CP3-RP-1108 FRev. 0	TITLE: Posting and Labeling	Page 1 of 16

DOCUMENT CATEGORY:	☒ Administrative ☐ Technical
LEVEL OF USE:	☒ Information Level ☐ Reference Level ☐ Continuous Use
FUNCTIONAL AREA: Radiation Protection **SUBJECT MATTER AREA**: Radiation Protection	**SUBJECT MATTER EXPERT**: Dan Tockstein, Radiation Protection Project Manager
NUCLEAR SAFETY REVIEW DOCUMENTATION: ~~Needs USQ Review prior to first use~~ JL 10/25/17 FRNP-17-0006-D	**APPROVED BY/DATE** (Signature on file): Cork Blackshire, Radiation Protection Manager/10/18/17
REQUIRED REVIEW DATE: 10/18/20	**EFFECTIVE DATE**: 10/20/17

REVISION/CHANGE LOG

Revision/Change Letter	Description of Changes	Pages Affected	Date of Revision/Change
FRev. 0	Initial Release by FRNP. Specific change to Step 6.5.5.	All	10/18/17

TABLE OF CONTENTS

1.0 PURPOSE AND SCOPE 3
1.1 Purpose 3
1.2 Scope 3
2.0 REFERENCES 3
2.1 Use References 3
2.2 Source References 3
3.0 COMMITMENTS 3
4.0 ROLES AND RESPONSIBILITIES 3
5.0 GENERAL INFORMATION 4
6.0 INSTRUCTIONS 6
6.1 Routine Activities 6
6.2 Classification and Posting of Radiological Areas 6
6.3 Radioactive Material Labeling and Tagging 7
6.4 Controlled Area Posting 7
6.5 Radiological Area Posting 7
6.6 Exceptions to Posting Requirements 9
6.7 Other Posting 10
6.8 Radioactive Material Labeling/Tagging 11
6.9 Non-Radioactive Material Tagging 12
7.0 RECORDS 13
Appendix A – Acronyms/Definitions 14

1.0 PURPOSE AND SCOPE

1.1 Purpose

The requirements in this procedure are the minimum steps necessary for compliance with the applicable regulatory requirements for posting and labeling specified in Title 10, Code of Federal Regulations (CFR), § 835, *Occupational Radiation Protection*, and for conformance with mandatory contractual and administrative requirements.

1.2 Scope

This procedure applies to all Radiological Control (RADCON) personnel involved with the evaluation and placement of postings for Radiological Areas and labels/tags for radioactive materials managed by the Paducah Gaseous Diffusion Plant (PGDP) Deactivation and Remediation (D&R) Contractor at any sites or facilities where PGDP D&R Contractor conducts radiological operations for the U.S. Department of Energy (DOE) Portsmouth/Paducah Project Office.

The D&R Radiation Protection organization has organizational ownership and maintenance responsibility for this procedure. The approval authority for this document is the Radiation Protection Manager (RPM).

2.0 REFERENCES

2.1 Use References

CP3-RP-1105, *Receipt, Transport, and Movement of Radioactive Materials*

2.2 Source References

- 10 CFR § 835, *Occupational Radiation Protection*
- CP2-RP-0001, *Radiation Protection Program For the Paducah Gaseous Diffusion Plant Paducah, Kentucky*
- CP3-RP-1109, *Radioactive Contamination Control and Monitoring*
- DOE G 441.1-1C, *Radiation Protection Guide for Use with Title 10, Code of Federal Regulations, § 835, Occupational Radiation Protection*
- DOE-STD-1098-99, *DOE Standard Radiological Control*

3.0 COMMITMENTS

None

4.0 ROLES AND RESPONSIBILITIES

Roles and Responsibilities may be incorporated with Section **6.0**.

5.0 GENERAL INFORMATION

5.1 Except as otherwise provided in this procedure, postings and labels required by this procedure shall include the standard radiation warning trefoil in black or magenta imposed upon a yellow background [§835.601(a)].

5.2 Signs, required by this procedure, shall be conspicuously posted at each access point to the specified area and may include appropriate radiological protection instructions [§835.601(b)].

5.3 The posting and labeling requirements in this procedure may be modified to reflect the special considerations of DOE activities conducted at private residences or businesses. Such modifications shall provide the same level of protection to individuals as the existing provisions in this procedure [§835.601(c)]. DOE site office approval must be obtained to conduct DOE activities at private residences or businesses.

5.4 Radiological Areas may be exempted from the posting requirements for periods of less than eight continuous hours when placed under continuous observation and control of a Radiological Control Technician (RCT) or designated qualified representative who is knowledgeable of and empowered to implement required access and exposure control measures[§835.604(a)].

5.5 Areas may be exempted from the radioactive material area (RMA) posting requirements **when** [§835.604(b)]

- They are posted as a Radiological Area [§835.604(b)(1)] (in accordance with Section **6.5**);
- Each item or container of radioactive material is labeled in accordance with Section **6.8** such that individuals entering the area are made aware of the hazard [§835.604(b)(2)]; or
- The radioactive material of concern consists solely of structures or installed components which have been activated (such as, by being exposed to neutron radiation or particles produced in an accelerator) [§835.604(b)(3)].

5.6 Areas, containing only packages received from radioactive material transportation that are labeled and in non-degraded condition, need **NOT** be posted, as required by Section **6.5**, until the packages are monitored according to CP3-RP-1105, *Receipt, Transport, and Movement of Radioactive Materials* [§835.604(c)].

5.7 Other than sealed or unsealed sources, items and containers may be exempt from the radioactive material labeling requirements **when** [§835.606(a)]:

- Used, handled, or stored in areas posted and controlled in accordance with Section **6.5** and **6.7** and sufficient information is provided to permit individuals to take precautions to avoid or control exposures [§835.606(a)(1)]; or
- The quantity of radioactive material is less than one tenth the values specified in 10 CFR § 835 and less than 0.1 Ci[§835.606(a)(2)]; or

- Packaged, labeled, or marked in accordance with the regulations of the Department of Transportation or DOE Orders governing radioactive material transportation [§835.606(a)(3)]; or
- Inaccessible, or accessible only to individuals authorized to handle or use them, or work in the vicinity [§835.606(a)(4)], such as color-coded portable tools or color-coded pallets maintained in a designated "hot" tool storage or distribution area; or
- Installed in manufacturing, process, or other equipment, such as reactor components, piping, and tanks[§835.606(a)(5)]; or
- The radioactive material consists solely of nuclear weapons or their components [§835.606(a)(6)] l or
- Protective clothing and equipment when it meets the requirement in **6.8.3** of this section (except when potentially contaminated and packaged for shipment to laundry facilities); or
- Radiological samples that are in the custody of RADCON personnel or radiological workers; or
- Radiation-generating devices and sealed sources used for medical purposes to the extent that they are subject to local, state, or federal licensing provisions.

5.8 No control(s) shall be installed at any Radiological Area exit that would prevent rapid evacuation of personnel under emergency conditions [§835.501(e)].

5.9 All individuals entering Airborne Radioactivity Areas (ARAs) are required to wear respiratory protection except in extreme situations such as visibility impairment, heat stress, or overriding health and safety concerns. In these situations, RADCON will coordinate with Industrial Hygiene to approve task specific exceptions to the use of respiratory protection.

5.10 Do **NOT** remove part of an existing posting (for example: drop a rope or chain), **UNLESS:**

- the level of posting does **NOT** change,
- access to the area is well controlled, and
- 8-hours are **NOT** exceeded.

5.11 **When** surveyed **and** released from the Controlled Area: **Do NOT** label the following materials with a "white tag:"

- Incidental tools, small equipment, office supplies, office furniture, personal property, etc. that were never placed in a Radiological Area or RMA; and/or
- Personal items (example pens, clipboards, radios) surveyed by Radiological Workers or RCTs.

6.0 INSTRUCTIONS

6.1 Routine Activities

Radiation Protection Manager (RPM)

Ensure annual inspections of radiological postings and labeling are performed and documented.

6.2 Classification and Posting of Radiological Areas

Radiation Protection Project Manager (RPPM)

6.2.1 Provide recommendations to Facility Managers and line organizations as needed to assist them in reducing radiological conditions in their areas, to levels that are as low as reasonably achievable (ALARA). The goals for these activities should be:

- To reduce radiation source terms to levels that are consistent with the area mission, and
- To reduce the size of Contamination Areas (CA) through decontamination and down-posting.

RCT

6.2.2 Perform surveys to assess the radiological hazards of the area in accordance with applicable RADCON procedures.

6.2.3 Evaluate **and** specify posting, labeling, and radiological controls required for the area surveyed.

6.2.4 Obtain posting materials, signs, ropes, chains, etc.

6.2.5 Install **or** remove, as appropriate, radiological signs and physical barriers (for example posting, stanchions, chain, and perm-a-signs) at area boundaries.

6.2.6 Assist in the coordination of installation or removal of permanently affixed signs or barriers, as applicable.

6.2.7 Post radiological signs so they can be seen from all approaches; from the appropriate elevation, angle of approach, and with associated doors open or closed.

6.2.8 Post signs **and** place physical boundaries so they **DO NOT** interfere with the rapid evacuation of personnel in the event of an emergency.

6.2.9 Replace signs, labels, and tags that are missing or **NOT** legible.

6.2.10 Perform **and** document inspections of radiological posting and labeling.

6.3 Radioactive Material Labeling and Tagging

RCT

6.3.1 Perform surveys to assess the radiological conditions of the material/items in accordance with applicable RADCON procedures.

6.3.2 Label **and/or** tag surveyed items as specified, in this procedure.

6.3.3 Update area postings, as appropriate, following the completion of survey and labeling/tagging activities.

6.4 Controlled Area Posting

RCT

NOTE:

Individuals who enter only Controlled Areas without entering Radiological Areas or Radioactive Material Areas are **NOT** expected to receive a Total Effective Dose of more than 0.1 rem in a year.

Signs used for this purpose may be selected by the Radiation Protection Manager (RPM) to avoid conflict with local security requirements [§835.602(b)].

Post each access point to a Controlled Area whenever radiological areas or RMA's exist in the area [§835.602(a)].

6.5 Radiological Area Posting

RCT

6.5.1 Post the words "*Caution, Radiation Area*" at any area accessible to individuals in which radiation levels could result in an individual receiving an equivalent dose to the whole body in excess of 5 mrem in one hour at 30 cm from the radiation source or from any surface that the radiation penetrates[§835.603(a)].

6.5.2 Post the words "*Caution, High Radiation Area* or *Danger, High Radiation Area"* at any area accessible to individuals in which radiation levels could result in an individual receiving an equivalent dose to the whole body in excess of 100 mrem in one hour at 30 cm from the radiation source or from any surface that the radiation penetrates [§835.603(b)].

6.5.3 Post the words "*Grave Danger, Very High Radiation Area*" at any area accessible to individuals in which radiation levels could result in an individual receiving an absorbed dose in excess of 500 rads in one hour at one meter from the radiation source or from any surface that the radiation penetrates [§835.603(c)].

6.5.4 Post the words "*Caution, Airborne Radioactivity Area" or "Danger, Airborne Radioactivity Area*" when the general area airborne radioactivity concentrations are

likely to exceed 25 percent of the Derived Air Concentration (DAC) listed in Appendix B, *Derived Air Concentrations for Activities at PGDP* [§835.603(d)].

6.5.5 Post the words "Caution, Contamination Area" according to the following:

- in areas accessible to individuals where removable surface contamination levels exceed values listed in Appendix B of CP3-RP-1109, *Radioactive Contamination Control and Monitoring*, but are less than or equal to 100 times those values [§835.603(e)].
- for any area containing contaminated soil, if routine entry into the area could cause individuals, equipment, or material to become contaminated in excess of removable contamination limits specified in CP3-RP-1109 Appendix B.

- Contamination Area's posted as "Inactive" are areas that have been determined to be abandoned or infrequently entered. These areas are not surveyed on any frequency. The area shall be surveyed and the insert "Inactive" removed prior to performing walkdowns, tours, or work.

6.5.6 Post the words "Caution, High Contamination Area" or "*Danger, High Contamination Area*" in areas accessible to individuals where removable surface contamination levels are greater than 100 times the values listed in Appendix B of CP3-RP-1109 [§835.603(f)].

6.6 Exceptions to Posting Requirements

RCT

NOTE:

For the purposes of posting exceptions, Radiological Area access may be controlled by an RCT or a qualified representative. A qualified representative is a Radiological Worker II (RWII) trained individual that has been designated by title or position in an applicable Radiological Work Permit (RWP).

Since a RMA is **NOT** a Radiological Area as defined in 10 CFR § 835, an RCT may verbally authorize an individual to control the posted boundary when simple access control measures are required.

6.6.1 **If** taking a posting exception to a Radiological Area, **then** implement the following additional requirements:

- A single RCT or qualified representative may only control a single Radiological Area boundary or physical area; and
- **If** the area is a Contaminated Area (CA) or High Contamination Area (HCA), **then** the boundaries must be clearly defined (for example the rim of a B-25 box or drum opening, edges of a drip pan, open pipe end, flange, etc.).

6.6.2 Open excavations that contain Radiological Areas may be excepted from posting provided:

- The area is under constant RCT attendance and control;
- The immediate vicinity around the excavation is posted as a Radiological Buffer Area (RBA); and
- Ingress/egress points are clearly defined, as appropriate.

6.6.3 Document posting exceptions in an applicable RWP when:

- Anticipated radiological conditions are **NOT** well defined;

- Posting exceptions are for ARA, HCA, High Radiation Areas, or Very High Radiation Areas;
- Access control requirements are complex (multiple entries, etc.); or
- A qualified representative other than an RCT is going to control the area.

6.7 Other Posting

RCT

6.7.1 Post the words "*Caution, Radioactive Material*" at any area accessible to individuals in which items or containers of radioactive material exist and the total activity of the radioactive material exceeds the applicable values in Appendix E of 10 CFR § 835[§835.603(g)].

6.7.2 Post installations where radiation-generating devices or sealed sources are used according to the applicable mandatory industry standard procedure or federal regulation.

6.7.3 Control Fixed Contamination Areas (FCAs) (for example, areas accessible to individuals where the measured total surface contamination levels exceed, but the removable surface contamination levels are less than, corresponding surface contamination values specified in Appendix B of CP3-RP-1109) as follows when located outside of Radiological Areas [§835.1102(c)]:

A. Routinely monitor the area to ensure the removable surface contamination level remains below the removable surface contamination values specified in Appendix B of CP3-RP-1109 [§835.1102(c)(1)]; and

B. Conspicuously post the area to warn individuals of the contaminated status [§835.1102(c)(2)] as follows:

- Post each access point to the area with the words "*Caution, Fixed Contamination Area*" provided the postings meet the requirements specified in Section **6.4**, or
- Post each access point to the area with the words "Notice, Fixed Contamination." Such postings may contain additional information as to the location of the fixed contamination or other radiation protection instructions, or
- Paint or affix coatings or other labels on the specific area of Fixed Contamination. **If** painting or coating is used instead of labels, **then** the painting or coating shall be yellow or magenta.

6.7.4 Post the words "*Caution, Underground Radioactive Material*" at any area identified as having underground items or material containing radioactive material, unless an

exception is provided by the RPM.

6.7.5 Post the words "*Radiological Buffer Area*" to delineate the boundary around CAs, HCAs, or ARAs within which the spread of contamination is controlled.

6.7.6 Post the words "*Dosimeter Required for Entry*" per the RWP or if posting requires TLD, or at the boundaries of Radiation areas.

6.7.7 **When** determining the boundary dose rate, consider all forms of penetrating radiation (for example: gamma, neutron, and high-energy beta).

RPPM

6.7.8 **If** it is impractical to post an area with "*Dosimeter Required for Entry*," due to area size (or other circumstances), **then** perform an ALARA evaluation.

6.7.9 Document (in the ALARA evaluation) the cost/benefit of actions and/or controls necessary to reduce the equivalent dose rate to less than 5 mrem/hour at the boundary.

6.7.10 **If** a deviation from this posting requirement is necessary, **then** have the RPM approve the ALARA evaluation.

6.8 Radioactive Material Labeling/Tagging

RCT

6.8.1 Except as provided below, tag, label, or mark each item or container of radioactive material with a durable, clearly visible label bearing the standard radiation warning trefoil and the words "Caution, Radioactive Material," or "Danger, Radioactive Material."

6.8.2 Include on the tag, label, or marking sufficient information to permit individuals handling, using, or working in the vicinity of the items or containers to take precautions to avoid or control exposures [§835.605]. Contamination levels and dose rates of material inside container/bag should be documented on the label/tag. **If** total contamination levels outside of the container/bag are greater than 100,000 dpm, **then** dose rate should be recorded on tag/label.

6.8.3 Label radioactive waste containers using UE-583, G/O Corp 611249, or equivalent.

6.8.4 **If** radioactive material is located or taken outside of an RMA, CA, HCA, or ARA, **then** individually label, tag, or mark as radioactive material the following items (include contamination levels and identified radioisotopes known on the yellow tag [UE-583, G/O Corp 611249, or equivalent]):

- Equipment, components, and other items that are contaminated or have been exposed to radioactive material contamination or activation sources and **NOT** released for unrestricted use;
- Equipment, components, or other items that are contaminated or are potentially contaminated with radioactive material on internal surfaces;
- Components, equipment, or other items that have fixed radioactive material contamination; and/or
- Components, equipment, or other items that have been surveyed and demonstrated to have removable radioactive contamination levels below unrestricted release limits but have not been surveyed adequately to provide assurance that fixed radioactive contamination levels are below unrestricted release limits.

6.8.5 Label internally contaminated or potentially internally contaminated materials or equipment with the words "*Caution, Internal Contamination" or "Caution, Potential Internal Contamination*," as applicable.

6.8.6 Mark **and** label radiological-use vacuum cleaners to identify both their internal and external contamination characteristics.

NOTE: Radioactive material labels applied to sealed radioactive sources may be exempt from the color specifications of this procedure [§835.606(b)].

6.8.7 Label sealed and unsealed sources or their associated storage containers as radioactive material. Clearly mark storage containers and devices containing a sealed source.

6.8.8 **If** material or equipment is taken from a Radiological Area or RMA and placed in the Controlled Area, **and** has **NOT** been surveyed adequately to allow unrestricted release, **then** the material and equipment must be tagged as radioactive material with a "yellow tag" as specified in Step **6.8.4.**

6.9 Non-Radioactive Material Tagging

<u>RCT</u>

NOTE:

White tags (UCN-582 or equivalent) are not required for all material released for unrestricted use. White tags are a tool to be used at the discretion of the RPM or designee or to meet the needs of specific projects.

There is no expiration date for white tags, attached to an item meeting survey requirements for unrestricted release, provided they are legible and **NOT** in a degraded condition on the date the item is released without restrictions and the item has not been placed in a Radiological Area or RMA since it was white tagged.

If non-radioactive materials meet the criteria for unrestricted release from CAs, HCAs, and ARAs (for example: a release survey has been performed per CP3-RP-1109), **then** label the material with a white tag (UCN-582, or equivalent).

7.0 RECORDS

None

Appendix A – Acronyms/Definitions

ACRONYMS

ALARA – As Low As Reasonably Achievable

ARA – Airborne Radioactivity Area

CA – Contamination Area

CFR – Code of Federal Regulations

D&R – Deactivation and Remediation

DAC – Derived Air Concentration

DOE – Department of Energy

FCA – Fixed Contamination Area

HCA – High Contamination Area

PGDP – Paducah Gaseous Diffusion Plant

RADCON– Radiological Control Organization

RBA – Radiological Buffer Area

RCT – Radiological Control Technician

RMA – Radioactive Material Area

RPM – Radiation Protection Manager

RPPM – Radiation Protection Project Manager

RWP – Radiological Work Permit

DEFINITIONS

Airborne Radioactivity Area – any area, accessible to individuals, where:

- The concentration of airborne radioactivity, above natural background, exceeds or is likely to exceed the Derived Air Concentration (DAC) values listed in Appendix A or Appendix C of 10 CFR § 835; or
- An individual present in the area without respiratory protection could receive an intake exceeding 12 DAC-hours in a week.

Contamination Area – any area, accessible to individuals, where removable surface contamination levels exceed or are likely to exceed the removable surface contamination values specified in Appendix B of CP3-RP-1109, but do **NOT** exceed 100 times those values.

Appendix A – Acronyms/Definitions (Continued)

Controlled Area – any area to which access is managed by or for DOE to protect individuals from exposure to radiation and/or radioactive material.

Entrance or Access Point – any location through which an individual could gain access to areas controlled for the purpose of radiation protection. This includes entry or exit portals of sufficient size to permit human entry, irrespective of their intended use.

High Contamination Area – any area, accessible to individuals, where removable surface contamination levels exceed or are likely to exceed 100 times the removable surface contamination values specified in Appendix B of CP3-RP-1109.

High Radiation Area – any area, accessible to individuals, in which radiation levels could result in an individual receiving an equivalent dose to the whole body in excess of 0.1 rems in 1 hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates.

Inactive – areas that have been determined to be abandoned or infrequently entered. These areas are not surveyed on any frequency. The area shall be surveyed and the insert “Inactive” removed prior to performing walkdowns, tours, or work.

Radiation Area – any area, accessible to individuals, in which radiation levels could result in an individual receiving an equivalent dose to the whole body in excess of 0.005 rem in 1 hour at 30 centimeters from the source or from any surface that the radiation penetrates.

Radioactive Material Area – 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 of 10 CFR § 835.

Radiological Area – any area within a Controlled Area defined in this procedure as a "Radiation Area," "High Radiation Area," "Very High Radiation Area," "Contamination Area," "High Contamination Area," or "Airborne Radioactivity Area.”

Very High Radiation Area – any area accessible to individuals in which radiation levels could result in an individual receiving an absorbed dose in excess of 500 rads in one hour at 1 meter from a radiation source or from any surface that the radiation penetrates

Appendix B – Derived Air Concentrations for Activities at PGDP

Nuclides	DAC	Posting level
Gross alpha (uranium)—based on ^{234}U, Type M	2E-10	5–11
Transuranics—based on ^{241} Am, Type M	5E-12	1.2E-12
TRU, Modified—based on ^{234}U, Type M	5E-11	1.3E-11
TRU Modified—based on ^{234}U, Type S	7E-11	1.7E-11
Gross beta-gamma—based on ^{234}Th, Type S	9E-8	2.2E-8
^{99}Tc, Type M	1E-7	2.5E-8
^{230}Th, Type M	3E-12	7.5E-13