

SITE CHARACTERIZATION

OPERATING PROCEDURE

***RADIOACTIVE CONTAMINATION MONITORING REQUIREMENTS
FOR FACILITY SURFACE CHARACTERIZATION***

**BATTELLE
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Procedure Status:

- Non-Critical Procedure
- Critical Procedure—Procedure
Qualification Packet (PQP)
Required

REVISION RECORD INDICATING
LATEST DOCUMENT REVISION

Title: Radioactive Contamination Monitoring Requirements
For Facility Surface Characterization

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Issue Date	
Issued By	

PROCEDURE APPROVAL PAGE

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RADIOACTIVE CONTAMINATION MONITORING REQUIREMENTS FOR FACILITY SURFACE CHARACTERIZATION

1.0 Scope

This document describes the standards, instrumentation, operational procedures, and documentation required for monitoring facility surfaces and drains for radioactive contamination for characterization purposes.

2.0 Purpose

The purpose of this document is to establish the requirements for monitoring and documenting the radioactivity level for a facility as a guide for planning and completing decontamination efforts in compliance with References 3.1.1, 3.1.2, and 3.1.9, of this procedure.

3.0 References, Definitions, and Developmental Resources

3.1 References

- 3.1.1 DD-93-02, Surface Release Criteria, Technical Basis Document for Battelle Columbus Laboratories Decommissioning Project (BCLDP)
- 3.1.2 DD-93-03, Volumetric Release Criteria, Technical Basis Document for Battelle Columbus Laboratories Decommissioning Project (BCLDP)
- 3.1.3 SC-OP-002, Facility Post-Decontamination - Final Status Survey For Baseline Areas
- 3.1.4 SC-OP-007, Baseline Reference Values for Facility Radiological Characterization Surveys
- 3.1.5 SC-OP-010, Establishing a Surface Reference Grid for Walls, Floors and Ceilings for a Detailed Characterization Survey
- 3.1.6 RL-AP-1.0, Administrative Operating Procedure For The Radioanalytical Laboratory (JN-2)
- 3.1.7 QD-AP-5.2, Work Instructions
- 3.1.8 SC-SP-006, Sampling of Sediment and Sludge For Chemical and Radiological Characterization

- 3.1.9 NUREG/CR-5849, Manual for Conducting Radiological Surveys in Support of License Termination - Draft Report for Comment, 1992
- 3.1.10 WA-OP-020, Identification, Segregation, Separation, and Documentation of Low Level Waste
- 3.1.11 PR-AP-17.1, Operation of the Project Records Management System

3.2 Definitions

Refer to BCLDP Procedures Dictionary for definitions of the following terms.

Direct survey	Minimum Detectable Activity (MDA)
Decision Level Value (DLV)	Static measurement
Indirect survey	Ten percent indirect survey
Partial grid	

3.3 Developmental Resources

None.

4.0 General

4.1 Requirements

- 4.1.1 Section 5.0 shall be used as the general survey procedure for initial characterization and interim surveys.
- 4.1.2 The room/area and surface to be surveyed shall be identified and recorded on DDO-376, DDO-381, or DDO-382.
- 4.1.3 A grid system shall be used as a surface-specific identifier, in accordance with Reference 3.1.5.
- 4.1.4 In locations where measurements exceed the decision level value (DLV) during scanning, a one-minute static measurement shall be taken in both alpha-plus-beta and alpha-only modes.
- 4.1.5 Drains, sumps, etc. shall be sampled, in such a manner to ensure that they are representatively monitored, in accordance with Reference 3.1.8.

4.2 Equipment

- 4.2.1 Gas proportional detectors and associated electronics sensitive to alpha and beta/gamma radioactivity and equipped with an aural indicator. These

instruments may be operated in gas flow or static gas configuration and will be capable of detecting alpha-only and alpha-plus-beta activity. Some electronics also may allow beta-only readings. Examples of gas proportional detectors are the Eberline ESP-2 meter with a Ludlum 239-1F detector (floor monitor) and the Eberline ESP-2 meter with a Ludlum 43-20 detector.

- 4.2.2 Scintillation detectors and associated electronics sensitive to alpha, beta, or gamma radiation. These instruments may be capable of detecting both alpha and beta activity and discriminating between them. Examples of scintillation-type instruments are the Delta 3/DP6 combination for alpha and beta detection/discrimination and an NaI crystal (Ludlum 12S Micro R meter) for gamma detection.
- 4.2.3 A pressurized ionization chamber, Micro R meter, or Geiger-Mueller instrument may be used to measure external penetrating radiation (gamma) and to estimate exposure rates.
- 4.2.4 A high purity germanium (HPGe) detector and associated electronics may be used in the field for isotopic identification of contamination and in the laboratory for determination of isotope(s) and quantity of contaminants in samples.
- 4.2.5 Smears to quantify removable contamination.
- 4.2.6 Scaffolding equipment, ladders, and related elevated or remote access equipment.
- 4.2.7 Personal protective clothing and/or equipment and monitoring equipment as required by the Work Instruction and Radiation Work Permit.

5.0 **Procedure**

Unless otherwise specified, the **surveyor(s)** will be responsible for completing the following steps.

5.1 **Start-up Documentation**

NOTE: Project Managers are responsible for 5.1.1 and 5.1.2.

- 5.1.1 Complete Work Instructions (DDO-104) and Industrial Safety Checklist (DDO-195) forms in accordance with Reference 3.1.7.
- 5.1.2 Complete a Waste Management Checklist (DDO-164) in accordance with Reference 3.1.10.

5.1.3 Complete the Field Instrument Check Source Log (DDO-380) prior to starting the survey.

5.1.4 Establish DLV in accordance with Reference 3.1.4.

5.2 Exposure Rate Survey

5.2.1 Take measurements using an exposure rate meter (μR meter) to determine ambient external penetrating radiation levels for each room/area as follows: corners and center of room at contact and at 1 meter above the floor.

5.2.2 For areas exceeding 10 meters in any direction, divide areas into equal segments and take exposure rate measurements in the center of each segment and as described in section 5.2.1. Each segment shall not exceed 100 m^2 (10 meters by 10 meters square).

5.2.3 Record data on DDO-381.

5.3 Reference Grids

5.3.1 Each room or area will be gridded in accordance with Reference 3.1.5.

5.3.2 A map will be drawn depicting the reference grids and identifying features for each room (e.g., doors, convectors, I-beams, etc.).

5.4 Drain Sampling

5.4.1 A sample will be taken from all accessible floor drains, unless otherwise stated on the Work Instruction.

5.4.2 Drain samples will be taken in accordance with Reference 3.1.8.

5.5 Direct Survey (Scanning)

5.5.1 Carefully observe surfaces and structures in the area/room that have a high probability of accumulating contamination, should it be present (e.g., cracks and drains).

5.5.2 The **surveyor(s)** shall scan the entire surface area of each designated grid section with an alpha/beta survey instrument as the fundamental survey technique. A scan shall be performed in the alpha-plus-beta mode of the instrument. An alpha-only scan also shall be performed unless the minimum detectable activity (MDA) of the instrument in the alpha-plus-

beta mode is less than the surface release criteria specified in Reference 3.1.1. Should suspect areas be present in the grid, survey of such areas shall be performed with the detector oriented for maximum geometric efficiency (i.e., the long axis of the detector parallel with the long axis of the seam or crack).

5.5.2.1 Scanning may be done manually or by some mechanically supported device.

5.5.2.2 The window of the instrument detector shall be ≤ 0.5 centimeters from the surface.

5.5.2.3 The scanning speed shall not exceed 5 cm/sec.

5.5.2.4 Scanning shall be performed in the ratemeter mode of the instrument. If the instrument is capable of storing the highest reading (i.e., peak trap), this mode shall be used.

5.5.2.5 A periodic check shall be conducted at a minimum of once per each two-hour period (if not in constant flow mode) using a check source of established count rate. Document source check readings on DDO-380. Discontinue use of the monitoring instrument if the check source reading varies more than 10% of the established rate (i.e., reading does not fall within the source check range listed on the detector). If source check is failed, all data collected since the last acceptable source check shall be evaluated by the **Characterization Project Manager** for validity.

5.5.3 One hundred percent direct surveys shall be performed on (1) floors, (2) walls to a minimum height of 2 meters, (3) horizontal surfaces above and (4) ceilings, unless otherwise stated in a Work Instruction.

5.5.3.1 Walls above 2 meters will be surveyed 10%.

5.5.3.2 If activity levels meet or exceed the limits set in Reference 3.1.1, all surrounding grids also shall be surveyed.

If contamination is present on surfaces near a ceiling or on a wall near the 2-meter height mark, an additional surrounding area shall be monitored. EXAMPLE: Contamination found on an I-beam near the ceiling shall require direct monitoring of the ceiling and wall grids corresponding to that I-beam.

5.5.4 Scans shall be performed for each category of surface material (e.g., metal, solid concrete, concrete block).

Surface materials less than 7 centimeters in width shall not be separated from the predominant surface material in the grid.

- 5.5.5 Scanning shall be performed by slowly passing the detector over the surface of interest and recording the maximum value displayed.
- 5.5.6 For areas where measurements exceed the DLV, precise identification of the area and additional data collection shall be required.

- 5.5.6.1 Identification of the area shall be provided in accordance with Reference 3.1.5, and additional data collection shall include (1) a static alpha-plus-beta measurement, (2) a static alpha-only measurement, and (3) a smear sample.

- 5.5.6.2 Static measurements will be taken in the ratemeter mode of the instrument. If the instrument is capable of storing the highest measurement (i.e., peak trap), this mode shall be used.

- 5.5.7 The activity level and location will be recorded on DDO-376 (Reference 3.1.5). The location will be further identified by painting the outline of the contaminated area on the actual surface to facilitate decontamination.

5.6 Inaccessible Surfaces and Locations

- 5.6.1 Attached and unattached furniture/equipment shall be removed prior to full characterization. Building pipe chases or utility trenches identified shall be uncovered to allow the maximum percentage of surface area to be available for characterization.
- 5.6.2 Grids or areas which are not surveyed, including all inaccessible locations, are considered contaminated. These areas will be recorded on forms DDO-376 and DDO-382. The areas will also be further identified by outlining the unmonitored locations on the actual surfaces.

5.7 Indirect Survey (Smear Survey)

- 5.7.1 A 10% minimum indirect survey shall be performed on all grids with activity levels that do not exceed the DLV.
- 5.7.2 All smears shall be referenced to a specific grid and numbered uniquely, with exceptions noted on DDO-376.
- 5.7.3 A request for analysis (DDO-027) for gross alpha and gross beta counting data for smear samples shall be submitted to the Radioanalytical

Laboratory (RAL) in accordance with Reference 3.1.6. The request for analysis, completed DDO-376, and results from the RAL shall constitute a complete analysis package.

5.7.4 In rooms or areas where no residual contamination is identified by initial survey measurements, a final status survey may be performed in accordance with Reference 3.1.3.

5.8 Daily activities, including unusual situations, inaccessible areas, etc. will be summarized on DDO-382.

6.0 **Records**

Records are sent in duplicate to Project Records in accordance with Reference 3.1.11

- DDO-027, Radioanalytical Laboratory Analytical Request
- DDO-104, Work Instructions
- DDO-164, Waste Management Checklist
- DDO-195, Industrial Safety Checklist
- DDO-376, Characterization Radiological Survey Report
- DDO-380, Field Instrument Source Check
- DDO-381, Characterization Sampling Or Gamma Survey Report
- DDO-382, Daily Summary Report Form

7.0 **Forms, Exhibits, and Attachments**

7.1 **Forms**

- DDO-027, Radioanalytical Laboratory Analytical Request (see Reference 3.1.6)
- DDO-104, Work Instruction (see Reference 3.1.7)
- DDO-164, Waste Management Checklist (see Reference 3.1.10)
- DDO-195, Industrial Safety Checklist (see Reference 3.1.7)
- DDO-376, Characterization Radiological Survey Report
- DDO-380, Field Instrument Source Check
- DDO-381, Characterization Sampling Or Gamma Survey Report
- DDO-382, Daily Summary Report Form

7.2 Exhibits

None.

7.3 Attachments

None.

