

Unconditional Release of Tools and Equipment From Projects

Revision 1

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1. SCOPE

1.1 Purpose

This procedure provides guidelines and criteria for the performance of surveys that are required prior to the unconditional release of tools, equipment, and waste materials from Radiologically Controlled Areas (RCAs).

1.2 Applicability

Requirements herein are applicable only to Project Support Division projects and are applicable to no other operational entities of EnergySolutions.

This procedure applies to unconditional release surveys performed by project personnel on materials and equipment from areas controlled under the Commercial Services Radiation Protection Program (Reference 2.8). The following items are not addressed or covered by this procedure:

- The monitoring of personnel or personal articles prior to egress from a radiologically controlled area (Reference 2.1);
- Samples for off-site analysis (Reference 2.2);
- Surveys of radioactive waste packages for shipment (Reference 2.3);
- Liquid releases/discharges (Reference 2.3); and
- Release of facilities and permanent structures and associated grounds areas

2. REFERENCES

- 2.1 CS-RS-PR-002, *Personnel Survey and Decontamination Procedure*
- 2.2 CS-FO-PR-003, *Soil Surveys; Collection of Water, Sediment, Vegetation and Soil Samples; and Chain-of-Custody Procedure*
- 2.3 CS-WM. PR-001, *Handling, Storage, and Characterization of Radioactive Material and LLRW*
- 2.4 CS-AD-PR-002, *Global Commercial Group – TES Services Project Records*
- 2.5 ES-QA-PR-005, *Records*
- 2.6 CS-FO-PR-001, *Performance of Radiological Surveys*

2.7 *Guidance for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material.* U.S. Nuclear Regulatory Commission. April 1993

2.8 CS-RS-PG-001, *Commercial Services Radiation Protection Program*

3. GENERAL

3.1 Definitions

3.1.1 *Bulk Material* - Items or material that by their physical nature do not lend themselves to being effectively surveyed using portable instrumentation and require bulk or composite survey techniques or representative sampling and analysis. (e.g., concrete rubble, soil,, etc.)

3.1.2 *Contamination Area* - Any area accessible to personnel with loose surface activity greater than 1000 dpm/100cm² β - γ , 20 dpm/100cm² α , or loose surface radioactivity greater than or equal to the site's regulatory guideline values.

3.1.3 *Minimum Detectable Activity (MDA)* - The smallest amount or concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95% probability (true positive) with only 5% probability of falsely concluding that a blank observation represents a "real" signal (false positive). MDA depends upon the type of instrument, the counting geometry, counting time, and the radionuclide to be detected. MDA has the same meaning as Lower Limit of Detection (LLD) for radiation survey instruments (ANSI N13.3-1996).

3.1.4 *Unconditional Release* - The removal of materials from a Radiologically Controlled Area (RCA) to areas that do not require radiological control of the material by the licensee.

3.1.5 *Radiologically Controlled Area (RCA)* - Any area to which access is controlled and a warning is posted because of the presence of radiation or radioactive materials. RCAs include Radioactive Materials Areas, Contamination Areas, Radiation Areas, High Radiation Areas, Very High Radiation Areas, and Airborne Radioactivity Areas.

3.2 Responsibilities

3.2.1 Project Manager

The Project Manager (PM) is responsible for ensuring that the proper procedures/programs are implemented on the project site as required by

customer agreements and contracts. The PM is responsible for ensuring that these programs and procedures are properly incorporated into project-specific plans and procedures. The PM is responsible for ensuring that Commercial Services and/or client programs/procedures are available for use by field personnel.

3.2.2 Radiation Safety Officer (RSO)

The RSO maintains and oversees implementation of the Commercial Services radiation safety program. This maintenance includes ensuring that radiation safety, radioactive materials management, and radiological operations procedures and programs are kept current such that they comply with current regulations and incorporate current and relevant industry practices and regulatory guidance. The RSO shall also make applicable notifications to the appropriate regulatory agencies.

3.2.3 Project Health Physicist (PHP)

The Project Health Physicist (PHP) is responsible for assisting the CS RSO in providing health physics support to the PM and Radiation Protection Supervisor (RPS). This responsibility includes technical support to ensure procedural and regulatory compliance and to ensure that the project-specific Data Quality Objectives (DQOs) are met.

3.2.4 Radiation Protection Supervisor (RPS)

The Radiation Protection Supervisor (RPS) is responsible for implementing the Radiation Protection Program and project-specific radiological requirements. The RPS manages and oversees technicians performing radiation protection surveys and radiological site monitoring. The RPS shall also ensure that no radiologically affected materials are released from a controlled area without a comprehensive survey in accordance with this procedure.

3.2.5 Technicians under the supervision of the RPS or PHP [often referred to as Radiation Protection Technicians (RPT), Radiological Control Technicians (RCT), Radiation Safety Technicians (RST) or Health Physics Technicians (HPT)] are responsible for:

- Performing radiation and contamination surveys of items being released.
- Documenting the release and/or disposition of materials.
- Providing sample analysis results to the RPS, PHP or RSO.

- Assuring the appropriate consideration and evaluation of materials requiring release analysis.

3.3 Precautions and Limitations

3.3.1 Material from RCAs shall not be removed without having the material surveyed and released in accordance with this procedure. This process includes review and approval of all release surveys by the RSO, PHP or RPS before the materials leave the RCA.

NOTE: Only the PHP, RPS, or RSO may approve release of equipment and materials with inaccessible surfaces.

3.3.2 Technicians performing radiological measurements shall be knowledgeable in the use of the applicable instruments and laboratory analysis equipment.

3.3.3 Instrumentation shall have a valid calibration.

3.3.4 Wet materials should be dried prior to performance of surveys.

3.3.5 Due to interference and sensitivity difficulties in performing direct frisk for alpha, a technical basis may be developed to demonstrate compliance with alpha criteria using measured correlations with associated beta-gamma emitting radioisotopes.

3.3.6 Electrical equipment containing power supplies or transformers (e.g., welders) shall not be opened to avoid the risk of electrical shock. Contact personnel knowledgeable of such hazards (i.e., electricians) for specific guidance.

3.3.7 Contamination shall not be covered by painting, plating, taping, etc. to reduce contamination to less than or equal to release limits.

3.3.8 The limits in Attachment 5.1 do not apply to facilities, equipment, or scrap containing induced volumetric radioactivity.

3.4 Records

3.4.1 Records shall be maintained per project requirements and/or as directed by the Project Manager in accordance with References 2.4 and 2.5.

4. REQUIREMENTS AND GUIDANCE

4.1 General

Note: Take extreme care when handling sensitive maintenance and test equipment (e.g., micrometers, voltmeters, oscilloscopes, etc.).

- 4.1.1 Technicians shall be notified of items or materials to be removed from RCAs prior to their removal.
- 4.1.2 Surfaces of tools and equipment which are likely to be contaminated, but are of such size, construction, or location as to make the surfaces inaccessible for measurement, shall be presumed to be contaminated unless a documented process evaluation and indirect survey can support a release of the equipment without surveying inaccessible areas that is reviewed and approved by the PHP or RSO.
- 4.1.3 Control all material as radioactive material until release surveys indicate that the material is unconditionally released.
- 4.1.4 Resurvey aggregate waste packages found to be free from radioactive contamination with a gamma sensitive instrument prior to release from potentially contaminated areas.
- 4.1.5 Document all release surveys in accordance with Section 4.8

4.2 **Minimum Detectable Activity**

Reference 2.6 shall be used for determining the minimum detectable activity of survey instruments and sample counters.

4.3 **Instrumentation Criteria**

- 4.3.1 Instrumentation selected for release surveys shall be calibrated and selected based on their detection capabilities for the expected contaminants and activities.
- 4.3.2 As a minimum, portable counting instruments employed to evaluate gross beta-gamma or alpha contamination shall have an MDA no more than 50% (and preferably 10%) of the limits provided in Attachment 5.1 using direct or indirect survey methods.
- 4.3.3 A Certified Health Physicist (CHP) should be consulted before releasing items potentially contaminated with hard-to-detect contaminants, such as tritium or iron-55. These surveys may require only removable contamination measurements with analysis in a liquid scintillation counter while applying an assumption about the removable fraction. Typically, a 10% removable fraction is an acceptable assumption.

4.4 **General Survey Techniques for Items and Equipment**

- 4.4.1 Evaluate the material for loose surface contamination by taking smears on accessible surfaces in accordance with Reference 2.6. Depending on the size and configuration of the item(s), use enough smears to adequately characterize any loose surface contamination.
- 4.4.2 Evaluate removable contamination results in accordance with Reference 2.6 and document results on a survey form and compare against release criteria (Attachment 5.1). If greater than release criteria, **do not release the item(s)**.
- 4.4.3 If practical, relocate the item(s) to an area with a background of less than 200 cpm beta-gamma.
- 4.4.4 Perform scan surveys of materials with a sufficiently sensitive beta-gamma instrument and/or alpha instrument as appropriate.
- 4.4.5 Hold the probe not more than ½ inch (¼ inch for alpha) from the surface of the item being surveyed and move at approximately one-two (1-2) detector widths per second for beta-gamma and one inch per second for alpha or in accordance with documented survey plan and/or PHP requirements.
- 4.4.6 Hold the probe stationary over areas that indicate an increase in the audible or visual count rate and allow the meter to stabilize (approximately 5 to 10 seconds). Static readings may require longer count times, such as 30 seconds or 1 minute, to meet applicable MDC requirements as per survey plan or PHP requirements.
- 4.4.7 Record gross readings in cpm and convert measurements that are above background as dpm/100 cm². Use the appropriate intrinsic efficiency, surface efficiency, and probe area for the detector used to correct to dpm, unless otherwise directed by the RPS.
- 4.4.8 If measurable surface activity exceeds Attachment 5.1 limits, **do not release the item(s)**.
- 4.4.9 Perform a physical inspection. **Do not release the following:**
- Items containing inaccessible areas when accessible areas required decontamination to meet releasable limits;
 - Items with inaccessible areas where a documented process evaluation cannot sufficiently minimize the contamination potential; or

- Items containing porous surfaces (wood, brick, etc.) with a potential for contamination based on usage. Porous surfaces may self-shield activity.

4.4.10 Inaccessible areas of items such as piping or ducting can be released by:

- The PHP or RSO reviewing and approving documented process knowledge and evaluation of such piping and ducting as well as collected radiological survey information on the piping and ducting.

4.4.11 If surfaces cannot be adequately surveyed or if the adequacy of the survey is questionable, **do not release the item**. The PHP or RSO should be contacted for assistance.

4.5 **General Survey Techniques for Bulk Items**

4.5.1 Site-specific procedures shall be developed if bulk surveys are to be used for the free-release of materials.

4.5.2 Bulk surveys generally require demonstration that the material meets a dose-based release criterion in units of activity per gram.

4.5.3 Potential survey methods may include:

- Dose rate measurements with MicroShield® modeling;
- In-situ gamma spectroscopy with ISOCS®; or
- Other non-destructive assay techniques.

4.5.4 A statistically-based sampling or survey approach may also be used for bulk material releases.

4.5.5 A CHP shall approve all bulk survey release methods for field projects.

4.6 **Vehicle Surveys**

4.6.1 Survey all vehicles exiting RCAs with contamination areas and/or radioactive materials areas that contain loose radioactive debris/ material according to the following criteria:

- Perform all removable contamination and direct surveys in accordance with Section 4.4 of this procedure;
- Survey all tires and/or tracks which came into contact with contaminated or potentially contaminated surfaces;

- Survey components of the tire and track systems such as the wheels, cogs, drive shafts, etc.
- Survey steps and driver's compartment area if the driver left the vehicle;
- Scan 100% of the interior surface and the bottom surfaces of loader and excavator buckets if they were used to handle radioactive materials;
- Survey additional areas of heavy equipment based on its use and potential for contamination with special attention given to locations where contamination would be likely to accumulate such as greasy or oily locations; and
- Survey vehicle ventilation grills and/or air filters if there is a potential for measurable airborne contamination (regardless of concentrations).

4.6.2 Perform the following surveys for vehicles exiting RCAs that did not contain loose radioactive debris/material:

- Perform all removable contaminations and direct surveys in accordance with Section 4.4 in this procedure;
- Survey all tires and/or tracks which came into contact with surfaces inside the RCA;
- Survey steps up to and in the driver's compartment if the driver exited the vehicle; and
- Survey additional areas of heavy equipment as necessary based on its use in the area with special attention given to locations where contamination could accumulate such as in greasy or oily locations or on material load-handling surfaces.

4.6.3 Vehicles used in Airborne Radiation Areas:

- Place extra attention on inaccessible areas and other areas likely to collect contamination;
- All air filters shall be removed and surveyed, along with filter housings where applicable;
- Other forced air intake pathways (such as cooling fans) should be surveyed.
- Contaminated air filters shall be replaced with new filters;
- If contamination is identified on an air filter, the RPS shall be notified and additional surveys and sampling may be required; and

- In extreme cases, it may be necessary to change engine oil or hydraulic fluids. Sample the old fluids prior to disposal

4.6.4 Emergency vehicles should be kept out of RCAs if practical. Allow emergency vehicles to immediately exit a contamination area or radioactive materials area without a release survey when transporting a seriously injured or ill individual.

4.6.5 If a vehicle is allowed to exit a contamination area or radioactive materials area without a release survey, perform the following steps:

- Survey along the travel route within the controlled area and in the immediate area(s) outside the controlled from which the vehicle exited;
- Notify the RPS after emergency vehicles have exited a controlled area without a release survey; and
- If the RPS determines it is necessary, survey the emergency vehicle as soon as possible following use in accordance with Section 4.4 of this procedure.

4.7 **Disposition of Materials**

Materials that do not meet established release criteria shall be managed in accordance with Reference 2.3.

4.8 **Survey Documentation**

4.8.1 The RPS, PHP or RSO shall document routine material releases on Attachment 5.2, "Material Release Log" or similar log.

4.8.2 The RPS staff shall document release surveys on surveys forms as described in Reference 2.6 and provide the following information:

- Date and time of survey;
- Organization responsible for the item or material;
- Item description, identification number, and origin, if known;
- Instruments used to perform the survey, including the serial number, calibration due date and background count rate, as applicable;
- Instrument and surface efficiencies used in calculations;
- Survey data in cpm and dpm/100cm²;
- The name of the technician performing the survey; and

- A sketch or a photo of the item(s) with survey points identified.

4.8.3 The release survey documentation shall be reviewed by the RPS, PHP or RSO as appropriate and placed in the project files until transferred to the client or filed in accordance with Reference 2.4.

5. **ATTACHMENTS**

5.1 **NRC Contamination Limit Guidelines**

5.2 **Material Release Log**

Attachment 5.1
NRC Contamination Limit Guidelines
 (From Reference 2.7)

NUCLIDES	AVERAGE ^{b c}	MAXIMUM ^{b d}	REMOVABLE ^{b e f}
U-nat, U-235, and associated decay products	5,000 dpm/100cm ²	15,000 dpm/100 cm ²	1,000 dpm/100 cm ²
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100 dpm/100 cm ²	300 dpm/100 cm ²	20 dpm/100 cm ²
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000 dpm/100 cm ²	3,000 dpm/100 cm ²	200 dpm/100 cm ²
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above	5,000 dpm/100 cm ²	15,000 dpm/100 cm ²	1,000 dpm/100 cm ²

Notes:

- ^a Where surface contamination by both alpha and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma emitting nuclides should apply independently.
- ^b As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriated detector for background, efficiency, and geometric factors associated with the instrumentation.
- ^c Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.
- ^d The maximum contamination level applies to an area of not more than 100 cm².
- ^e The amount of removable radioactive material per 100 cm² of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.
- ^f The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/hr at 1 cm and 1.0 mrad/hr at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

