

Course Title: Radiological Control Technician
Module Title: Radioactive Source Control
Module Number: 2.08

Objectives:

- 2.08.01 Describe the requirements for radioactive sources per 10 CFR 835.
- ⇒ 2.08.02 Identify the characteristics of radioactive sources that must be controlled at your site.
- ⇒ 2.08.03 Identify the packaging, marking, and labeling requirements for radioactive sources.
- ⇒ 2.08.04 Describe the approval and posting requirements for radioactive materials areas.
- ⇒ 2.08.05 Describe the process and procedures used at your site for storage and accountability of radioactive sources.

INTRODUCTION

A radioactive source is material used for its emitted radiation. Sources are constructed as sealed or unsealed and are classified as accountable or exempt.

Radioactive sources are used for response checks in the field, functional checks, calibration of instruments and monitors to traceable standards. To ensure the safety and welfare of all personnel it is important to maintain control of radioactive sources.

Radioactive sources are controlled to minimize the potential for:

- Spread of contamination
- Unnecessary exposure to personnel
- Loss or theft
- Improper disposal

References:

1. 10 CFR 835 (1998), "Occupational Radiation Protection"

10 CFR 835.

2.08.01 Describe the requirements for radioactive sources as outlined in 10 CFR 835.

In accordance with 10 CFR 835, Subpart M, the following provisions apply to sealed sources:

1. §835.1201 Sealed Radioactive Source Control

Sealed radioactive sources shall be used, handled, and stored in a manner commensurate with the hazards associated with operations involving the sources.
2. §835.1202 Accountable Sealed Radioactive Sources
 - (a) Each accountable sealed radioactive source shall be inventoried at intervals not to exceed six months. This inventory shall:
 - (1) Establish the physical location of each accountable sealed radioactive source;
 - (2) Verify the presence and adequacy of associated postings and labels; and
 - (3) Establish the adequacy of storage locations, containers, and devices.
 - (b) Except for sealed sources consisting solely of gaseous radioactive material or tritium, each accountable sealed radioactive source shall be subject to a source leak test upon receipt, when damage is suspected, and at intervals not to exceed six months. Source leak tests shall be capable of detecting radioactive material leakage equal to or exceeding 0.005 μCi .
 - (c) An accountable sealed radioactive source is not subject to periodic source leak testing if that source has been removed from service. Such sources shall be stored in a controlled location, subject to periodic inventory, and subject to source leak testing prior to being returned to service.
 - (d) An accountable sealed radioactive source is not subject to periodic inventory and source leak testing if that source is located in an area that is unsafe of human entry or otherwise inaccessible.
 - (e) An accountable sealed radioactive source found to be leaking radioactive material shall be controlled in a manner that minimizes the spread of radioactive contamination.

CONTROL OF SOURCES

Types of sources to be controlled include:

- a. Accountable sealed radioactive source means a sealed radioactive source having a half-life equal to or greater than 30 days and an isotopic activity equal to or greater than the corresponding value provided in Appendix E of 10 CFR 835.

- b. Sealed radioactive source means a radioactive source manufactured, obtained, or retained for the purpose of utilizing the emitted radiation. The sealed radioactive source consists of a known or estimated quantity of radioactive material contained within a sealed capsule, sealed between layer(s) of non-radioactive material, or firmly fixed to a non-radioactive surface by electroplating or other means intended to prevent leakage or escape of the radioactive material.
- c. Source leak test means a test to determine if a sealed radioactive source is leaking radioactive material.

Responsibilities for controlling these sources include the following:

- a. It is important that the following actions be done:
 - 1) establishing the program
 - 2) maintaining records related to the accountability and control of accountable sealed radioactive sources for a facility
 - 3) providing each source custodian with an inventory list of accountable sealed radioactive sources assigned to him or her
 - 4) assisting the source custodian in training source users
- b. The source custodian:
 - 1) should be responsible for ensuring that tests to establish the integrity of an accountable sealed radioactive source are conducted and inventory checks are performed at least every 6 months.
 - 2) should maintain records of the storage and use locations of all assigned accountable sealed radioactive sources.
 - 3) should be trained as a radiological worker prior to being designated as a source custodian.
 - 4) should notify and obtain approval of the RCO prior to:
 - a) any major changes in the use of a sealed radioactive source
 - b) on-site transfer of a sealed radioactive source to a new permanent storage location
 - c) modification of a device containing a sealed radioactive source
 - d) disposal or off-site transfer of a sealed radioactive source

- e) any procurement or acquisition of additional sealed radioactive sources
- 5) should also notify the RCO in the event of the loss or damage to any accountable sealed radioactive source
- c. The source user:
- 1) should be an individual trained by the RCO and the source custodian to use either accountable or exempt sealed radioactive sources
 - 2) should be trained as a radiological worker and receive appropriate training on handling their specific sealed radioactive source(s).

Sources are controlled using the following precautions:

- Each source is to be inspected before each use.
- Remove damaged sources from service.
- Fingers, whether gloved or not, or other objects should never be allowed to touch the active surface of unsealed sources.
- Protect the source from being contaminated when used in a surface contamination area.

<p>2.08.02 <i>Identify the radioactive sources that must be controlled at your site.</i></p>

(Insert site specific information here)

RECEIPT

Prior to receipt of accountable sealed radioactive sources, the RCO should assign the sources to the proper source custodians. Immediately upon receipt of accountable sealed radioactive sources, the RCO should be notified. The packaging should be inspected for damage and a contamination and radiation survey performed. The RCO should perform receipt surveys (RCS 431.3). Upon receipt from radioactive material

transportation, external surfaces of packages known to contain radioactive material shall be monitored if the package: (1) Is labeled with a Radioactive White I, Yellow II, or Yellow III label (as specified at 49 CFR 172.403 and 172.436-440); or (2) Has been transported as low specific activity material (as defined at 10 CFR 71.4) on an exclusive use vehicle (as defined at 10 CFR 71.4); or (3) Has evidence of degradation, such as

packages that are crushed, wet, or damaged (10 CFR 835.405(b)). The source custodian should be notified of the arrival of the sealed sources to ensure that proper accountability and control are initiated. The sources should be placed into storage or into the device in which they will be used. The source custodian and site's records should be updated to include the new sources received.

LABELING AND STORAGE OF RADIOACTIVE SOURCES

2.08.03 Identify the packaging, marking, and labeling requirements for radioactive sources.

(Insert site specific information here)

Labeling requirements from 10 CFR 835 include:

- (a) Items and containers may be excepted from the radioactive material labeling requirements of 10 CFR 835.605 when:
 - (1) Used, handled, or stored in areas posted and controlled in accordance with this subpart and sufficient information is provided to permit individuals to take precautions to avoid or control exposures; or
 - (2) The quantity of radioactive material is less than one tenth of the values specified in Appendix E of 10 CFR 835; or
 - (3) Packaged, labeled, and marked in accordance with the regulations of the Department of Transportation or DOE Orders governing radioactive material transportation; or
 - (4) Inaccessible, or accessible only to individuals authorized to handle or use them, or to work in the vicinity; or
 - (5) Installed in manufacturing, process, or other equipment, such as reactor components, piping, and tanks; or
 - (6) The radioactive material consists solely of nuclear weapons or their components.
- (b) Radioactive material labels applied to sealed radioactive sources may be excepted from the color specifications of §835.601(a)

Sealed radioactive sources not in storage containers or devices and not labeled by the manufacturer must be clearly marked with a radiation symbol and have a durable label/tag containing the following information:

- Radionuclide

- Amount of activity
- Name of manufacturer
- Date of assay
- Model and serial numbers (where available)

RADIOACTIVE MATERIALS AREAS

2.08.04 *Describe the approval and posting requirements for radioactive materials areas.*

(Insert site specific information here)

Definitions from 10 CFR 835 for posting of radioactive materials areas include:

- (a) Radioactive Material Area means any area within a controlled area, accessible to individuals, in which items or containers of radioactive material exist and the total activity of radioactive material exceeds the applicable values provided in Appendix E to 10 CFR 835.
- (b) Radioactive Material Area Posting The words “Caution, Radioactive Material(s)” shall be posted at each radioactive material area. (§835.603(g))

§835.604 Exceptions to posting requirements

- (a) Areas may be excepted from the posting requirements of §835.603 for periods of less than 8 continuous hours when placed under continuous observation and control of an individual knowledgeable of, and empowered to implement, required access and exposure control measures.
- (b) Areas may be excepted from the radioactive material area posting requirements of §835.603(g) when:
- (1) Posted in accordance with §§835.603(a) through (f); or
 - (2) Each item or container of radioactive material is labeled in accordance with this subpart such that individuals entering the area are made aware of the hazard; or
 - (3) The radioactive material of concern consists solely of structures or installed components which have been activated (i.e., such as by being exposed to neutron radiation or particles produced by an accelerator).

- (c) Areas containing only packages received from radioactive material transportation labeled and in non-degraded condition need not be posted in accordance with §835.603 until the packages are monitored in accordance with §835.405.

In addition, storage rooms or cabinets containing radioactive sources should meet the following:

- Locked and posted
- Located to minimize damage from fire
- Free of flammable substances
- Isolated from occupied areas or located in radiological areas or radiological buffer areas
- When selected in continuously occupied controlled areas, the radiation level at the closest approach is as low as reasonably achievable and does not exceed 0.5 millirem per hour on average

Gamma radioactive sources (except small counting radioactive sources that are low energy and low activity or well shielded) should be stored separate from locations where radiation detection/counting equipment is present.

SOURCE DISPOSAL

Obsolete, excess, or leaking accountable sealed radioactive sources should be disposed of according to RCO instructions.

SUMMARY

Sources may be sealed or unsealed, accountable or exempt. Controls for sources is governed by DOE requirements. Responsibility for source control is delineated in contractor procedures. The RCT needs to be knowledgeable of controls used to prevent contamination and minimize exposure. All on-site sources require prior written approval. Accountable sources are identified, inventoried, surveyed and tested (sealed only). The use and disposition of sources is maintained on records.