges. This includes fuses, batteries, windows, etc. Malfunctioning gauges must be sent to the nearest approved vendor for servicing.

5.5.6 Specialized Nuclear Equipment

This refers to special equipment containing radioactive materials other than density gauges that the Department possesses. The equipment is handled, operated, transported, and stored according to the following:

(A) Wherever appropriate, the provisions of the RSM apply equally to specialized equipment as they do to density gauges.

(B) The conditions of the Department's radioactive materials license permitting it to own or possess a piece of specialized equipment must be stringently followed. This information is available from the RSO.

(C) Operators of the equipment require the same training as operators of the density gauges (Chapter 2). Additionally, they must receive special training that may be required by the Department's license or recommended by the equipment manufacturer. Special training will be provided when necessary by the DRSO, RSO or other qualified personnel.

(D) Most gauges instructions also apply to specialized equipment and should

be implemented when applicable. Additionally, safety and operation instructions stipulated by the manufacturer and any specific license requirements for this specialized equipment must be followed.

5.6 OBTAINING EQUIPMENT

5.6.1 Required of the Department

Every piece of nuclear equipment owned or possessed by the Department must be authorized by its radioactive materials license. Consequently, arrangements for this authorization are made or coordinated by the State RSO or designee before obtaining any equipment, new or used.

5.6.2 Required of the Manufacturer

(A) The manufacturer of nuclear equipment must be authorized by the appropriate licensing agency of the state in which the equipment is manufactured. The state must be an agreement state, if not authorization of the NRC is required.

(B) Before delivering a piece of nuclear equipment, the manufacturer must determine that the purchaser's license permits the purchaser to own or possess said piece of equipment.

5.6.3 Required of the District

Ordering and Receiving

(A) The DRSO/RSO will approve all orders for radioactive material and ensure that the requested material(s), quantities, manufacturer, and model are authorized by the license and that possession limits are not exceeded.

(B) Transportation carriers will provide instructions on where to deliver packages containing radioactive materials.

Safely Opening Packages

(A) Only authorized users will open shipping packages containing radioactive materials. Each package will be received and opened in accordance with the procedure described below.

(1) Each package will be visually inspected for any sign of damage. If the exterior damage is noted, stop and notify the DRSO/RSO. Packages that are crushed or damaged will be evaluated for the possibility of degradation of the package's integrity. If the density gauge shielding appears to have been compromised, arrangements will be made to have the package's radiation levels monitored to determine the presence and extent of any radioactive contamination.

(2) If the physical inspection indicates no damage, the outer package will be opened and the packing slip removed. The transport container will be inspected for evidence of damage; if none is noted, it will be opened and the contents will be verified. The equipment will be closely examined for damage and the manufacturer model number will be checked to verify that it is authorized by the radioactive materials license. If anything appears out of place or missing, notify the DRSO/RSO.

(B) The equipment will be placed in the designated secure storage area.

(C) The DRSO will establish a file for each gauge obtained, including records of receipt, and forward a copy of all documents to the RSO.

5.7 TRANSPORT AND STORAGE CONTAINERS

5.7.1 FDOT Custom Transport/Storage Container

The FDOT custom transport/storage container allows density gauges to be transported and stored in pickup truck beds. The container design meets U.S. DOT Type A package specifications. This is the only FDOT produced container currently approved by both agencies.

Container Availability – Currently manufactured by the Oviedo Aluminum Shop. Available through normal requisition procedures.

Container Description – The container is an aluminum rectangular box that

is bolted to the bed of a pickup truck. It has features to stow tools and related items. It is marked and labeled according to 49 CFR Part 172.

Container Locks – The Resident Engineer or authorized designee will provide container locks for all containers in service under their jurisdiction.

Container Access – The Resident Engineer or authorized designee will ensure the DRSO has access to density gauges stored within containers under their jurisdiction.

Container Inspection – DOT Transport/Storage Containers:

(1) Inspect to ensure no moisture leakage has occurred.

(2) Gauge cushioning material is in place and functioning.

(3) Door weather stripping is functioning.

(4) Hasps, windshield, and container itself are in good working order.

(5) Replace illegible labels.

If repairs are needed, DRSO should advise the operator and the operator's supervisor of the needed repair(s) and advise them to arrange to have them done locally or return to the Oviedo Aluminum Shop if necessary. It is recommended that DRSOs have weather stripping, cushioning material, and adhesive available for repairs.

5.7.2 Manufacturer Shipping Container

Inspect to ensure the container furnished with each gauge is useable.

Locks – Make sure all required storage container and gauge locks and keys are present and are in good working condition. The gauge lock should not be chained or otherwise attached to the gauge because to do so may cause damage to the keyboard during indexing.

Labels – The DRSO will replace any missing or illegible labels and tags.

5.8 RADIATION SURVEY INSTRUMENTS

5.8.1 Radiation Survey Instruments

The RSO and DRSOs shall maintain two calibrated and operable radiation survey instruments to make physical radiation surveys.

5.8.2 Storage and Security

Store and secure each survey instrument (meter) to prevent unauthorized removal in separate buildings to minimize both being out of service simultaneously due to fire, unauthorized removal, etc.

5.8.3 Calibration of Survey Instruments

Calibrate at intervals no greater than once per year. It is recommended that instruments be calibrated alternately between leak tests. DRSOs should have instruments calibrated by a DOH authorized calibrator locally. If not possible send to RSO. If calibrated locally, DRSOs should furnish RSO with calibration date, name, address, and DOH license number of calibrator.